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FOURTH EDITION

Cost Accounting



- Jawahar Lal
- Seema Srivastava

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Cost Accounting

Fourth Edition

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Fourth Edition

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PREFACE TO THE FOURTH EDITION

It is our pleasure to place the fourth edition of the book *Cost Accounting* among the students and other readers. The earlier edition of the book has been highly appreciated by the students and the academic community. This fact has further inspired us to make the revised edition a highly valuable and student friendly text.

The fourth edition of *Cost Accounting* is further an attempt to present an update on different aspects of cost accounting in a more logical, clear and comprehensive manner. Large portions in most chapters of the book have been thoroughly revised and rearranged to make them more lucid and understandable to the students and other users. The following chapters have been greatly modified and improved to make them highly purposeful for the students.

- Financial Accounting, Cost Accounting and Management Accounting
- Cost: Concepts and Classifications
- Activity—Based Costing
- Marginal (Variable) Costing
- Alternative Choices Decisions
- Pricing Decisions
- Responsibility Accounting and Divisional Performance Measurement

In addition to the above, this edition has added new inputs on certain emerging concepts in cost accounting. It has the following value-added features to make it an essential and quality text for the students.

(i) All the chapters in the book begin with Learning Objectives to enhance understanding of concepts and discussion presented in the chapters.

(ii) Inclusion of materials on some emerging concepts and other topics to strengthen the discussion of the subject matter such as

- Backflush Costing
- Throughput Costing
- Cost Management
- Kanban
- Advantages and Demerits of ABC
- ABC in Service Organisations
- Target Costing
- Kaizen Costing
- Life Cycle Costing
- Activity-based Management
- Curvi-linear Breakeven Analysis
- Desired or Target Profit

- Multi-product situations
- Sales Mix and Breakeven point
- Desired Profit and Tax
- Cost Indifference Point
- Relevant Revenues
- Qualitative Factors
- Make/Buy or Outsourcing Decision
- Target Pricing
- Prices Indifference Point
- Objectives in Sound Transfer Pricing System

(iii) Numerical Problems taken from the examination papers of the following courses have been included in the text.

- B.Com. (Hons.), University of Delhi
- B.Com., University of Delhi
- C.A., Professional Competence Course, Group – II, Paper – IV – Cost Accounting and Financial Management (earlier known as C.A. (Inter) and P.E. Course II, Group II)
- I.C.W.A. (Intermediate) Stage I, Paper V – Cost and Management Accounting [earlier known as C.A. (Inter)]

(iv) Objective Type Questions taken from the examination papers of B.Com. (Hons.), B.Com. of University of Delhi, C.A., I.C.W.A. and other examinations have been given in Appendix A alongwith their answers. They include True/False statements, Fill in Blanks, Matching Statements and Multiple Choice Questions.

(v) All the chapters have now more solved and unsolved numerical problems.

(vi) Theory questions of the examination papers of B.Com. (Hons.), B.Com. of University of Delhi, C.A., I.C.W.A. have been included.

(vii) Solutions manual as a companion volume has been developed for this edition which contains solutions to all the numerical problems given in different chapters of the text. This will be available on the website (address: **www.mhhe.com/lalcostacc4e**).

This fourth edition fits adequately and satisfactorily well with the course contents of the following courses:

(i) B.Com. (Hons.) course of University of Delhi, Paper IX – Cost Accounting and Paper XVI – Management Accounting

(ii) B.Com. Course of University of Delhi, Paper XII – Cost Accounting

(iii) B.Com. and M.Com. of other Indian Universities having a paper on Cost Accounting in their syllabi

(iv) C.A., Professional Competence Course, Group II, Paper 4 – Cost Accounting and Financial Management (for Cost Accounting portion)

(v) I.C.W.A., Intermediate, Stage I, Paper 5 – Cost and Management Accounting

(vi) M.B.A., M.F.C., MIB, MHROD, C.S., C.F.A. and other professional examinations having a semester or annual course on Cost Accounting

It is our strong conviction that this fourth edition would prove highly relevant and very useful text to the students pursuing the above courses.

We would welcome and appreciate constructive suggestions and opinions from the readers to improve further the quality of the book.

Jawahar Lal
Seema Srivastava

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PREFACE TO THE FIRST EDITION

This book has been written to serve as a text and provides a vigorous and interesting coverage of the topics in a simple manner. It is designed to help students understand the role of cost accounting, a subject of considerable interest and utility, in accomplishing three broad objectives: (i) cost ascertainment; (ii) cost analysis and cost control; and (iii) managerial decision-making. To achieve these objectives, the contents of the text have been divided into five parts. Part I explains the objectives and role of cost accounting, and basic cost concepts. Part II emphasises the basic elements of cost and Part III discusses cost accumulation and costing making. Part IV is devoted to a discussion on the foundations of managerial planning, control and decision-making. Part V discusses some independent topics which are important in cost accounting.

Part I consists of two chapters which covers the basic concepts and techniques in depth, before a student is exposed to the more vital areas of cost accounting.

Chapter 1 deals with cost accounting, financial accounting, objectives of cost accounting and the cost accounting department.

Chapter 2 provides a survey of basic cost concepts, such as fixed cost, variable cost, semi-variable cost, direct cost, indirect cost, product cost, period cost, opportunity cost, sunk cost, differential cost, joint cost, common cost, and other cost concepts.

Part II is devoted to the basic elements of cost.

Chapters 3, 4, 5, 6 and 7 discuss in detail, each of the components making up the cost of goods manufactured—materials, labour, overhead costs, and expenses.

Part III explains the approaches to product cost accounting, i.e. the basic cost methods. It also stresses methods of accounting systems—integrated and non-integrated.

Chapters 8, 9, 10, 11 describe in great detail cost accumulation methods, such as single costing, job costing, process costing, and operating costing respectively.

Chapters 12, 13, 14 and 15 are devoted to cost control accounts, reconciliation of cost and financial accounts, integrated accounts, and uniform costing and inter-firm comparison.

Part IV consists of four chapters whose principal emphasis is on the internal uses of cost accounting data for managerial planning, control and decision-making.

Chapter 16, 17, 18 and 19 cover and make an in-depth study of budgeting, standard costing and variance analyses, variable costing, and decision-making problems.

Part V comprises four independent chapters which cover a few but important areas in cost accounting.

Chapters 20, 21, 22 and 23 explain responsibility accounting and cost control, marketing cost analyses and decisions, mechanised accounting, cost audit and costing requirements.

I strongly believe that cost accounting books available at present in India and used by the students, both university and professional, have not responded adequately and satisfactorily to their changing requirements

and objectives. Most such books lack relevant, up-to-date and adequate material, logical presentation, practical problems, and satisfactory explanation of basic cost accounting concepts, cost analysis, and managerial uses of cost accounting data.

The present book not only avoids the limitation of these presently available books, but also has several features to help students adequately in their academic and professional courses. Basically, it aims at achieving the following important objectives:

- Detailed coverage of all topics and related subject matter in cost accounting.
- Adequate flexibility to fulfil the needs of different university and professional courses in cost accounting which vary in terms of coverage and emphasis.
- Simple, clear and logical presentation, and an integrated approach to the study of cost accounting, making the subject appear as one comprehensive unit.
- A wide range of illustrations beginning with simple ones and subsequently presenting complex problems. This will help create confidence among students and encourage them to accept challenges later.
- A wide range of thought-provoking questions and problems varying in content, length and difficulty. Most problems are new and have been taken from university and professional examinations, such as B Com (Hons), B Com, M Com, CA, ICWA, ICMA and CIMA (UK), CMA and CPA (USA).
- Coordination between the questions and problems at the end of each chapter and the discussions and explanations presented in the body of the chapter. This facilitates the learning process among students and increases understanding of the subject.

The present book will be very useful for the following courses:

- B Com (Hons), B Com and M Com examinations
- The Institute of Chartered Accountants of India examinations (Intermediate)
- The Institute of Cost and Works Accountants of India examinations (Intermediate)
- Company Secretaries examination
- Master of Business Administration (MBA) examination
- The Institute of Chartered Financial Analysts of India
- Other professional examinations

I am grateful to numerous persons and friends who have given valuable suggestions in the course of writing this text. The materials found in an existing source and used in the book have been duly acknowledged. I appreciate the permissions given by various publishers to use the published materials in this text.

To my wife Pratibha, and our children Sanjay, Seema and Rajnish, I acknowledge a special debt. Their constant support, encouragement and patience have greatly eased my burden and made this project possible.

I sincerely welcome criticisms, views and suggestions from readers for improvement of this text.

Jawahar Lal

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LIST OF ABBREVIATIONS

SCFP	Statement of Changes in Financial Position
GAAP	Generally Accepted Accounting Principles
ICMA	The Institute of Cost and Management Accountants
JIT	Just-In-Time
CIMA	Chartered Institute of Management Accountants
WIP	Work-In-Process or Progress
ABC	Activity Based Costing
ABM	Activity Based Management
EOQ	Economic Order Quantity
ROQ	Reorder Quantity
ROL	Reorder Level
TQM	Total Quality Management
AQL	Acceptable Quality Level
FIFO	First-in, First-out
LIFO	Last-in, First-out
HIFO	Highest-in, First-out
WN	Working Note
CVP	Cost-Volume-Profit
BEP	Break-even Point
DMV	Direct Material Variances
DMCV	Direct Material Cost Variance
DMPV	Direct Material Price Variance
DMUV	Direct Material Usage Variance
DLCV	Direct Labour Cost Variance
DLRV	Direct Labour Rate Variance
DLRTV	Direct Labour Rate Time Variance
DLITV	Direct Labour Idle Time Variance
LCV	Labour Cost Variance
LEV	Labour Efficiency Variance
LYV	Labour Yield Variance
LRV	Labour Rate Variance
ITV	Idle Time Variance
LMV	Labour Mix Variance
ZBB	Zero Base Budgeting
PPBS	Planning, Programming and Budgeting System
ROI	Return On Investment
RI	Residual Income

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PART 1

CONCEPTUAL FRAMEWORK

The first part of this book discusses the basic nature of financial accounting, cost accounting and management accounting and different cost concepts and classifications. The distinctive features and scope of financial, cost and management accounting alongwith their similarities, dissimilarities, and roles have been discussed in the first chapter. The second chapter focuses on different cost classifications for different purposes, cost control; cost reduction and preparation of cost sheet.

1. FINANCIAL ACCOUNTING, COST ACCOUNTING AND MANAGEMENT ACCOUNTING
2. COST: CONCEPTS AND CLASSIFICATIONS

1 FINANCIAL ACCOUNTING, COST ACCOUNTING AND MANAGEMENT ACCOUNTING

Learning Objectives

After reading this chapter, you should be able to:

1. understand financial accounting, its scope, nature and limitations;
2. describe cost accounting, its objectives, advantages, its importances in management;
3. discuss management accounting, its inter-relationships and dissimilarities with cost accounting and financial accounting;
4. explain costing, its types, methods and techniques;
5. understand the role of cost accounting department in a manufacturing concern;
6. define throughput and backflush costing, cost centres, cost units;
7. explain cost accounting system, its features, difficulties in its installation, factors influencing it, arguments against it; and
8. understand the role of management accountant.

Modern business needs frequent information regarding costs of business activities to plan accurately for the future, to control business results, and to make a proper appraisal of the performances of persons working in an organisation. The fulfilment of these goals requires details about the costs incurred and benefits (revenues) obtained which are provided by what are known as "cost accounting", and "management accounting". In comparison, financial accounting does not provide management with detailed cost and revenue information relevant to its needs. Before examining the nature and contribution of cost accounting it would be appropriate to discuss the nature of financial accounting and its limitations in greater detail.

FINANCIAL ACCOUNTING

Financial accounting is concerned with providing information to external users such as shareholders (existing and potential), creditors, financial analysts, labour unions, government authorities, and the likes. Financial accounting is oriented towards the preparation of financial statements which summarise the results of operations for selected periods of time and show the financial position of the business at particular dates. The following points are important to understand the scope and nature of financial accounting:

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Objectives

The basic objective of financial accounting is to provide useful information, through preparing general purpose reports, to investors, creditors and other users in making sound investment and economic decisions. These general purpose reports provide information on management performance to judge its effectiveness in utilising the resources and running the enterprise.

Contents

The end product of the financial accounting process are the financial statements that communicate useful information to decision-makers such as profit and loss account, balance sheet, statement of changes in financial position (SCFP) etc.

Accounting System

Journals, ledgers and other accounting techniques used in financial accounting depend upon the concept of the double-entry system. Financial accounting also uses generally accepted accounting principles (GAAP)[1] to record, classify and summarise business transactions and to prepare financial statements.

Measurement Unit

Financial accounting measures business transactions, economic resources and economic obligations and changes in them in terms of monetary units of a society in which it operates. For example, the common denominator or yardstick used for accounting measurement is the Rupee in India and dollar in the U.S.A.

Users of Financial Accounting Information

As stated earlier, financial accounting information is intended primarily to serve external users. Examples of such users are owners, creditors, potential owners, suppliers, management, tax authorities, employees, customers, financial analysts and advisers, stock exchanges, financial press and reporting agencies, trade associations, labour unions, general public.

LIMITATION OF FINANCIAL ACCOUNTING

Financial accounting is significant for managements as it helps them to direct and control the firm's activities and functions and to determine appropriate managerial policies in different areas, such as production, sales, administration and finance. However, financial accounting suffers from the following limitations which have been responsible for the emergence of cost accounting:

1. Financial accounting does not provide detailed cost information for different departments, processes, products, jobs, different services and functions.
2. Financial accounting does not set up a proper system of controlling materials and supplies which leads to losses on account of misappropriation, misutilisation, scrap, defectives, etc.
3. The recording and accounting for wages and labour is not done for different jobs, processes, products, departments. This creates problems in analysing the cost associated with different activities and rewarding workers and employees for the above-average performance.

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1. Generally Accepted Accounting Principles (GAAP) encompass the conventions, rules and procedures necessary to define accepted accounting practice at a particular time.

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4. It is difficult to know the behaviour of costs in financial accounting as expenses are not classified into fixed and variable, direct and indirect costs.
5. Financial accounting does not possess an adequate system of standards to evaluate the performance of departments and employees working in the departments.
6. Financial accounting contains historical cost information which is accumulated at the end of the accounting period. The historical cost is not a reliable basis for predicting future earnings, solvency, or overall managerial effectiveness.
7. Financial accounting does not provide necessary information to management in taking important decisions about expansion of business, dropping of a product line, starting a new product, alternative methods of production, improvement in product etc.
8. Financial accounting does not provide cost data to determine the price of the product being manufactured or the service being rendered to the consumers.

In spite of the above limitations, financial accounting has utility and will continue to serve management in the future also. Because of growing business requirements, the scope of financial accounting is changing and can be expected to continue to change.

COST ACCOUNTING

Cost accounting, as a tool of management, provides management with detailed records of the costs relating to products, operations or functions. Cost accounting refers to the process of determining and accumulating the cost of some particular product or activity. It also covers classification, analysis and interpretation of costs. The costs so determined and accumulated may be the estimated future costs for planning purposes, or actual (historical) costs for evaluating performance. The Institute of Cost and Management Accountants (ICMA), London, defines cost accounting as "the process of accounting for cost from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with cost centres and cost units. In its widest usage it embraces the preparation of statistical data, the application of cost control methods and the ascertainment of the profitability of activities carried out or planned".

COST ACCOUNTANCY

Cost accounting has been differentiated from cost accountancy. The Institute of Cost and Management Accountants, London has defined cost accountancy as the "application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and ascertainment of profitability as well as presentation of information for the purpose of managerial decision-making". According to this definition the term "cost accountancy" includes costing, cost accounting, budgetary control, cost control and cost audit. Although literature in the U.K. in the area of cost accounting tends to differentiate between cost accounting and cost accountancy, U.S. literature does not appear to point out any basic difference between these two terms.

COSTING

Cost Accounting and Costing have distinctly different meanings. The Institute of Cost and Management Accountants, London has defined costing as the ascertainment of costs. Costing includes the 'techniques' and 'processes' of ascertaining costs. The 'technique' refers to principles and rules which are applied for ascertaining costs of products manufactured and services rendered. There are mainly two methods of costing known as job costing and process costing. The 'process' includes the day to day routine of determining costs

within the method of costing (either job or process) adopted by a business enterprise. Within such a process, there could be historical costing, marginal costing, absorption costing, standard costing etc.

In practice, the three terms cost accounting, cost accountancy, and costing are most often used interchangeably although they are defined differently.

COST ACCOUNTING AND MANAGEMENT

Management requires adequate, systematic and useful cost data and reports to manage a business enterprise and to achieve business objectives. The useful information provided by cost records and reports in cost accounting assists management in performing the following important tasks:

1. Cost accounting helps in determination and analysis of cost of departments, processes, jobs, products, sales territories, sales order etc. This advantage is not available to manufacturing companies alone. In fact, the analysis of cost and income can be made in almost all type of organisation—profit or non-profit.

The example given below points out how cost accounting by products, may reveal facts and data which cannot be developed in financial accounting. Cost statements produced at regular, short intervals, which are not prepared in financial accounting, would have enabled the firm to take prompt action to overcome the problems of producing and selling Product C.

The analysis (based on cost statements) points out that the contribution of firm products to total net profit (15%) vary significantly among products. Product C does not cover its prime costs, and causes a net loss to the firm of Rs. 8,000 in the year; its selling and distribution costs are also particularly more compared to the other products.

The firm may decide to discontinue product C, but before deciding this, an enquiry may be made of the cost structure to find out whether or not more efficient manufacturing, selling and distribution is possible. At the same time attention must be paid to pricing policy. It should be investigated as to whether the selling price of this product can be increased to a profitable level.

Table 1–1 COST STATEMENTS

Particulars	*A*	*B*	*C*	*D*	*Total*
Sales	Rs. 60,000	Rs. 60,000	Rs. 40,000	Rs. 40,000	Rs. 2,00,000
Materials	30,000	22,000	26,000	24,000	1,02,000
Wages	12,000	8,000	12,000	8,000	40,000
Direct Exp.	2,000	2,000	3,000	1,000	8,000
Prime Cost	44,000	32,000	41,000	33,000	1,50,000
Work Exp.	1,600	2,000	500	200	
Selling Exp.	400	1,600	2,000	400	
Distribution Exp.	1,000	400	3,500	200	
General Adm. Exp.	1,000	4,000	1,000	200	
Overhead costs	4,000	8,000	7,000	1,000	20,000
Total Cost	48,000	40,000	48,000	34,000	1,70,000
Profit	12,000	20,000	–(8000)	6,000	30,000
Percentage Profit/Loss	20%	$33\frac{1}{3}$ %	(–)20%	15%	15%

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2. Cost accounting helps management in controlling cost which is probably the most important objective of every business firm. Cost accounting facilitates this task through accumulation and utilisation of cost data regarding different products, activities or functions. Each cost should be examined in the light of service or benefit obtained so that management can keep the cost at the lowest possible point.
3. One of the important uses (perhaps the most important) of cost information is in helping to make revenue decisions. Revenue decisions can be divided into the following three categories:
   (i) Pricing—Cost data are vital in pricing new products, and to make a decision as to whether to lower or raise a price.
   (ii) Product mix—Management generally has to make short term and long term product mix decisions. For short-term cost data are used to determine which product to push in the market. Similarly, in the long run the questions of increasing and decreasing capacity can be solved with the help of relevant cost information.
   (iii) Profit-volume decisions—The profit is mainly the result of a combination of three factors, namely cost, volume, selling price. Decisions like reducing price and having additional sales, maintaining *status quo* and accepting a lower income, increasing quality of the product and having extra volume of sales, increasing selling price and improving the turnover, are significant.
   Cost data assists managements in making sound decisions in all these important areas.
4. Cost accounting helps in making special cost studies and investigations which are vital to management in formulating policies and plans directed towards profitable operations. Such special studies include pricing of a new product or new services, elimination of seasonal conditions, expansion or contraction programmes, replacement of machinery and equipment, dropping a product, changes in methods of distributing products, changes in production methods.
5. Cost accounting assists and participates in the formulation and execution of budgets and standards. Cost information for managerial decision making and planning is the most important justification of a sound cost accounting system.

OBJECTIVES OF COST ACCOUNTING

There is a direct relationship among information needs of management, cost accounting objectives, and techniques and tools used for analyses in cost accounting. Cost accounting has the following three important objectives:

1. To determine product costs.
2. To facilitate planning and control of regular business activities.
3. To supply information for short- and long-run decisions.

Product Costing

The objective of determining the cost of products is of prime importance in cost accounting. The total product cost and cost per unit of product are important in making inventory valuation, deciding price of the product, and managerial decision-making. Product costing covers the entire cycle of accumulating manufacturing and other costs and subsequently assigning them to work-in-progress and finished goods.

Planning and Control

Another important objective of cost accounting is the creation of useful cost data and information for the purposes of planning and control by management. The different alternative plans are evaluated in terms of respective cost and associated benefits.

The management control over business operations aims to establish balance between actual and budgeted performances. A properly designed cost accounting system includes the following steps in the control process:

1. Comparing actual business performances with budgets and standards.
2. Analysing the variance between budget and standards and actuals by causes, and management responsibility so that corrective action may be taken.
3. Providing managers with data and reports about their individual performances and performance of subordinates.

Information for Decisions

An important purpose of the cost accounting system is to provide data and special analyses for short- and long-run decisions of a non-recurring nature. Appropriate cost information must be accumulated to make a wide variety of short- and long-run decisions.

According to Henke and Spoede[2], the following are the objectives of cost information developed in cost accounting:

1. As a basis for valuing manufactured inventories and cost of goods sold in externally presented financial reports.
2. In controlling operations through the evaluation of operating results and the placement of responsibilities for the uses of organisational resources on the shoulders of specifically identifiable persons within the organisation.
3. In planning operations through the establishment of cost and budgetary goals.
4. In making day-to-day operating decisions (a part of controlling operations).

COST ACCOUNTING Vs. FINANCIAL ACCOUNTING

Financial accounting is that branch of accounting which accumulates and presents data primarily for use by investors, creditors and other external parties. Financial accounting is designed to meet external information needs and to comply with generally accepted accounting principles.

Cost accounting focuses primarily on accounting for the flows of costs and is concerned with the development of systems for relating costs to the products or services produced by an organisation.

Financial accounting and cost accounting differs in the following respects:

1. *Nature* Basically, financial accounting classifies, records, presents and interprets, in terms of money, transactions and events that are of a financial character, and provides management with the facts and figures necessary for the preparation of the periodic financial statements—the balance sheet, the income statement and the statement of changes in financial position. Financial accounting provides information about the business in a general way. In contrast to financial accounting, cost accounting classifies, records, presents and interprets in a significant manner the material, labour and overhead costs involved in manufacturing and selling each product, or each job or rendering a service.
2. *Primary users of information* The users of financial accounting statements are mainly external to the business enterprise such as shareholders, creditors, financial analysts, government authorities, stock exchange, labour unions, etc.

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2. Emerson O. Henke and Charlene W. Spoede, Cost Accounting: Managerial Use of Accounting Data, PWS-KENT Publishing Company, Boston, 1991, p. 5.

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The information generated under the cost accounting system is used by members of management at different levels. Thus, different sets of information could be developed under cost accounting and supplied to different persons responsible for activities in the organisation. Cost accounting provides information to the management for proper planning, operation, control and decision making.

3. *Accounting system* Financial accounting strictly follows the double-entry system for recording, classifying and summarising business transactions. Cost accounting may not be based on the double-entry system. The data under cost accounting may be gathered for small or large segments or activities of an organisation and monetary as well as other measures can be used for different activities in the firm.
4. *Accounting principles* Financial accounting data is primarily meant for external users. The "generally accepted accounting principles" are important in financial accounting and are used extensively while recording, classifying, summarising, and reporting business transactions.

   On the contrary, cost accounting is not bound to use "the generally accepted accounting principles". It can use any accounting technique or practice which generates useful information.
5. *Analysis of profit* Financial accounts in financial accounting gives the accounts of the whole business and disclose the net profit or loss of the business as a whole. However, cost accounting discloses profit or loss of each product, job, service or division. In financial accounting, costs are reported in aggregate while costs are broken down on a unit basis in cost accounting.
6. *Scope of transactions* Financial accounting relates to all commercial transactions of a business and include all expenses in preparing financial accounts. However, cost accounting and cost accounts relate to transactions connected with the manufacture of goods and services and include only those expenses which enter into the production.

   Financial accounts are concerned with external transactions that is, transactions between the business concern on one side and third parties on the other. These transactions form the basis for payment or receipt of cash. Cost accounts are concerned with internal transactions which do not form the basis of payment or receipt of cash.
7. *Unit of measurement* All information under financial accounting is in terms of money. That is, transactions measured in terms of money have already occurred. In comparison, cost accounting applies any measurement unit that is useful in a particular situation. Besides the monetary unit, the cost accountant may find it necessary to use such measures as labour hours, machine hours and product units for the purpose of analysis and decision making. Financial accounts deal mainly with historical actual facts and figures whereas cost accounts deal partly with historical facts and figures and partly with future estimates and projections.
8. *Time span* Financial accounting data and statements are developed for a definite period, usually yearly, half yearly, quarterly. It requires that financial statements be developed and presented at regular time intervals. Cost accounting reports and statements are prepared whenever needed. Reports may be prepared on a monthly, weekly or even daily basis. Frequency of reports is determined by particular planning and controlling needs, objectives of cost control and cost determination.

Inspite of the above differences, both financial and cost accounting are in agreement regarding actual cost data and product costing analyses. Closing inventory values and cost of goods manufactured and sold are the main examples. For the preparation of the income statement, financial accountant receives the necessary data from the cost accountant.

MANAGEMENT ACCOUNTING

Management accounting deals with providing information including financial accounting information to managers for their use in planning, decision-making, performance evaluation, control, management of costs

and cost determination for financial reporting. Management Accounting contains reports prepared to fulfil the needs of managements.

The National Association of Accountants (USA), in Statement No. 1A (Statements on Management Accounting, 1982), has defined management accounting as:

"...the process of identification, measurement, accumulation, analysis, preparation and communication of financial information used by management to plan, evaluate, and control within the organisation and to assure appropriate use and accountability for its resources."

The CIMA (UK) defines the term, 'management accounting' in the following manner:

"Management accounting is an integral part of management concerned with identifying, presenting and interpreting information used for:

1. formulating strategy
2. planning and controlling activities
3. decision taking
4. optimising the use of resources
5. disclosure to shareholders and others external to the entity
6. disclosure to employees
7. safeguarding assets."

Thus management accounting is concerned with data collection from internal and external sources, analysing, processing, interpreting and communicating the information for use within the organisation so that management can more effectively plan, make decisions and control operations.

Management accounting is not only confined to the area of product costing, cost and price data. In management accounting, the objective is to have a data pool which will include any and all information that management may need. For example, if management decides to depend on long-terms debt for expansion of business, it may be investigated as to what effect this decision will have upon the earnings per share? Should debt in the equity structure be too large or small? Similarly, management may be interested in knowing the adequacy of cash flow receipts to pay current obligations or the effect of inflation on business decisions and performances. Thus, this field of accounting helps management in the total situation. In achieving this goal, management accounting makes use of information that is drawn from financial accounting and other disciplines, such as economics, finance, statistics, operational research and the like.

The term 'management' includes the activities and functions of all individuals who are working at different positions in an organisation such as

- executive directions with management responsibilities
- senior managers
- middle-level managers
- lower-level managers
- supervisors/inspectors/foremen and other personnel in a supervisory position.
- employees and workers (who are not in the position of managers) such as operating workers; production line workers; employees, workers and clerks working in different departments; salespersons.

Management accounting, in future, may include many areas of managerial and operating activities to help managers in their tasks and business firms to achieve its objectives and vision. Further, it is likely that management accounting may discard some of its activities currently within its scope and include some new activities as mainstream management accounting activities to cope with changing complex business environment. The following table summarises some of the areas considered to be part of management accounting.

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Table 1–2 SOME AREAS OF ACTIVITY CONSIDERED TO BE PART OF MANAGEMENT ACCOUNTING

- Budgeting, planning and forecasting
- Calculating the profitability of products, services and operations
- Measuring organisational, divisional and departmental performance
- Comparing results and performance within and between organisations
- Assisting in the performance of increasing effectiveness and efficiency
- Assessing the performance of past and future capital investments
- Advising on decisions about product mix, markets to be served and selling prices
- Advising on decisions on whether to outsource products, components, activities and services
- Advising on decisions involving the investment of scarce funds between a range of possible alternatives
- Assisting in the making of a wide range of strategic decisions.

Source: Hugh Coombs, David Hobbs and Ellis Jenkins, Management Accounting, Sage Publications, New Delhi, 2007, p.7.

COST ACCOUNTING AND MANAGEMENT ACCOUNTING

Although over the years, the subject matter of cost accounting has broadened, it is concerned mainly with the techniques of product costing and deals with only cost and price data. It is limited to product costing procedures and related information processing. It helps management in planning and controlling costs relating to both production and distribution activities.

Management accounting may be defined as the application of accounting techniques for providing information designed to help all levels of management in planning and controlling the activities of a business enterprise and in decision making. Management accounting is not confined to the area of product costing, cost and price data. In management accounting, the objective is to have an information system which may provide all information that management may need for planning, control and decision making. For example, if management decides to depend on equity capital for expansion of business, it may be investigated as to what effect this decision will have upon the company's share prices. Should debt in the capital structure be too large or small? Similarly, management may be interested in knowing the adequacy of cash inflows to pay liabilities on the due date or the effect of growing competition and use of latest technology on business decisions and performances. Thus, management accounting helps management in the total situation and in accomplishing all managerial functions.

Inspite of the differing parameters of cost accounting and management accounting, cost accounting is generally indistinguishable from what is known as management or managerial accounting. Both these accounting systems are closely linked as they use common basic data and reports to a significant degree. Much of the information used to prepare accounting statements and reports in cost accounting is also used in management accounting reports. Management accounting utilises the same (and also additional) data to prepare budgets, performance reports, control reports, data analyses for decision-making, planning and control purposes.

DIFFERENCES BETWEEN MANAGEMENT ACCOUNTING AND FINANCIAL ACCOUNTING

The differences between cost accounting and financial accounting, are also the points of difference between management accounting and financial accounting. As stated earlier, financial accounting implies the preparation of a set of financial statements, for each accounting period, in accordance with laws, rules, regulations and accounting standards and is concerned with shareholders, governmental authorities and other parties outside the business enterprise. Management accounting is not governed by any statute and is an internal function which aims to provide information to management.

Financial accounting takes an overall view of a business enterprise by totalling the results of its divisions and departments into a single summarised financial statement. Management accounting focuses attention at the lowest levels of production or any other activity in the organisation for providing help in planning, control and decision making.

Financial accounting records past, historical information. However, management accounting primarily uses present and future information. The past information in management accounting acts only as a guide in predicting the future.

COST ACCOUNTING, FINANCIAL ACCOUNTING AND MANAGEMENT ACCOUNTING

The discussion in the preceding paragraphs has tried to bring out differences as well as interdependency between cost accounting, financial accounting and management accounting. It is significant to note that all accounting information tends to rely on the same basic data system and set of accounts. Although an organisation can have different accounting systems designed for different purposes, some companies still depend on a single system to provide the basic accounting information. The single system typically focuses on providing information for financial accounting purposes, but its informational output can be adopted to meet most internal management requirements.

Barfield, Raiborn and Kinney[3] observe:

Cost accounting creates an overlap between financial accounting and management accounting. Cost accounting integrates with financial accounting by providing product costing information for financial statements and with management accounting by providing some of the quantitative, cost-based information managers need to perform their tasks.

The cost accounting overlaps causes the financial and management accounting systems to articulate or be joined together to form an informational network. As these two systems articulate, accountants must understand how cost accounting provides cost information for financial statements and supports management information needs. Organisations that do not manufacture products may not require elaborate cost accounting systems. However, even service companies need to understand how much their services cost so that they can determine whether it is cost-effective to be engaged in particular business activities or not.

There is no realistic dividing line between cost accounting and management accounting particularly with regard to the provision of information for planning and control. Cost accounting is at a more basic level than management accounting and in many organisations is primarily concerned with the ascertainment of product costs. But the cost accounting system is also an important source of data for management accounting purposes[4].

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3. Jesset T. Barfield, Cecily A. Raiborn and Michael R. Kinney, Cost Accounting, Traditions and Innovations, 5th Edition, Thomson South Western, 2003, p. 7.

4. T. Lucey, Management Accounting, ELBS, London, 1996, p. 2.

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ROLE OF MANAGEMENT ACCOUNTANT

A Management accountant is an accountant who participates in all accounting work within the organisation, including maintaining the accounting records, preparing financial statements, preparing many specialised managerial reports and statements, generating information for different levels of management, coordinating budgeting, accounting and reporting functions. Management accountant plays a vital role in helping managers in performing management functions such as planning, organising, coordination, control, decision making etc. However, the management accountant is a part of the management and not just a service arm to management. He acts as a manager and decisionmaker and exercises managerial influence and, of course, is responsible for the management of the entire accounting, reporting and budgeting functions.

ADVANTAGES OF COST ACCOUNTING

Business enterprises can derive many advantages from the cost accounting system. Some advantages are listed below:

1. The cost accounting system provides data about profitable and unprofitable products and activities. After investigating the causes of low profitability and unprofitability, management can take suitable corrective measures which may lead to higher profit.
2. All items of costs can be analysed to minimise the losses and wastage emerging from the manufacturing process and reduce the costs associated with different activities.
3. Production/manufacturing methods may be improved or changed so that costs can be controlled and profit increased.
4. Cost data can be obtained and compared with standard cost within the firm or industry.
5. Cost accounting helps management in avoiding losses arising due to many factors, such as low demand, competitive conditions, change in technology, seasonal demand for the product and the like.
6. Cost accounting also provides cost data and information to determine the price of the product. The cost of the product is perhaps the most important determinant of product pricing.
7. Negotiations with government and labour unions can easily be made with the information provided by the cost accounting system.
8. Cost accounting helps management in knowing the costs of different alternatives and selecting the most advantageous course of action. Decisions like make or buy, continue or drop a product, buy or lease, sell or process further, operate or shut down and other short-term decisions are easily solved with the help of cost accounting data.
9. More accurate and reliable financial accounts can be prepared promptly for use of management.
10. An adequate cost accounting system ensures maximum utilisation of physical and human resources, checks fraud and manipulations, and helps employees as well as the employers in their basic goals of getting higher earnings and maximising the profit of the concern.

METHODS OF COSTING

As stated earlier, the term "costing" refers to the techniques and processes of determining costs of a product manufactured or a service rendered. Different methods are applied in business enterprises to ascertain costs depending upon the nature of the product, production method and specific business conditions. For example, in a textile or steel company, raw material passes through different stages (processes) and production is done continuously. In some other industries, production is done at different customers' specific orders and each job is obviously different from the other job. In service industries like transport, hospital, banks etc.,

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all activities and costs incurred relate mainly to performing certain services (or activities). There are two methods of costing:

(A) Job Costing
(B) Process Costing

All other methods of costing are only variants of the above two methods of costing. All possible variations of job and process costing are as follows:

(A) Job Costing
(i) Batch Costing
(ii) Contract or Terminal Costing
(iii) Multiple or Composite Costing

(B) Process Costing
(i) Unit or Single Output Costing
(ii) Operating (Service) Costing
(iii) Operation Costing

Job Costing

Job costing is used in those business concerns where production is carried out as per specific order and customers specifications. Each job (or product) is separate and distinct from the other jobs or products. The method is popular in enterprises engaged in house-building, ship-building, machinery production and repair. Job costing has the following variants:

(i) Batch Costing

Batch costing is based on the concept of contract costing. This method is used to determine the cost of a group of identical or similar products. The batch consisting of similar products is the unit and not the single item within the batch. This method can be usefully applied for the production of nuts and bolts, medicines, components and other items which are manufactured in distinct batches.

(ii) Contract or Terminal Costing

This method of costing, based on the principle of job costing is used by house builders and civil contractors. The contract becomes the cost unit for which relevant costs are accumulated.

(iii) Multiple or Composite Costing

This costing method is used in those industries where the nature of the product is complex, such as motor cars, aeroplanes, etc. In such cases costs are accumulated for different components making the final product and then totalled to ascertain the total cost of the product.

Process Costing

This costing method is used in those industries where production is done continuously, such as chemicals, oil, gas, paper, etc. It is difficult to trace the costs to specific units and the total cost is averaged for the number of units manufactured. Sometimes, total cost and per unit cost is calculated at each stage of production for control purposes. Process costing has the following variants:

(i) Unit or Single Output Costing

This method is used where a single item is produced and the final production is composed of homogeneous units. The per unit cost is obtained by dividing the total cost by the total number of units manufactured.

(ii) Operating (Service) Costing

Operating costing method is used by those organisations which render services and do not manufacture any physical item, such as transport, power house, hospital. The cost units differ among these service organisations

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depending upon the nature of service being rendered. But usually the units are passenger-mile, tonne-mile, a bed in hospital, per student in a college.

(iii) Operation Costing

This costing method aims at ascertaining the costs of each operation in place of each process. In this method the assumption is that output is achieved through a number of different operations.

Besides the above variations of job costing and process costing, the different techniques or types of costing (discussed below) can be found in these two methods of costing and can be used to determine costs therein.

TECHNIQUES (TYPES) OF COSTING

The terms 'techniques' or 'types' refer to the manner of ascertaining costs of a product, job or activity. But these terms (techniques or types) also necessarily indicate what types of costs are being ascertained such as historical cost, standard cost, absorption (full) cost, marginal cost etc. It is clear that the term 'Methods of Costing' itself signifies only the method(s), job costing or process costing, that is being used to determine costs without indicating the types of costs (historical, standard, full or marginal) which are ascertained under the two methods of costing (Job or Process Costing). The following are generally the techniques of costing:

(1) Historical Costing

Historical costing is system of costing under which costs are determined after they have been incurred.

(2) Standard Costing

Under standard costing, standard costs are determined and used, and then compared with the actual costs to determine the extent of variances so that remedial action can be taken. Standard costs are the predetermined costs in conformity with the most efficient operation and use of the resources within the film.

(3) Absorption or Full Costing

Under this costing method, all manufacturing costs, fixed and variable, are charged to products, jobs, processes, etc. and are included in total cost.

(4) Variable or Marginal Costing

Variable costing method charges only variable production costs to products or jobs, and thus the cost of the products or jobs consists of only variable production and not fixed production costs. The fixed production, administration, selling and distribution costs are written off against profits in the periods in which they arise.

(5) Uniform Costing

Truly speaking, uniform costing is not a technique of costing, but is an attempt by several undertakings and organisations to use similar costing principles and/or practices.

COSTING SYSTEM

The term 'costing system' refers to an accounting system followed to accumulate costs, to ascertain costs of products or jobs, to prepare cost information using some procedures and principles for recording of cost data. Since there are two basic methods of costing—Job Costing and Process Costing, to ascertain costs, the costing system followed by business enterprises are also divided into two categories:

1. Job Order Costing System
2. Process Costing System

It should be understood that within these two costing systems, further, business enterprises may follow different techniques of costing such as historical cost, standard cost, full cost, marginal cost etc., which have been discussed earlier.

THROUGHPUT COSTING

Throughput Costing is also known as super-variable costing. This costing technique considers only direct materials as true variable cost and other remaining costs as period costs to be charged in the period in which they are incurred. Thus, in throughput costing, inventory is valued in terms of only direct material costs. In this costing, contribution is equal to revenue minus all variable direct materials cost of goods sold. GAAP in India and in other countries of the world do not permit use of this method for valuation of inventories. This costing is not used for external reporting because it gives significant different net income figures than those revealed by absorption costing. In this costing inventory figures are very low. Throughput costing has not achieved widespread use even for internal reporting purposes.

In throughput accounting, return is defined as sales less material costs in contrast to contribution which is sales less all variable costs (material, labour and variable overheads). The assumption is that all costs, except materials, are fixed in relation to throughput in the short run.

Throughput accounting is beneficial in a Just-In-Time (JIT) situation. It helps to direct attention to bottlenecks and forces management to concentrate on the key elements in making profits namely, inventory reduction and reducing the response time to customer demand[5].

BACKFLUSH COSTING

CIMA (UK) defines backflush costing as:

"A cost accounting system which focuses on the output of the organisation and then works backwards to allocate costs between cost of goods sold and inventory."

Backflush is a simple and clear book-keeping system created to reflect key aspects of JIT systems which implies little or no work-in-progress and demand pull. There are many variants of backflush accounting, a more popular among them is creating a single account 'Raw and In Process Account' in place of separate Raw Materials and Work-In-Process (WIP) accounts. When goods are sold, the standard cost of the materials in the finished goods would be credited, that is, backflushed to Raw and In Process Account. All conversion costs that is, labour and material is transferred to the cost of finished goods production and not to WIP account.

The following example illustrates the applications of backflush accounting.

Example: A firm has the following transactions for the month of January 2008.

	(Rs.)
Raw materials purchase	8,50,000
Conversion costs	6,86,000
	Units
Production	4,900
Sales	4,850

5. T. Lucy, Management Accounting, Ibid, p. 483.

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There are no opening inventory of raw materials, WIP and finished goods. The standard cost per unit is Rs. 310 (Rs. 170 for materials + Rs. 140 conversion cost). There was no closing WIP at the end of the period.

Required: Make journal entries for a backflush accounting system using a Raw Materials and In Progress account.

Solution:

	Rs.	Rs.
Raw materials and In Porgress A/c Dr.	8,50,000	
To creditors		8,50,000
(Purchase of raw materials on credit)		
Finished goods A/c Dr.	15,19,000	
Raw materials and In Progress A/c		8,33,000
Conversion cost control A/c		6,86,000
(Cost of goods produced 4,900 units)		
Cost of sales A/c Dr.	15,03,500	
To finished goods stock		15,03,500
(Cost of goods sold, 4,850 units × Rs. 310)		

At the end of January 2008, there will be two separate stock balances:

Raw materials and In Progress A/c = Rs. 8,50,000 – 8,33,000
= Rs. 1,70,000
Finished goods (50 units @ Rs 310) = Rs. 15,500

Notes: 1. Raw materials and In Progress A/c amount is calculated as follows:
4900 units × Rs. 170 = Rs. 8,33,000
2. All the entries shown above are at standard cost.
3. Figures have been chosen as such to avoid variances.

Backflush is an easy method. There is no separate account for WIP. Materials are not tracked through the production process as is found in traditional cost accounting. Accounting entries are very few; supporting vouchers and work flow documents are less required. Backflush accounting does not provide any incentives to managers for producing for stock.

INSTALLATION OF A COST ACCOUNTING SYSTEM

A cost accounting system is a system that accumulates costs, assigns them to cost objects, that is, products, jobs, processes, etc. and reports cost information. In addition to this, a proper cost accounting system assists management in the planning and control of business operations, in analysing product profitability, and in accomplishing business objectives through optimum utilisation of available resources. The underlying principles, procedures and objects of all costing system are the same, but the application of these principles and methods may vary with the circumstances. Basically, two main questions are involved in installing a cost accounting system: (i) factors influencing cost accounting system, and (ii) features of cost accounting systems.

Factors Influencing the Cost Accounting System

The following factors should be considered before designing the cost accounting system:

1. *Size of the firm* The complexity and outline of the cost accounting system depends on the size of the business enterprise and management requirements. As the size of the firm and business grows, management requirements for cost data and information increase. A large firm has to develop a large volume of cost data regarding the activities of various departments of the business enterprise.
2. *Manufacturing process or methods* The manufacturing process includes production layout and arrangement, production scheduling, production control methods, plant and equipment capacities, inspection and testing of materials, degree of complexity in the production procedure and factory layout of the particular business firm for which it is designed. Methods of wage payment (piece-rate, time-rate, incentive schemes), methods of collecting hours worked, inventory system, overhead recovery, and other problems related with the factory are the factors vital in designing a cost accounting system.
3. *Nature and number of products* If a single product is manufactured, all costs of direct material, direct labour and other factory expenses can be directly allocated to that product. But in the case of more than one product being produced, some costs of production relating to two or more products are to be equitably apportioned among them. In this situation, the process of developing cost data is more complex, which, in turn, influences the designing of the cost system.
4. *Management control needs* The designing of the cost accounting system in a business firm is guided by the management control requirement. The costing system should supply data to persons at different levels in the organisation to take suitable action in their respective areas.
5. *Raw materials* The nature of raw materials and the degree of waste therein influences the designing of the cost accounting system in a manufacturing concern. There are some materials which have a high degree of spoilage. The issuing of materials, methods of pricing and control over spoilage are accordingly adopted as to suit the specific type of materials.
6. *Staff efficiency* The working and formulation of the cost accounting system depends, to a great extent, on the efficiency of personnel and staff engaged in it.
7. *Comparability* A business enterprise follows cost accounting systems prevailing in other business firms within the same industry. This is necessary to facilitate comparison of its own cost data with data produced for the industry.
8. *Organisational structure* The cost accounting system must correspond to the organisational division or authority so that individual foremen, supervisors, department heads, or executives can be held accountable for the costs incurred in their respective departments.
9. *External factors* The adoption of a costing system depends mainly on internal factors and situations within the firm. However, external factors may influence scope of the costing system to be applied by a business firm. For example, Cost Accounting Rules are applicable to manufacturing companies in India which require certain cost information to be developed and submitted to government authorities.

Features of Cost Accounting System

The cost accounting system may be used by all types of business organisations—manufacturing and non-manufacturing. The cost accounting system should be practical, that is, it must be helpful to the business. There must be no attempt to make the business suit the system. The following are the essential features of a cost accounting system:

1. *Basis for accumulating costs* A fundamental feature of any system is the method of accumulating manufacturing costs. Costs may be accumulated by individual jobs (job order cost system) or by manufacturing departments or processes (process cost system).

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A job order cost system has the unique feature of accumulating manufacturing costs separately for each batch or job. Within a process cost system, costs are accumulated by process or department. Cost of production reports are prepared for each process in the factory. A process cost system is best suited for standard products that are manufactured continuously for mass production.

2. *Relationship with financial accounting* Most cost accounting systems are complementary/ supplemental in their relation to financial accounting. In this role, cost accounting systems imply physical inventory counts to determine quantities of materials, work-in-process and finished goods. Inventory quantities must be counted and unit costs determined before periodic financial statements can be prepared. An integrated system removes the need of coordination between financial accounting and cost accounting. Integrated systems are comparatively more sophisticated, more costly and more conducive to cost control than supplemental system.
3. *Basis of product costs* In many cost accounting systems, cost estimates are desirable in addition to actual or historical costs. Actual costs incurred for a period are used to compute product costs. A system using actual material cost, actual labour cost and estimated overhead rate is called a normal cost system. In contrast, standard costs may be developed for the purpose of product costing. Standard costs are carefully predetermined estimates of what material, labour and overhead costs should be on a per unit basis, given product specifications and desired operating efficiency.
4. *Full (absorption) costing or marginal (variable) costing* Another important question relating to the cost accounting system is whether all manufacturing costs are to be accumulated and attached to products. The traditional opinion is that all manufacturing costs—variable and fixed—should be charged to products. This method is known as full costing or absorption costing, because fixed manufacturing costs are absorbed by units produced. An alternative viewpoint is that only variable manufacturing costs should be attached to products. In this method, fixed manufacturing costs are recorded as expenses of the accounting period.

Difficulties in Installation of a Costing System

The installation of costing system in business organisations is not an easy task. There are many difficulties, as listed below, which are faced by organisations while setting up costing system.

(1) Opposition from the Existing Staff

The existing staff is likely to oppose the introduction of costing system, may resent the additional work and may not provide cooperation which is necessary for the success of cost accounting system.

(2) Shortage of Trained Manpower

Installation of cost accounting system requires trained staff to operate the system effectively which organisations may not have, thus affecting adversely the better application of the system.

(3) Error in Measuring Requirements

The organisations, big and small, have varying requirements as to the costing system. Organisations may not know their specific requirements accurately. Consequently, the installation of costing system will either not meet their requirements or will provide unnecessary sophistication and dose of accounting procedures.

(4) Non-cooperation from Management

Resistance is noticed not only from the lower and middle staff but also from the members of top management. Managers may not support the Managing Director in his efforts to minimise costs and control activities as these might be looked upon as an interference in their managerial authorities.

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ARGUMENTS AGAINST COST ACCOUNTING

Cost accounting undoubtedly helps managements in managing the affairs of business efficiently and in accomplishing business goals. However, some organisations do not look with favour the installation of cost accounting system. Some arguments which are advanced against adopting cost accounting are as follows:

(1) The system of cost accounting may prove costly and small organisations may not find it profitable. The collection, analysis, allocation and maintenance of cost data is a time-consuming and difficult task which requires efficient manpower.
(2) All business organisations are required to prepare financial accounts to determine profit and financial position. Installation of cost accounting system along with financial accounting system increases work load.
(3) Cost accounting system itself is not an end but only a means to achieve certain objectives. The system itself will not improve efficiency, control costs and avoid wastage. Sometimes management personnel become inactive with the mere installation of the cost accounting system.

However, all the above arguments are not valid. Keeping in view the advantages and contributions of cost accounting to management, as explained earlier, it can be rightly said that cost accounting is a necessity for all business organisations. For manufacturing firms, cost accounting is vital necessity to reduce cost, to avoid waste, to improve efficiency and to provide cost data to management for planning, control and decision making.

COST CENTRES

The ICMA, London defines cost centres as "a location, person, or item of equipment (or a group of these) for which costs may be ascertained and used for the purposes of cost control." A cost centre is an organisational segment or area of activity considered to accumulate costs. The following are the types of cost centres usually found in a manufacturing company.

Impersonal Cost Centre

A cost centre which consists of a location or item of equipment (or a group of these).

Personal Cost Centre

A cost centre which consists of a person or group of persons.

Operation Cost Centre

A cost centre which consists of the machines and/or persons carrying out similar operations.

Process Cost Centre

A cost centre which consists of a specific process or a continuous sequence of operations.

COST UNITS

The ICMA, London has defined a cost unit as follows: "A unit of quantity of product, service or time (or a combination of these), in relation to which cost may be ascertained or expressed."

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In the job costing method, cost unit is a single specific order; in batch costing it consists of a group of similar articles; and in contract costing, it consists of a single product (contract). The cost units used in different industries cannot be uniform. The cost units and centres should be those which suit the business and which are readily understood and accepted by all concerned.

The Table 1.3 gives examples of cost units (that is, unit of cost activity) and method of costing used in different industries.

Table 1–3 COST UNIT AND METHOD OF COSTING

Industry/ Enterprise	*Cost unit*	*Method of costing*
1. Building	House or square foot of area	Job Costing
2. Chemical	Tonne, pound or kilogram	Process Costing
3. Cement	Tonne	Process Costing
4. Automobile	Number	Process Costing
5. Steel	Tonne	Process Costing
6. Transport	Tonne kilometre, Passenger kilometre	Operating Costing
7. Cable	Metre	Process Costing
8. Gas	Cubic foot or cubic metre	Process Costing
9. Nuts and bolts	Gross or some measure of standard weight	Job Costing
10. Power	Kilowatt hour	Process Costing
11. Paper	Ream	Process Costing
12. Timber	Cubic foot	Process Costing
13. Brewery	Per dozen bottles or per gallon of draught brew	Process Costing
14. Biscuits	Per (WT)	Process Costing
15. Hospital	Per bed occupied/out-patient visit	Operating Costing
16. Case-making	Per case	Job Costing
17. Road contractors	Per mile	Job Costing
18. Ice cream	Per gallon	Process Costing
19. Knitted textiles	Per pound/kg of fabric	Process Costing
20. Canned fruit	Per dozen cans or per gross cans	Process Costing
21. Soft drinks	Cases of 24 bottles each	Process Costing
22. Oil extraction, petrochemicals	Gallons, litres, tonnes	Process Costing
23. Pharmaceuticals	1000 nos. tablets, ampulses	Process Costing
24. Machine building	Numbers	Job Costing
25. Readymade garments	Numbers	Batch Costing
26. Aircraft	Numbers	Job Costing
27. Sugar	Tonnes, kilograms	Process Costing
28. Furnishing	Each article by numbers	Job Costing
29. Confectionary	Per kg	Process Costing
30. Clothing (automatic process)	Per dozen articles	Process Costing
31. Bicycle manufacturing	Number	Multiple Costing
32. Textiles	Metres, yards	Process Costing
33. Flour	Tonnes	Process Costing
34. Parts manufacturing	Nos. of articles in tens, hundreds, thousands	Job Costing

COST ACCOUNTING DEPARTMENT

The organisation of business enterprises differ widely in their nature and structure. Also, the accounting information is required to be provided to various persons within the organisation for decision-making. These factors greatly influence the designing of an organisational structure and the cost accounting department. In a typical manufacturing company, the Chief Accounting Officer is the controller or head of the accounting division (Fig. 1.1). The controller performs other functions besides determining the cost of product, such as budgeting, general (financial) accounting, systems and procedures, data processing, taxes and reports, internal auditing. Figure 1.2 depicts the different functions of the accounting department within the purview of the Chief Accounting Officer.

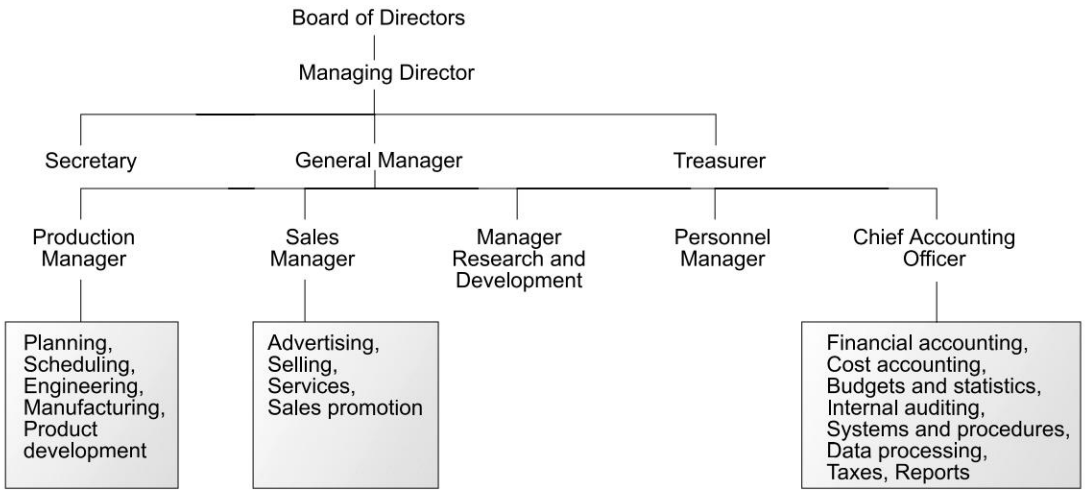


Fig. 1.1 Organisation Chart of a Manufacturing Company

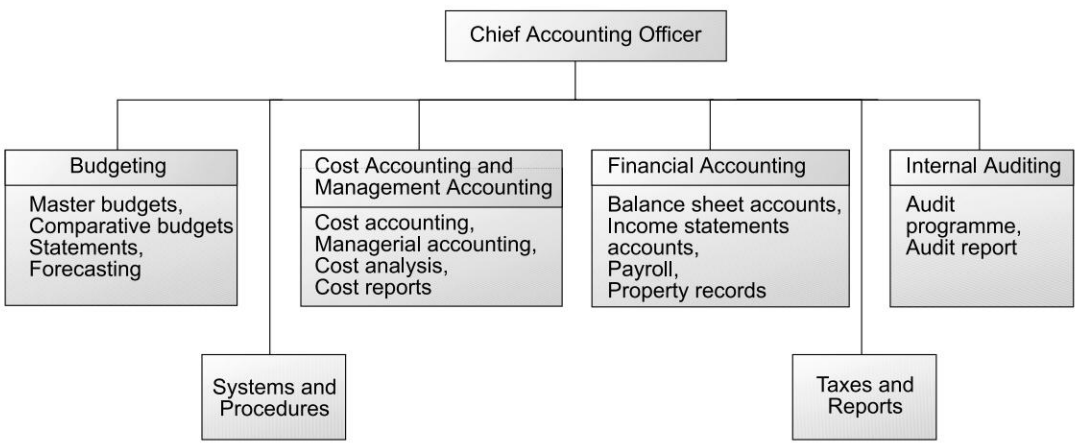


Fig. 1.2 Organisation of the Department of the Chief Accounting Officer

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The cost accounting department discharges many important functions in a manufacturing concern. It keeps full records about material, labour and overhead. After accumulating all different costs, it analyses them so that they can be used by management for planning, control and decision-making.

The cost accounting department, further, divides its responsibilities into different components to get prompt and timely reports. Coordination is needed among these functions (or departments) within the cost accounting department. Generally, these functional units are under the supervision of the Chief Accounts Officer (Fig. 1.2).

The cost accounting department and its activities are closely connected with other departments and their activities in the organisation. For example, the production department is responsible for designing, planning and producing products upto the finished product stage. The research and development department develops cost estimates for each element of cost, that is, material, labour and overhead. Costs are measured at different stages of production and activities to evaluate the efficiency of the department or persons associated with the specific activity. The personnel department is mainly engaged in keeping efficient employees, establishing wage rates and methods or remuneration which are beneficial to employees as well as to the firm. The marketing department requires a good product at a competitive price for dealing with customers. The sales department determines sales policies in terms of product cost data which helps the department to know which are profitable and unprofitable products. The finance department, which is responsible for arrangement of funds is greatly assisted by the cost accounting department which gives vital information on accounting, budgeting and cash flow. The cost accounting department helps the law department in working as per the legal requirements. Wages laws, bonus laws, labour agreements, taxes are some of the important areas where cost accounting and the law department both have to cooperate.

THEORY QUESTIONS

1. "Financial accounting procedures are generally designed to ascertain the periodic profit or loss, but there are important limitations and deficiencies in the system." Discuss. *(B Com (Hons), Delhi)*
2. Examine critically the drawbacks of conventional financial accounting. Do you think that these limitations have been overcome by the introduction of cost accounting in business? *(CA Inter)*
3. What is cost accounting? What are its objectives? How do cost accounting records help in the planning and control of operations of a business enterprise? *(B Com (Hons), Delhi, 2006)*
4. What is meant by cost accounting? In what essential respects does cost accounting differ from financial accounting? *(B Com (Hons), Delhi)*
5. Explain fully the concept of cost. How does cost accounting contribute to the effective and efficient management of an industrial establishment? *(B Com (Hons), Delhi)*
6. What is the function of a costing department in a manufacturing concern? How is the costing department useful to other departments in a manufacturing concern?
7. SV Ltd. is a manufacturing company which has a sound system of financial accounting. The management of the company, therefore, feels that there is no need for the installation of a cost accounting system. Prepare a report for management, bringing out the distinction between cost and financial accounting systems and the need for the introduction of a sound cost accounting system. *(CA Inter, MFC, Delhi)*
8. "A cost keeping system that simply records costs for the purpose of fixing sale prices has accomplished only a small part of its mission." What are the other functions of costing? *(ICWA, Inter)*
9. "Cost accounting is an unnecessary luxury for business establishments." Do you agree with the statement? Discuss. *(B Com (Hons), Delhi)*
10. Explain the important objectives of cost accounting. *(B Com (Hons), Delhi 1997, 2004)*
11. What is cost accounting? Discuss briefly its important functions in a business firm. *(B Com (Hons), Delhi 1998)*

12. Cost accounting has come to be an essential tool of the management." Comment. *(B. Com (Hons), Delhi, 2000, 2007)*

13. "Cost accounting is a system of foresight and not a postmortem examination, it turns losses into profits, speedsup activities and eliminates waste." Discuss. *(ICWA; B. Com (Hons), Delhi)*

14. State the primary objectives of installation of a costing system. Apart from technical costing problems, what practical difficulties would you meet and how would you overcome them? *(B. Com (Hons), Delhi)*

15. (a) State and explain the main differences between financial accounting and cost accounting.
(b) What is a cost centre and how does it differ from a department of a factory? *(B. Com (Hons), Delhi)*

16. How far is cost information helpful for the following purposes:
(a) Fixation of selling prices
(b) Control of costs
(c) Management decisions

17. "Limitations of financial accounting have made the management to realise the importance of cost accounting". Comment. *(B. Com (Hons), Delhi, 2003, 2006, B.Com. 2006)*

18. What are the advantages of introduction of costing system in an industrial organisation? *(I.C.W.A. Inter, Stage I, Dec. 2006, B.Com (Hons), Delhi, 2004)*

19. Mention the factors which should be considered in installing a costing system in an organisation. *(B. Com (Hons), Delhi, 2004, 2007)*

20. What is meant by cost accounting? Explain the difference between financial accounting and cost accounting. *(B. Com, Delhi, 2002)*

21. What purposes do cost centres serve? Are cost centres and cost units related to each other? *(B. Com (Hons), Delhi, 2002, B. Com, Delhi, 2005, 2006)*

22. "Cost accounting is becoming more and more relevant in the emerging economic scenario in India". Comment. *(B.Com (Hons), Delhi, 2007)*

23. Discuss the essentials of good cost accounting system. *(CA, P.E. Exam II, Group II, May 2004)*

24. You have been asked to install a costing system in a manufacturing company. What practical difficulties will you expect and how will you propose to overcome the same? *(C.A, P.E., Exam II, Group II, May 2004)*

25. What is meant by management accounting? Discuss its objectives. *(B. Com (Hons), Delhi, 2007)*

SELF EVALUATION QUESTIONS

1. List *A* gives you different methods of costing which can be used in one or more industries or organisations given in List *B*. Mention the correct costing method of the industries in List *B*.

List A Process, operating, single output, job, contract, multiple

List B

(i)	Chemical works	(ii)	Road transport company
(iii)	Coal	(iv)	Nursing home
(v)	Paint	(vi)	Construction industries
(vii)	Cement manufacturing	(viii)	Soap manufacturing
(ix)	Railways	(x)	Ship builders
(xi)	Bicycle manufacturing	(xii)	Readymade garments
(xiii)	Telephone	(xiv)	Cotton textiles
(xv)	Aluminum	(xvi)	Paper mill
(xvii)	Furniture manufacture	(xviii)	Meat packing
(xix)	Sugar	(xx)	Steel
(xxi)	Paper boxes	(xxii)	Air conditioners
(xxiii)	Locomotive	(xxiv)	Tyres and tubes
(xxv)	Leather	(xxvi)	Pianos
(xxvii)	Toys and novelties	(xxviii)	Oil refinery
(xxix)	Baby food	(xxx)	Radio receivers

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Ans. (i) Process (ii) Operating (iii) Single (iv) Operating (v) Process (vi) Contract (vii) Process (viii) Process (ix) Operating (x) Contract (xi) Multiple (xii) Batch (xiii) Operating (xiv) Process (xv) Process (xvi) Process (xvii) Job (xviii) Process (xix) Process (xx) Process (xxi) Process (xxii) Multiple (xxiii) Multiple (xxiv) Process (xxv) Process (xxvi) Batch (xxvii) Batch (xxviii) Process (xxix) Batch (xxx) Multiple

2. Indicate whether the following statements are True or False:

(i) The rental of a car which includes a fixed daily rate plus an extra fee for each kilometre driven is an example of a step cost.

(ii) Assuming inflation, if a company wants to maximise net income, it would select FIFO as the method of pricing raw materials.

(iii) Overtime premium paid to all factory workers is usually considered direct labour.

(iv) Period costs are invariable and are expensed out as and when the inventory is sold.

(v) Idle facility and idle time are the same. *(B. Com (Hons), Delhi 1999)*

Ans: (i) False (ii) True (iii) False (iv) True (v) False

COST: CONCEPTS AND CLASSIFICATIONS

2

Learning Objectives

After reading this chapter, you should be able to:

1. explain costs and its different classification, natural classification of costs, different costs for decision-making and planning;
2. explain expenses, loss, fixed cost, variable cost, mixed cost, direct and indirect cost, capital and revenue cost;
3. explain cost control, cost reduction, cost management and difference between cost control and cost reduction;
4. identify costs for control – controllable and uncontrollable costs, standard costs;
5. understand cost reduction techniques and cost reduction areas; and
6. define cost sheet, and explain its preparation.

The three important areas in cost accounting are cost ascertainment, cost analysis and cost control. For cost accounting to be useful in these areas, costs must be accumulated, classified and grouped in such a manner that (i) total costs and units costs can be determined; (ii) trends in costs behaviour can be observed; (iii) cost can be controlled; and (iv) useful analysis can be made based on past as well as future costs for planning, control and decision-making. These requirements call for an understanding of the concept of cost and of its appropriate classifications. The purpose of this chapter is to explain the concept of cost and different cost classifications.

COST

Cost is the amount of expenditure, actual (incurred) or notional (attributable), relating to a specific thing or activity. The specific thing or activity may be a product, job, service, process or any other activity.

Cost is the amount of resources given up in exchange for some goods or services. The resources given up are generally in terms of money or, if not in terms of money, they are always expressed in monetary terms. The term 'cost' itself is without any significant meaning and, therefore, it is always advisable to use it with an adjective or phrase that will convey the meaning intended, such as prime, direct, indirect, fixed, variable, controllable, opportunity, imputed, sunk, differential, marginal, replacement and the like. Each such adjective

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or description implies a certain attribute or characteristic which is important in computing, measuring and analyzing the cost.

Basically, when a cost is incurred, it could be in the form of deferred cost (asset) or expired cost (expense). Deferred costs are unexpired costs, capitalised costs, which provide benefits in the future periods and known as assets and hence appear on the balance sheet. Examples of deferred or unexpired costs are plant, equipment, building, inventory, prepaid rent and insurance. When these deferred costs (assets) are used up, to the extent used, they become expenses and appear on the income statement and are deducted from revenues. Expired costs are costs which have been used up totally in generating revenue. They are not capitalised but only shown as expenses on income statement.

EXPENSES

Expenses are expired costs, incurred and totally used up in generation of revenue. Examples of expired costs are costs of goods sold expense, selling and administrative expenses. Expenses need not necessarily have to be paid in cash immediately, even a promise to pay could be made for the benefits obtained. The manufacturing costs are capitalised in the form of finished goods inventory and when a sale is made, they expire (becoming expenses). The cost of unsold inventory which was an asset earlier, now becomes expenses (costs of goods sold) as it has contributed to the generation of revenue.

Factory (or manufacturing) overhead is treated as cost (an asset) because this is included in the cost of finished goods inventory which is an asset unless sale is made. Selling and administrative expenses, when not included in the cost of finished goods inventory, are treated only as expenses and not cost (asset). Factory overheads are assets because they are supposed to add utility to the goods manufactured. For example, depreciation of a factory machine increases the utility of the goods manufactured which are therefore included in work-in-progress and finished goods inventory. But selling and distribution overheads do not add to the utility of goods manufactured and are treated merely as expenses and are deducted from revenues whenever incurred. Similarly, depreciation of a factory building is a cost, but depreciation of an office building is an expense.

LOSS

Loss is lost cost. The term 'loss' is used to describe mainly two accounting events. In traditional financial accounting it is used to denote a situation where expenses exceed revenues for an accounting period, that is, the opposite of net income (earnings) for the accounting period. Secondly, a loss arises due to the cost of an asset being more than the sale proceeds when the asset is sold. This unfavourable event does not arise from a normal business activity but from non-operating transactions or events. This definition of loss is used to identify the opposite of gain. That is, if no benefit is received from the cost incurred or it becomes definite that no benefit will accrue, the cost becomes a lost cost, that is, loss.

Loss is unrelated to revenue generation and is only offset against revenue of the period in which the loss occurred. Examples of loss are, loss on sale of fixed asset, loss of a stock due to fire.

CLASSIFICATION OF COSTS

The achievement of the objectives of cost accounting requires that cost should be ascertained, classified and grouped. Cost classification may be defined as the process of grouping costs according to their common characteristics. There are many objectives of cost classifications depending on the requirements of management. However, the following objectives are considered very useful and significant:

(i) Determining product costs for stock valuation and profit measurement
(ii) Planning
(iii) Decision Making
(iv) Control

The different cost classifications are as follows:

1. Natural classifications of costs
   (i) Direct material
   (ii) Direct labour
   (iii) Direct expenses
   (iv) Factory overhead
   (v) Selling and distribution and administrative overheads
2. Cost behaviour (In relation to changes in output, activity or volume)
   (i) Fixed cost
   (ii) Variable cost
   (iii) Mixed cost (Semi-variable and Semi-fixed cost)
3. Degree of Traceability to the Product
   (i) Direct cost
   (ii) Indirect cost
4. Degree of Association with the Product
   (i) Product cost
   (ii) Period cost
5. Functional Classification of Costs
   (i) Manufacturing cost
   (ii) Selling and distribution cost
   (iii) Administrative cost
6. Relationship with the Accounting Period
   (i) Capital cost
   (ii) Revenue cost
7. Costs for Decision Making and Planning
   (i) Opportunity cost
   (ii) Sunk cost
   (iii) Relevant cost
   (iv) Differential cost
   (v) Imputed cost
   (vi) Out-of-pocket cost
   (vii) Fixed, variable and mixed cost
   (viii) Shutdown cost
8. Costs for Control
   (i) Controllable and uncontrollable cost
   (ii) Standard cost
   (iii) Fixed, variable and mixed cost
9. Other Costs
   (i) Joint cost
   (ii) Common cost

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NATURAL CLASSIFICATION OF COSTS

The term "natural classification" refers to the basic physical characteristics of the cost. In a manufacturing concern, generally, the following costs are incurred:

1. *Direct material* Direct materials refers to the cost of materials which are conveniently and economically traceable to specific units of output. The term "direct materials" is denoted by certain other names also, such as process material, prime cost material, production material, stores material, construction materials. Some examples of direct materials are: raw cotton in textiles, crude oil to make diesel, steel to make automobile bodies. The following group of materials fall within the definition of direct materials:

(a) All materials specially purchased for a particular job, order, process or product.
(b) All materials (including primary materials and raw materials) acquired and subsequently requisitioned from the stores for production.
(c) Components or parts purchased or produced and requisitioned from the storeroom.
(d) Material passing from one process to another process.
(e) Primary packing materials, for example, wrappings, cardboard boxes, etc.

Items, such as import duties, dock charges, transport cost of materials, storing of materials, cost of purchasing and receiving materials are properly added to their invoiced price and thus, the materials are charged out at this increased cost.

Chapters 3 and 4 discuss in detail direct materials and materials cost.

2. *Direct labour* Direct labour is defined as the labour of those workers who are engaged in the production process. It is the labour expended directly upon the materials comprising the finished product. Other terms for the direct labour are: process labour, productive labour, operating labour. Examples are the labour of machine operators and assemblers. However, a worker may be performing direct labour for a certain number of hours but be an indirect worker for the balance of the day. For example, manufacturing concerns frequently have workers who may be working on an assembly line or operating a machine as direct workers for three or four hours but later in the day may help in repairing machinery or in doing other work as indirect workers.

Chapter 5 explains direct labour and accounting and control of direct labour cost in detail.

3. *Direct expenses (Chargeable expenses)* These include any expenditure other than direct material and direct labour directly incurred on a specific product or job. Such special necessary expenses can be identified with product or job and are charged directly to the product as part of the prime cost. Examples of direct expenses are:

(a) Cost of hiring special machinery or plant.
(b) Cost of special moulds, designs and patterns.
(c) Experimental costs and expenditure on model and pilot schemes.
(d) Fees paid to architects, surveyors and other consultants.
(e) Cost of transport and conveyance to the site of job or operations.
(f) Inward carriage and freight charges on special materials.
(g) Cost of patents and royalties.
(h) Cost of defective work, for example, where several trials are necessary before an appropriate one is obtained. The cost of such trials is taken as direct expense.
(i) Licence fees.
(j) Hire charges for plants and equipments for a specific product or job.
(k) Components and parts processed for a special job.
(l) Insurance charges on special materials chargeable to a job.

Other things remaining the same, the term 'direct expenses' (chargeable expenses), whenever used in costing, refers to a specific product or job. That is, whether some expenses are direct or not, is decided in terms of specific job or product as product or job is considered the cost unit. However, some expenses which cannot be directly identified with product or job (and hence are not direct expenses), can sometimes be identified with a department, function, territory, customer, division etc. For example, salary of branch office manager, depreciation of plant, rent and rates, heating and lighting, insurance expenses etc. are direct in relation to some department or activity but become indirect with regard to a product or job because these expenses are incurred for more than one product or job.

The total of the above three elements of costs (i) direct materials, (ii) direct labour and (iii) direct expenses, are prime cost. According to Official Terminology of Chartered Institute of Management Accountants (CIMA) (London), prime cost is the total cost of direct material and direct labour. Thus, direct expenses is not included in prime cost as per CIMA Terminology. The CIMA defines direct cost as the expenditure which can be economically identified with a specific saleable cost unit.

4. *Factory overhead* Factory overhead, also called manufacturing overhead or factory burden, may be defined as the cost of indirect materials, indirect labour and indirect expenses. The term "indirect materials" refers to materials that are needed for the completion of the product but whose consumption with regard to the product is either so small or so complex that it would not be appropriate to treat it as a direct materials item. They are production supplies and other materials that cannot conveniently or economically be charged to a specific unit of output. Examples of such items are lubricants, cotton waste, handtools, works stationery etc.

The term "indirect labour" is the labour cost of production-related activities that cannot be associated with or conveniently and economically traced to specific products via physical observation. Some examples of indirect labour are: foremen, shop clerks, general helpers, cleaners, material handlers, plant guards, employees engaged in maintenance work or other service work.

The term "indirect expenses" covers all indirect expenditure incurred by the manufacturing enterprise from the time production has started to its completion and its transfer to the finished goods store. Any expenses not classified as direct expenses are known as indirect expenses. The Institute of Cost and Management Accountants (UK) defines indirect expenses as the "expenses which cannot be allocated but which can be apportioned to or absorbed by cost centres or cost units." They are incurred for the benefit of more than one product, job or activity and must be apportioned by appropriate bases to the various functions. Expenses of this type include items such as heat, light, maintenance, factory managers's salary etc.

The total of (i) prime cost, and (ii) factory overheads is known as 'Factory cost'. Direct labour and factory overhead together are known as Conversion Costs because they are the costs of converting raw materials into finished products.

Chapter 6 explains in detail the nature and accounting of overhead costs.

5. *Selling, distribution and administrative overheads* Selling and distribution overheads usually begin when the factory costs end. Such expenses are generally incurred when the product is in saleable condition. It covers the cost of making sales and delivering/despatching products. These costs include advertising, salesmen salaries and commissions, packing, storage, transportation, and sales administrative costs.

Administrative overhead includes costs of planning and controlling the general policies and operations of a business enterprise. Usually, all costs which cannot be charged either to the production or sales division are considered as administrative costs. Typical of such items are fees of the board of directors, the chairman's salary, the rent for general offices and costs of the general accounting and other departments. Sometimes, some such expenses such as manager's salary are often allocated to manufacturing and included in factory overhead.

The sum of (i) Prime cost, (ii) Factory overhead and (iii) Selling and distribution and Administrative Overhead is the total cost, that is, the cost "to make and sell."

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Chapter 7 discusses selling and distribution and administrative overhead costs.
Figure 2.1 presents the natural classification of costs as discussed above.

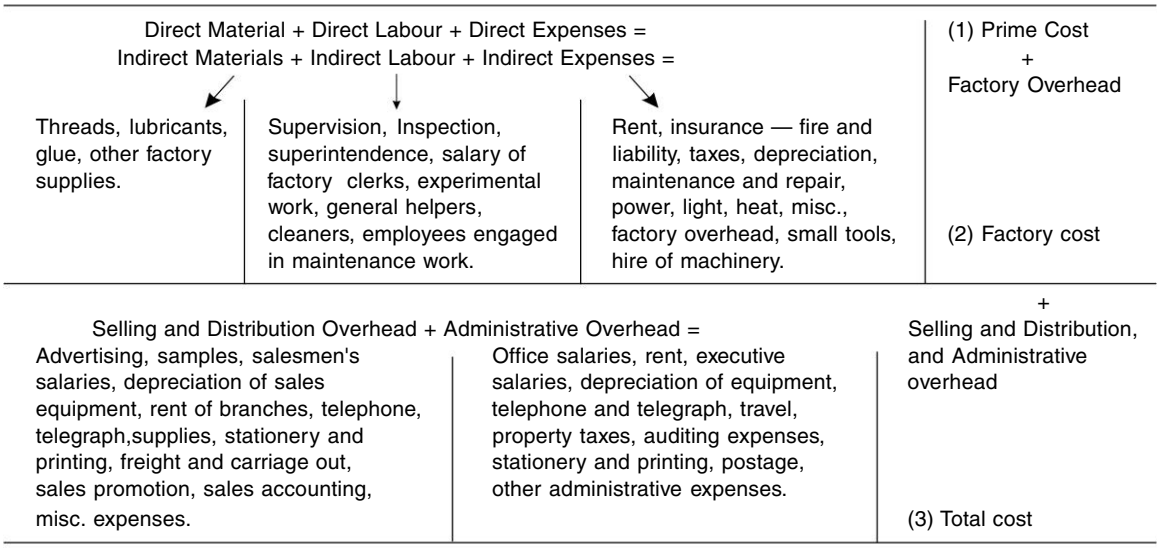


Fig. 2.1 Natural classification of costs in a manufacturing concern

COST BEHAVIOUR (IN RELATION TO CHANGES IN OUTPUT OR ACTIVITY OR VOLUME)

Costs can be classified into (i) fixed, (ii) variable and (iii) mixed costs, in terms of their variability or changes in cost behaviour in relation to change in output, or activity or volume. Activity may be indicated in any forms such as units of output, hours worked, sales, etc.

Fixed Cost

Fixed cost is a cost which does not change in total for a given time period despite wide fluctuations in output or volume of activity. These costs are also known as standby costs, capacity costs or period costs. Examples of fixed costs are rent, property taxes, supervising salaries, depreciation on office facilities, advertising, insurance, etc. They accrue or are incurred with the passage of time and not with the production of the product or the job. This is the reason why fixed costs are expressed in terms of time, such as per day, per month or per year and not in terms of unit. It is totally illogical to say that a supervisor's salary is so much per unit. But it can be said that supervisor's salary is so much per month.

Any fixed cost can be represented by a constant (See Fig. 2.2).

However it should be improper to say that fixed costs never change in amount. The basic concept is that the term "fixed" refers to fixity (non-variability) related to specific volume (or relevant range); the term does not imply that there will be no changes in fixed cost. This characteristic of fixed cost has been shown in Fig. 2.3. According to Fig. 2.3, the following are the fixed costs at different levels of production:

1. Rs. 50,000 fixed cost between 20,000 and 80,000 units of production.

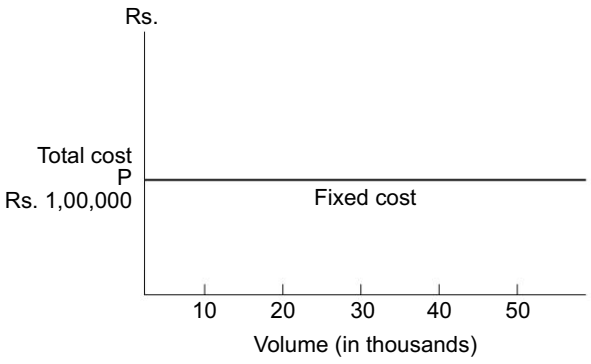


Fig. 2.2 Fixed Cost

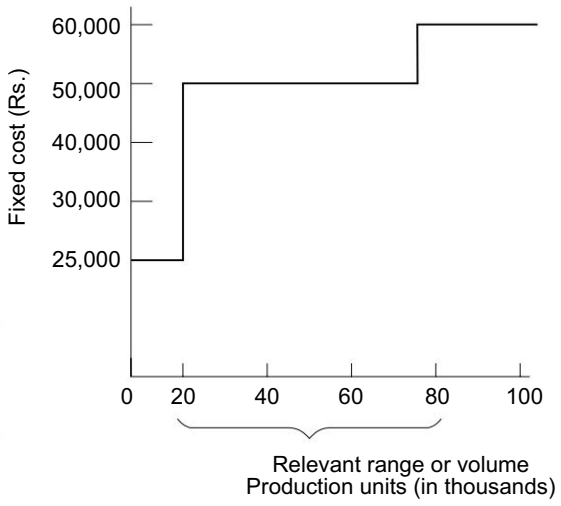


Fig. 2.3 Total Fixed Cost at Different Levels of Production

2. Rs. 60,000 fixed cost in excess of 80,000 units. This assumes that increase in production after a certain level (80,000 units) requires increase in fixed expenses which have been fixed earlier, for example, additional supervision, increase in quality control costs.

3. Rs. 25,000 fixed cost from zero units (shut down) to 20,000 units. This explains that if the level of activity comes to less than 20,000 units, some fixed costs may not be incurred. For example, if the plant is shut down or production is reduced, many of the fixed costs, such as costs on accounting functions, supplies, staff, will not be incurred.

However, if laying off of staff and personnel, etc. is not possible, then the fixed cost will remain at Rs. 50,000.

Fixed costs can be classified in the following categories for the purpose of analysis:

1. *Committed costs* Such costs are primarily incurred to maintain the company's facilities and physical existence, and over which management has little or no discretion. Plant and equipment depreciation, taxes, insurance premium rate and rent charges are examples of committed costs.

2. *Managed costs* Managed costs are related to current operations which must continue to be paid to ensure the continued operating existence of the company, for example, management and staff salaries.

3. *Discretionary costs* They are also known as programmed costs. Discretionary costs result from special policy decisions, management programmes, new researches, etc. Some examples of such costs are research and development costs, marketing programmes, new system development costs.

The difference between committed and discretionary costs lies in the fact that it is difficult to eliminate or avoid committed costs in times of low production or decline in business activity, whereas discretionary costs such as research and development could be eliminated or reduced to a desirable level.

4. *Step costs* A step cost is constant for a given amount of output and then increases in a fixed amount at a higher output level. For example, in a manufacturing company, one supervisor is required at a salary of Rs. 10,000 p.m. for every 50 workers. So long as 50 workers or less than that are working, the supervision costs will be Rs. 10,000 p.m. But as soon as the 51st worker is employed, the cost of supervision increases by Rs. 10,000 p.m. and will be Rs. 20,000. The cost of supervision remains fixed at Rs. 20,000 if not more than 100 workers are working. But it will go up if more than 100 workers have been employed. Figure 2.4 exhibits the behaviour pattern of step costs.

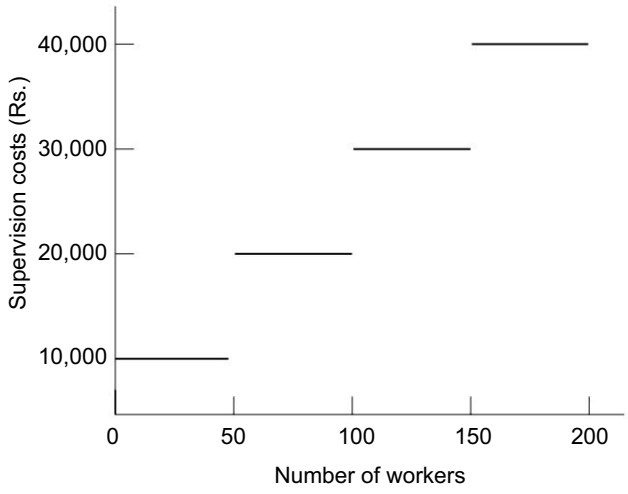


Fig. 2.4 Step Costs

Variable Cost

Variable costs are those costs that vary directly and proportionately with the output. There is a constant ratio between the change in the cost and change in the level of output. Direct materials cost and direct labour cost are the costs which are generally variable costs. For example, if direct material cost is Rs. 50 per unit, then for producing each additional unit, a direct material cost of Rs. 50 per unit will be incurred. That is, the total direct material cost increases in direct proportion to increase in units manufactured. However, it should be noted that it is only the total variable costs that change as more units are produced; the per unit variable cost remains constant.

Variable overheads like factory supplies, indirect materials, sales commission, office supplies are some other examples of variable costs. If the factory is shut down, variable costs are eliminated. Variable cost is always expressed in terms of units or percentage of volume; it cannot be stated in terms of time. Variable cost

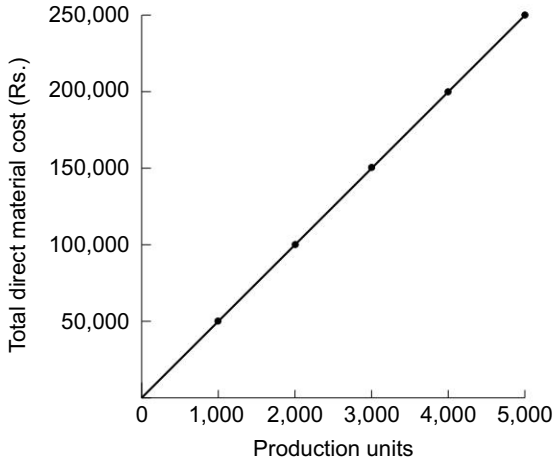


Fig. 2.5 Behaviour of Variable Costs (Direct materials cost)

is depicted in Fig. 2.5. The figure shows graphically the behaviour pattern of direct material cost. For every increase in the units produced there is a proportionate increase in the cost. When production increases to 3,000 units from a level of 2,000 units, the cost of direct materials increases in direct proportion at the constant rate of Rs. 50 per unit. The variable cost line in Fig. 2.5 has been shown as linear rather than curvilinear. That is, on a graph paper this variable cost line appears as an unbroken straight line in place of a curve.

However, the above pattern of variable cost line is the simplest possible and represents only those costs which vary in direct proportion to the level of activity. A completely linear variable costs over all levels of production or activity levels, as shown in Fig. 2.5 is very unlikely. In reality, a variable cost may be linear only over the normal range of activity levels and beyond the normal range of activity, variable cost per unit may show non-linear or curvi-linear line as displayed in Fig. 2.6. It implies that variable costs as displayed in this Fig. 2.6 are not varying in direct proportion to output or activity changes.

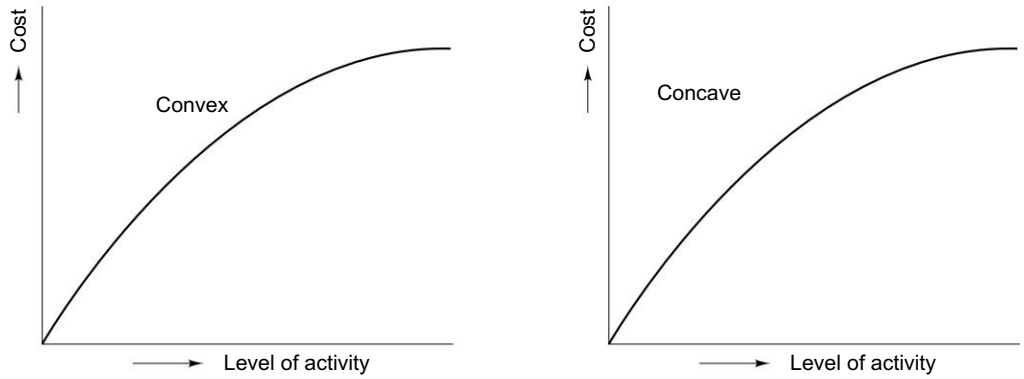


Fig. 2.6 Curvi-Linear Variable Costs

Convex — where each extra unit of output causes a less than proportionate increase in cost that is economies of scale operate.

Concave — where each extra unit of output causes a more than proportionate increase in cost that is diminishing returns operate.

There are some variable costs which may appear as curvi-linear. For example, in some production process the amount of waste materials remains more or less constant. Therefore, when production increases, the unit variable cost for material decreases due to economies of scale. On the other hand, when it becomes necessary to pay increasing differential piece rates to increase production, diminishing returns will operate and as a result of it, some form of concave curvi-linear relationship will emerge. That is, unit variable cost for labour will increase due to diminishing returns operating in this situation.

It can be concluded, therefore, that the classification of fixed and variable costs made in relation to one factor, that is, production volume is simplistic and is, at best, only a crude approximation of reality. In other words, it is known that the underlying variable cost relationship and function is curvi-linear, yet a linear approximation is assumed frequently.

Mixed Cost

Mixed costs are costs made up of fixed and variable elements. They are a combination of semi-variable costs and semi-fixed costs. Because of the variable component, they fluctuate with volume; because of the fixed

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component, they do not change in direct proportion to output. Semi-fixed costs are those costs which remain constant upto a certain level of output after which they become variable as shown in Fig. 2.7. Semi-variable cost is the cost which is basically variable but whose slope may change abruptly when a certain output level is reached as shown in Fig. 2.8.

An example of a mixed cost is the earnings of a worker who is paid a salary of Rs. 1500 per week (Fixed) plus a bonus of Re 1 for each unit completed (variable). If he increases his weekly putput from 1,000 units to 1,500 units, his earnings increase from Rs. 2,500 to Rs. 3,000.

Earnings	*Units produced*	
	1,000	1,500
Fixed component	Rs. 1,500	Rs. 1,500
Variable component	1000	1,500
Total	Rs. 2,500	Rs. 3,000

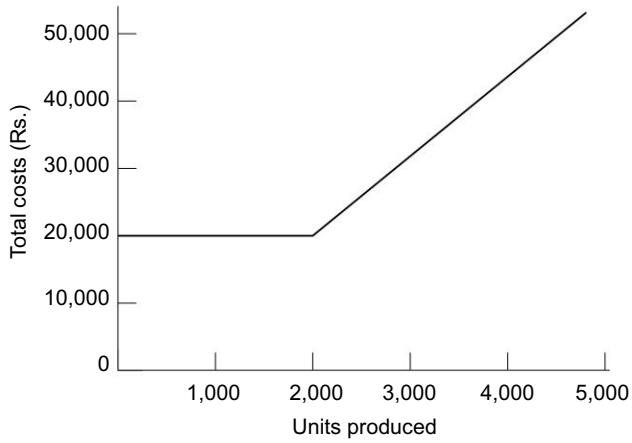


Fig. 2.7 Semi-fixed Cost

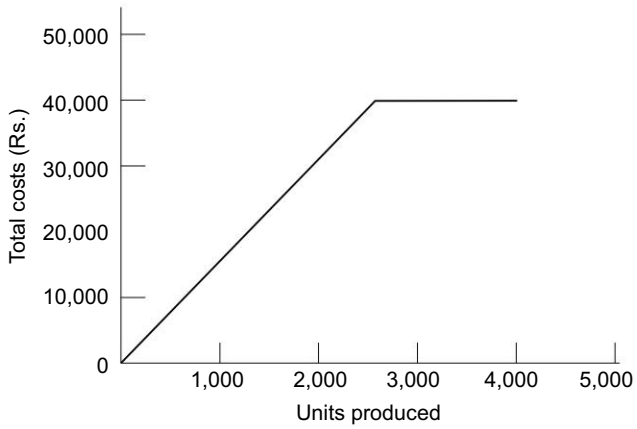


Fig. 2.8 Semi-variable Cost

An increase of 50% in output brings only a 20% increase in his earnings. Mathematically, mixed costs can be expressed as follows:

Total mixed cost = Total fixed cost + (Units × Variable cost per unit)

DEGREE OF TRACEABILITY TO THE PRODUCT

Cost is divided into direct and indirect cost in terms of degree of traceability to the product.

Direct Cost

Costs which are easily traceable or identifiable with a product are called direct costs. If output units are the objects of costing, then direct costs represent costs and resources that can be traced to or identified with the finished product.

Direct materails, direct labour and direct expenses are examples of direct costs.

Indirect Cost

Indirect costs are those costs which cannot be identified with, or traced to a single product because they are incurred for several products. The examples of indirect costs are: indirect materials (lubricants and scrap materials), salary of factory supervisors (indirect labour), rent, rates and depreciation (indirect expenses). Indirect costs, often referred to as overheads, have to be apportioned to different products.

Costs also may be direct or indirect with respect to particular company segments or divisions. That is some cost which are indirect for a product, may be traced to a segment or department and thus, will be direct costs for that department. A segment may mean any one of a number of things, namely department, division, specific activity, sales territory and the like.

Before dividing the cost into direct and indirect, it is necessary to know whether it is being associated with a product, sales area, department or some other activity. For example, if a salesman simultaneously handles several products, his salary is an indirect cost for each product, but a direct cost to his sales area or department.

ASSOCIATION WITH THE PRODUCT

Cost is classified into product costs and period costs in terms of association with the product.

Product Cost

Product costs are those costs which are identified with the product and included in inventory values. In other words, the costs that are included in the cost of manufacturing a product are called product costs. In a manufacturing concern, it is composed of four elements: (i) direct materials, (ii) direct labour (iii) direct expenses and (iv) manufacturing overhead. That is, product cost is a full factory cost. Prior to sale, product costs are deferred as inventories and until the goods are sold, are shown on the balance sheet as assets. As finished inventory goods is sold, product costs are transferred from the inventory accounts to the cost of goods sold account, thus becoming expenses and part of the period costs at the time revenue is realised.

Period Cost

Period costs are the costs which are not identified with product or job and are deducted as expenses during the period in which they are incurred. They are not carried forward as a part of value of inventory to the next accounting period.

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These costs are necessary to genetate revenues but they cannot be directly associated with units of product. Difference of opinion exists regarding whether certain costs should be considered as product or period costs. It is generally accepted that selling and administrative expenses should be treated as period costs for the following reasons:

(i) It is difficult to select equitable bases to apportion these costs to products. On the other hand, product costs can be assigned to specific products through objective and direct measurements and some by allocation.
(ii) The majority of these expenses are fixed regardless of the change in production or activity.
(iii) It is difficult, if not impossible, to determine the relationship between the incurrence of these costs and the production of individual units of output.
(iv) It is difficult to get evidence as to any future benefits that would be obtained from these expenses at the end of the accounting period. Such is the case with clerical salaries, used postage, office supplies, rent, advertising, sales promotion, consulting fees which may be expected to provide future benefits, but they are usually expensed when incurred. Even if it is argued that there will be future benefits, it is difficult to make accurate measurements of such benefits.

Effect of Product Costs and Period Costs

The net income of a business enterprise is influenced by the amount of product costs and period costs. Therefore, the manner in which some costs are divided as product or period will have a bearing on the reported net income of a business firm. Product costs, in the first instance, influence the value of inventory as such costs by nature should be included in the cost of product. Product costs affect net income in the period in which products representing the product costs have been sold. This event of influencing net income may take place in the current accounting period or subsequent accounting period. In other words, products costs do not reach the income statement and will not influence net income of a business enterprise until the product is sold. However, period costs appear directly on the income statement in the month or the period in which they are incurred.

FUNCTIONAL CLASSIFICATION OF COSTS

Functional classification of costs refers to how the cost was used (manufacturing, administration or selling). A functional classification implies that the business performs many functions for which costs are incurred. In measuring net income, expenses are usually classified by function and grouped under the headings of manufacturing, selling and administrative costs. Manufacturing costs are all production costs incurred to manufacture the products and to bring them to a saleable condition, including direct materials, direct labour and indirect manufacturing (or factory overhead) costs. Selling and administrative charges may be treated as expenses when incurred or charged to prepaid expense accounts such as prepaid insurance. Functional classification is also important because it provides an opportunity to the management to evaluate the efficiency of departments performing different functions in the organisation.

RELATIONSHIP WITH ACCOUNTING PERIOD

Capital Cost and Revenue Cost

Costs can also be divided into two broad classes on the basis of the accounting period to which they relate: (i) capital expenditures and (ii) revenue expenditures. A capital expenditure provides benefit to future periods and is classified as an asset; a revenue expenditure is assumed to benefit the current period and is classified

as an expense. A capital expenditure will flow into the cost stream as an expense when the asset is used up or written off.

The distinction between capital and revenue expenditures is vital to the proper matching of costs and revenue and to the accurate measurement of periodic net income.

COSTS FOR DECISION MAKING AND PLANNING

Opportunity Cost

Opportunity cost is the cost of opportunity lost. It is the cost of selecting one course of action in terms of the opportunities which are given up to carry out that course of action. Opportunity cost is the benefit lost by rejecting the best competing alternative to the one chosen. The benefit lost is usually the net earnings or profits that might have been earned from the rejected alternative. For example, assume that a manufacturer can sell a semi-finished product to a customer for Rs. 5,00,000. He decides, however, to keep it and finish it. The opportunity cost of the semi-finished product is Rs. 5,00,000 because this is the amount of economic resources foregone by the manufacturer to complete the product. Similarly, capital which is invested in plant and inventories cannot now be invested in shares and debentures that will earn interest and dividends. The loss of interest and dividend that would be earned is the opportunity cost. Other examples of opportunity cost are when the owner of a business foregoes the opportunity to employ himself elsewhere; or a machine used to make Product A is said to have an opportunity cost if the machine can be sold or if it can also make Product B.

Opportunity costs are important in decision-making and evaluating alternatives. Decision making is selecting the best alternative which is facilitated by the help of opportunity costs. But opportunity costs are not recorded in an accounting system as they relate to opportunities lost.

Sunk Cost

A sunk cost is the cost that has already been incurred. Generally known as unavoidable cost, it refers to all past costs since these amounts cannot be changed once the cost is incurred. They are the costs which have been created by a decision in the past and cannot be changed or avoided by any decision that is made in the future. Examples of sunk costs are the book values of existing assets, such as plant and equipment, inventory, investment in securities, etc. Except the possible gains or losses on sales of any of such assets, the book value is not relevant for decisions regarding whether to use them or dispose them off.

Some argue that the total cost of a fixed asset is not the sunk cost, but sunk cost is the difference between the purchase price of a fixed asset and the net amount that could be realised from its sale. For example, if a plant has a book value of Rs. 10,00,000 and a scrap value of Rs. 50,000 then the sunk cost is Rs. 9,50,000 (Rs. 10,00,000–50000) and not Rs. 10,00,000. That is, the sunk cost is the difference between book value and scrap value.

Relevant Cost

Relevant costs are those future costs which differ between alternatives. Relevant costs may also be defined as the cost which are affected and changed by a decision. On the contrary, irrelevant costs are those costs which remain the same and not affected by the decision whatever alternative is chosen. Relevant costs have the following two features:

(i) Relevant costs are only future costs, that is, those costs which are expected to be incurred in future. Relevant costs therefore, are not historic (sunk) costs which have already been incurred and cannot be changed by a decision.

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(ii) Relevant costs are only incremental (additional) or avoidable costs. Incremental costs refer to an increase in cost between two alternatives. Avoidable costs are those which are not incurred from one alternative to another.

To take an example, assume a business firm purchased a plant for Rs. 10,00,000 and has now a book value of Rs. 1,00,000. The plant had become obsolete and cannot be sold in its present condition. However, the plant can be sold for Rs. 1,50,000 if some modification is done on it which will cost Rs. 60,000. In this example, Rs. 60,000 (modification cost) and Rs. 1,50,000 (sales value) both are relevant as they reflect future, incremental costs and future revenues respectively. The firm will have incremental benefit of Rs. 90,000 (Rs. 1,50,000–Rs. 60,000) on sale of the plant.

Rs. 10,00,000 has already been incurred and being a sunk cost is not relevant to the decision, that is, whether modification should be done. Similary, the book value of Rs. 1,00,000 which has to be written off, whatever alternative future action is chosen is also not relevant because it cannot be changed by any future decision.

Differential Cost

Differential cost is the difference in total costs between any two alternatives. Differential costs are equal to the additional variable expenses incurred in respect of the additional output, plus the increase in fixed costs, if any. This cost may be calculated by taking the total cost of production without the additional contemplated output and comparing it with the total costs incurred if the extra output is undertaken.

Differential costs are also known as incremental costs, although technically an incremental cost should refer only to an increase in cost from one alternative to another; decrease in cost should be referred to as decremental cost. Differential cost is a broader term, encompassing both cost increases (incremental costs) and cost decreases (decremental costs) between alternatives.

For example, assume that a company has normal capacity to manufacture 50,000 units of a product; production beyond that point would require the installation of additional plant and equipment that would increase the amount of fixed costs. Normal utilisation of available capacity ranges between 40,000 and 50,000 units. Fixed costs for the range of output and expanded capacity have been estimated as follows:

	Normal capacity	*Expanded capacity*
Number of units	40,000 to 50,000	50,000 to 60,000
Fixed costs	Rs. 2,00,000	Rs. 2,50,000

Now assume that the variable cost is Rs. 4 per unit. A statement comparing manufacturing costs at three different production levels would be as follows:

	Number of units		
	40,000	*50,000*	*60,000*
Variable costs	Rs. 1,60,000	Rs. 2,00,000	Rs. 2,40,000
Fixed costs	Rs. 2,00,000	2,00,000	2,50,000
Total manufacturing cost	3,60,000	4,00,000	4,90,000
Average per unit	Rs. 9.0	Rs. 8	Rs. 8.17
Incremental costs	—	40,000	90,000
Additional output (units)	—	10,000	10,000
Incremental cost per unit	—	Rs. 4.00	Rs. 9.00

The additional capacity which would be required to expand operations to 60,000 units would increase the fixed costs by Rs. 50,000. The incremental cost of an additional 10,000 units would total Rs. 90,000 or Rs. 9.00 per unit. The average cost of the 60,000 units would be Rs. 8.17 per unit.

The concept of differential costing is vital in planning and decision making. It is an important tool in evaluating the profitability of alternative choice decisions and helping management in choosing the best alternative. The diffferential cost analysis can assist management in knowing the additional profit that would be earned if idle or unused capacity is used for extra production or if some additional investments are made by the firm.

Imputed Cost

Imputed costs are costs not actually incurred in some transaction but which are relevant to the decision as they pertain to a particular situation. These costs do not enter into traditional accounting system. Interests on internally generated funds, rental value of company-owned property and salaries of owners of a single proprietorship or partnership are some examples of imputed costs. Costs paid or incurred are not imputed costs. For example, if Rs. 5,00,000 is paid for purchase of raw materials, it is an outlay cost but not an imputed cost, because it would enter into ordinary accounting systems. When a company uses internally generated funds, no actual interest payment is required. But if the internally generated funds are invested in some projects, interest would have been earned. The revenue foregone (loss of interest) represents an opportunity cost, and thus, imputed costs are opportunity costs.

Out-of-Pocket Cost

While imputed costs do not involve cash outlays, out-of-pocket costs signify the cash cost incurred on an activity. Non-cash costs such as depreciation are not included in out-of-pocket costs. This cost concept is significant for management in deciding whether or not a particular project will at least return the cash expenditures associated with the project selected by management. Similary acceptance of a special order for production may necessitate the consideration of out-of-pocket costs that need not be incurred if the special order proposal is not accepted. Depreciation on plant and equipment is not relevant in decision-making because no cash goes outside the business.

Fixed, Variable and Mixed Costs

Fixed, variable and mixed costs have been explained in the preceding sections.

Shut Down Cost

Shut down costs are those costs which have to be incurred under all situations in the case of stopping manufacture of a product or closing down a department or a division. Shoutdown costs are always fixed costs. If the manufacture of a product is stopped, variable costs like direct materials, direct labour, direct expenses, variable factory overhead will not be incurred. However, a part of fixed costs (if not total fixed costs) associated with the product will be incurred such as rent, watchman's salary, property taxes etc. Such fixed costs are unavoidable. Some fixed costs associated with the product become avoidable and need not be incurred in case production is stopped such as supervisor's salary, factory manager's salary, lighting, etc. Shutdown costs, thus refer to minimum fixed costs which are incurred in the event of closure of a department or division.

COSTS FOR CONTROL

Controllable and Uncontrollable Cost

The concept of controllable cost is very important in cost accounting and contributes to the achievement of the objectives of cost control and responsibility accounting. The ICMA (UK) defines controllable cost as "a

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cost which can be influenced by the action of a specified member of an undertaking" and a non-controllable cost as "a cost which cannot be influenced by the action of a specified member of an undertaking." Basically, a controllable cost is the cost over which a manager has direct and complete decision authority. That is, controllable costs can be controlled (reduced) by a manager at a given organisational level. Some examples of controllable costs are indirect labour, lubricants, cutting tools, and power costs incurred in the machining department.

Controllable costs do not imply that they are 100% controllable. Some costs are partly controllable by a responsibility centre manager. For example, the cost of raw materials is controlled by the production managers as well as purchase managers. The production manager controls at quantity level, and the purchase manager at the price level. Such costs are reported to both of them, but one responsible manager should be held accountable for those costs which he can control.

The term "controllable cost" should not be confused with the terms "variable cost" "direct cost". These terms are not synonymous. Variable costs vary with the output but are not necessarily controllable. For example, factory supplies used for servicing plant and equipment may vary with the output in the production department, but the production manager cannot control them.

It is contended that two factors: (i) the time period factor, and (ii) the decision-making authority, can make a cost controllable or uncontrollable. If the time period is long enough, all costs can be controllable and curtailed. Similarly, the decision-making authority influences the cost. If a responsibility center manager has been delegated the authority to spend the cost, he can control it. But all costs can be said to be controllable by somebody in the organisation. The managing director of a company is responsible for all costs. But practically, the responsibility and authority of controlling costs is delegated to different levels in the organisation.

Standard Cost

Standard costs are those costs which are planned or predetermined cost estimates for a unit of output in order to provide a basis for comparison with actual costs. Standard costs are used to prepare budgets. Standard cost is a unit concept and indicates standard cost per unit of output, per labour hour etc. On the contrary, the term 'Budgeted Cost' is a total concept and indicates total budgeted cost of an item at some activity level or output level such as budgeted cost of material is Rs. 8,00,000 if 8000 units are manufactured.

Fixed, Variable and Mixed Costs

Fixed, variable and mixed costs have been discussed earlier in this chapter.

OTHER COSTS

Joint Cost

Joint costs arise where the processing of a single raw material or production resources results in two or more different products simultaneously. Joint costs relate to two or more products produced from a common production process or element-material, labour, or overhead or any combination thereof, or so locked together that one cannot be produced without producing the other(s).

Thus, joint cost is the cost of two or more products that are not identifiable as individual types of products until a certain stage of production known as the split-off point (point of separation) is reached. For example, kerosene, fuel oil, gasolene and other oil products are derived from crude oil. Joint costs are total costs incurred upto the point of separation. Joint costs can be apportioned to different products only by means of some suitable bases of apportionment.

Common Cost

Common costs are those which are incurred for more than one product, job, territory or any other specific costing object. Common costs are not easily identifiable with individual products and, therefore, are generally apportioned.

Common costs are not only common to products, but they may be common to processes, functions, responsibilities, customers, sales territories, periods of time and similar costing units. For example, the salary of a manager of a production department which is manufacturing three products is an example of common cost with respect to the products. But his salary is direct cost to the departments located in the factory. The basic point is that a particular (common) cost may be direct to one object and common as far as other objects are concerned.

Although both the terms, "common costs" and "joint costs" are sometime used interchangeably, they differ from each other. Joint costs emerge when multiple products are manufactured in a common process and when common inputs are used. The multiple products have a definite quantitative relationship to each other and the production of one product influences the output of the other product, though in a lesser proportion. Common costs are not the result of any manufacturing compulsion or the use of any single raw material. Besides common costs can be apportioned to costing objects like products, job, department, etc. without much difficulty. But the apportionment of joint cost involves many difficulties in cost accounting.

COST CONTROL, COST REDUCTION, COST MANAGEMENT

Cost Control

Cost control refers to management actions to keep the costs within standards and/or budget. Cost control can be defined as the comparative analysis of actual costs with appropriate standards or budgets to facilitate performance evaluation and formulation of corrective measures. It aims at accomplishing conformity between actual result and standards or budgets, keeping expenditures within prescribed limits. Cost control has the following features:

1. Creation of responsibility centres with defined authority and responsibility for cost incurrence.
2. Formulation of standards and budgets that incorporate objectives and goals to be achieved.
3. Timely cost control reports (responsibility reporting) describing the variances between budgets and standards and actual performance.
4. Formulation of corrective measures to eliminate and reduce unfavourable variances.
5. A systematic and fair plan of motivation to encourage workers to accomplish budgetary goals.
6. Follow-up to ensure that corrective measures are being effectively applied.

Cost control does not necessarily mean reducing the cost but its aim is to have the maximum utility of the cost incurred. In other words, the objective of cost control is the performance of the same job at a lower cost or a better performance for the same cost.

Cost Reduction

Meaning

Cost reduction may be defined as a planned, positive approach to bring costs down. It implies real and permanent reduction in the unit cost of goods manufactured or services rendered without impairing their (product or goods) quality or suitability for the use intended that is, without reducing their value in terms of utility or satisfaction to the customers. The goal of cost reduction is achieved in two ways: (i) by reducing the

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cost per unit and (ii) by increasing productivity. The steps for cost reduction include elimination of waste, improving operations, increasing productivity, search for cheaper materials, improved standards of quality, finding other means to reduce unit costs.

Cost reduction has to be achieved using internal factors within the organisation. Reduction of costs due to external factors such as reduction in taxes, government subsidies, grant etc. do not come under the concept of cost reduction. It should not be the result of wind falls.

With the globalisation of the Indian economy, it is necessary to reduce costs so that prices of our goods are really competitive in the world markets. This requires a massive effort on cost reduction in Indian industries.

Thus, cost reduction techniques occupy a prominent position in any organisation aiming to maximise profits.

Management should always attempt to remove difficulties generally found in cost reduction programmes. Some such difficulties are as follows:

(i) Workers and employees may not welcome cost reduction programmes and may resist their implementation.
(ii) Cost reduction programmes are generally carried out on an ad hoc basis.
(iii) The schemes may be applied in some areas but it should cover all activities.
(iv) Cost reduction programmes may be implemented hurriedly, whereas, they should be carried out after careful thought and in a planned manner.

Difference between Cost Control and Cost Reduction

Cost reduction is a much wider concept than cost control. As stated earlier, cost control aims at controlling costs within prescribed limits with the help of budgets and standards. The following are the differences between the two:

Cost Control	*Cost Reduction*
1. Cost control process involves: (a) setting targets and standards (b) ascertaining actual performance, (c) comparing actual performance with targets (d) investigating the variances and (e) taking corrective action. In cost control, standards form benchmarks for evaluating actual performance.	1. Cost reduction is not concerned with setting targets and standards and maintaining performance according to standards. It involves critical examination of the various products, processes, methods etc. with a view to reduce costs and improve efficiency and effectiveness.
2. It aims at adherence to and achieving standards, that is, cost targets. It assumes existence of standards and these standards are not challenged over the period.	2. It aims at real and permanent reduction in costs. Thus it aims at improving the standards. It challanges standards and assumes existence of concealed potential savings in the standards.
3. It lacks a dynamic approach as the only objective is not to exceed the standards.	3. It is continuous, dynamic and innovative in nature, looking always for measures and alternative to reduce costs.
4. It is a preventive function.	4. It is a never ending corrective function.
5. In cost control, costs are optimised before they are incurred. Being a routine exercise it is operation-oriented.	5. In cost reduction, there is always assumed a scope for reducing the incurred costs under controlled conditions. It is research oriented, always trying to reduce costs through planned research.

(*Contd.*)

Cost Control	*Cost Reduction*
6. It is generally applicable to items which have standards.	6. This is applicable to every activity of the business.
7. It contains guidelines and directive of management as to how to do a thing.	7. It adds thinking and analysis to action at all levels of management.
8. It requires close monitoring and timely corrective actions.	8. It demands creativity.
9. Budgetary control and standard costing are important tools of cost control.	9. It uses techniques like value engineering, value analysis, work study, operation research, ABC analysis, simplification and standardisation etc.

Both cost control and cost reduction are continuous processes in an enterprise. In all organisations, there should be planned, dynamic programme for cost reduction so that cost standards required for cost control may be improved continuously. However, cost reduction programme is neither a substitute nor it can replace a cost control system which emphasizes prompt investigation into variances and taking immediate corrective actions.

Techniques of Cost Reduction

Generally speaking, the following tools and techniques are used for the purpose of cost reduction:

1. Value analysis or value engineering
2. Work study
3. Job evaluation and merit rating
4. Production planning and control
5. Organisation and method study
6. Operations and method study, work study
7. Rationalisation
8. Quality control
9. Economic order quantity
10. Use of better technology
11. Mechanisation and automation
12. Standardisation
13. Simplification
14. ABC Analysis
15. Budgetary control and standard costing
16. Programme Evaluation and Review Technique (PERT) analysis
17. Cost-Benefit analysis
18. Improvement in the design of a product, design analysis
19. Market research
20. Inventory management and control

Cost Reduction Areas

Some of the important cost reduction areas are as follows:

1. *Product improvement* Product improvement and the level of efficiency determine the costs incurred. Important factors in product improvement are:

(a) Quality of the product.
(b) Unnecessary weight, materials content, machine or labour operations.

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(c) Waste and losses to be eliminated.
(d) Proper designing of the product.

2. *Production planning and control* The area of production methods and organisation is important for the purpose of cost reduction. There are many vital activities relating to production and production planning where a cost reduction programme may be applied, for example, materials control, labour control, production layout, system analysis, time and motion study, work measurements, standardisation of methods, designing of tools, equipment and machinery, modernisation of plant and equipment, use of incentive schemes, etc.

3. *Marketing areas* In marketing, the following are the cost reduction areas: channels of distribution, sales promotion schemes, marketing research plan, territorial responsibilities, methods of remunerating salesmen, advertising methods, after-sales service costs, packaging methods, materials handling, transport arrangement, etc.

4. *Administrative areas* Administrative functions include personnel, purchase and general administration.

The goal of cost reduction requires efficiency administration, effective purchasing procedure and a fair personnel policy and schemes. Some of the important areas are investment planning, cash discount policy, mechanised system of accounting, labour relations, labour welfare measure, availability of servicing facilities.

5. *Factory organisation and methods* A considerable cost reduction can be effected by studying factory organisation and various methods being used in the factory.

(i) Factory management must ensure correct assignment of authority and responsibility.
(ii) There should be well defined channels of communication to avoid ambiguity, misunderstanding and differences of opinion.
(iii) Overlapping of responsibility should be clearly avoided.
(iv) Delegation of responsibility should be encouraged.
(v) Cooperation and close relationship between the various executives should be encouraged.

6. *Utility services* Utility services include power, water, steam, repair and maintenance, transport and clerical services, etc.

The following points should be considered:

(i) Supply of utilities at economic costs or scope for any further increase in utilisation.
(ii) Proper system for preventive and curative maintenance.
(iii) Wastage and other losses in distribution to be kept to minimum.
(iv) Use of up-to-date equipment and the mechanisation of the routine as far as possible.
(v) Due attention to work flow and loading factor.

7. *Finance* Following points are important in this connection:

(i) Methods of funding capital expenditure to be cost effective.
(ii) Procuring capital at economical cost.
(iii) Employing capital in a manner so as to give the maximum return.

Cost Management

Cost management is a wider term than cost control and cost reduction. It considers both cost control and cost reduction in its perspective. In cost management, the objective is to increase productivity of resources and factors of production and to relate them to enhance profitability. It continuously looks for and identifies opportunities to have higher return on investment by studying customer needs, bringing improvement in the existing products or services, smoothening process and layout of manufacturing goods or services with a view to supply them to the customers and to ensure customer satisfaction so as to maximise margins and earn

higher profits. In this way, cost management achieves its goals by creating and sustaining linkages among revenue, cost, products manufactured or services rendered and the use of resources and infrastructure of an organisation.

Cost management identifies, collects, measures, classifies and reports information that is useful to managers and other internal users in cost ascertainment, planning, controlling and decision making.

Horngreen, Datar and Foster[1] are of the opinion that the term cost management has no uniform definition. Therefore, these authors use cost management to describe the approaches and activities of managers in short-run and long-run planning and control decisions that increase value for customers and lower the costs of products and services. For example, managers make decisions regarding the amounts and kinds of materials being used, changes in plant processes and changes in product designs. Information from accounting systems helps managers to manage costs but the information and the accounting systems themselves are not cost management.

Developing information within cost management requires that one should be aware about the cost structure of a business enterprise. Managers should know how to ascertain costs of different activities, processes, customers, goods, services and any other costing objects. Financial accounting does not deal with these costs and these costs are not found on the financial statements. However, knowledge about these costs is essential to help managers in productivity enhancement, strategic planning and management, total quality management, management control. By nature cost management includes both management accounting information system as well as cost accounting.

Example 2.1

A company manufactures and retails clothing. You are required to group the costs which are listed below and numbered 1 to 20 into the following classification: (Each cost is intended to belong to only one classification).

(a) Direct Materials
(b) Direct Labour
(c) Direct Expenses
(d) Indirect Production Overhead
(e) Selling and Distribution Costs
(f) Research and Development Costs
(g) Finance Cost
(h) Administration Costs

1. Telephone rental plus metered calls
2. Wages of security guards for factory
3. Parcels sent to customers
4. Wages of operatives in cutting department
5. Developing a new product in the laboratory
6. Wage of fork lift truck drivers who handle raw materials
7. Wages of storekeepers in materials store
8. Chief accountant's salary
9. Cost of painting advertising slogans in delivery vans
10. Auditor's fee
11. Cost of advertising on television
12. Lubricants for sewing machines

[1]Charles T. Horngree, Srikant M. Datar and George Foster, Cost Accounting, A Managerial Emphasis, Pearson Education, 2008, p. 3.

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13. Floppy disks for general office computer
14. Maintenance contract for office photo copying machine
15. Interest on bank overdraft
16. Market research undertaken prior to new product launch
17. Carriage on purchase of raw materials
18. Royalty paid on number of units of a particular product produced
19. Road licences for delivery vehicles
20. Amount payable to a company for broadcasting music throughout the factory *(ICWA Inter)*

Solution:

Cost element	*Numbers*
Direct materials	17
Direct labour	4
Direct expenses	18
Finance cost	15
Research and development expenses	5
Selling and distribution cost	3, 9, 11, 16, 19
Administration cost	1, 8, 10, 13, 14
Indirect production costs	2, 6, 7, 12, 20

COST STATEMENT OR COST SHEET

Cost Statement is a statement which is prepared usually to present the detailed costs of total production during the period in question. It provides information relating to cost per unit at different stages of the total cost of production or at different stages of completion of the product. Sometimes standard cost data are also provided to facilitate comparison with the actual cost incurred. The preparation of the cost sheet requires understanding of the treatment of the following items:

1. *Stock of raw materials* The cost statement requires the determination of the value of raw materials consumed for the output produced. If the opening stock of raw materials, purchase of raw materials during the period and closing stock of raw materials are given, then the value of raw materials consumed is computed as follows:

	Rs.
Opening stock of raw materials	—
Add: Purchase of raw materials	—
Total	—
Less: Closing stock of raw materials	—
Value of raw materials consumed	—

2. *Stock of work-in-progress* Work-in-progress represents the accumulated costs on goods that have not yet been completed. As such these goods are not yet available for sale. The degree of completion of work-in-progress is usually expressed as a fraction or as a percentage, such as 2/5 complete for materials or 50% complete for labour.

Work-in-progress is valued on a prime cost or factory cost basis. In case it is to be valued on a factory cost basis, the following procedure would be followed:

	Rs.
Prime Cost	—
Add: Factory overhead	—
Add: Work-in-progress (beginning)	—
Total	—
Less: Work-in-progress (closing)	—
Factory Cost	—

3. *Stock of finished goods* Finished goods inventory covers the products on which all factory work has been completed. It carries the cost of completed production. Nothing more is to be done to finished goods at the factory and no further costs are added to finished goods. If opening and closing stock of finished goods are given, then they would be adjusted as under:

	Rs.
Cost of production	—
Add: Finished goods (beginning)	—
Total	—
Less: Finished goods (closing)	—
Cost of goods sold	—

As stated earlier, cost sheet gives details about the cost of manufacturing a product or completing an activity. A cost sheet discloses:

(1) Prime Cost
(2) Factory Cost (also known as works cost)
(3) Cost of Production
(4) Total Cost (or cost of sales)

A cost sheet shows total cost and cost per unit. Cost per unit is obtained by dividing total cost by the number of units produced. A cost sheet will have separate columns for the total and the unit cost of each element of cost. Cost sheet can be prepared on weekly, monthly or other time period basis as desired by management. Specimen of a cost sheet is given below:

Specimen of Cost Sheet
Cost Sheet for the Period _____
Production _____ Units

	Total cost (Rs.)	*Cost per unit (Rs.)*
Direct Materials:		
Opening stock...		
Purchases...		
Carriage inwards...		
Less: Closing stock...		
Less: Scrap		
Direct materials consumed		
Direct wages		
Direct expenses		

(*Contd.*)

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	Total cost (Rs.)	*Cost per unit (Rs.)*
I. *Prime Cost*		
Add: Factory Overheads:		
Indirect materials		
Loose tools		
Indirect wages		
Rent and rates (factory)		
Lighting and heating (factory)		
Power and fuel		
Repairs and maintenance		
Cleaning		
Drawing office expenses		
Cost of research and experiments		
Depreciation of factory plant		
Works stationery		
Welfare service expenses		
Insurance—Fixed assets etc.		
—Stock and finished goods		
Works manager's salaries		
II. *Factory or Works Cost*		
Add: Office and Administrative Overheads:		
Rent and rates (office)		
Salaries (office)		
Lighting and heating		
Insurance of office building and equipments etc.		
Telephone and postages		
Printing and stationery		
Depreciation of furniture and office equipments and buildings.		
Legal expenses		
Audit fees		
Bank charges		
III. *Cost of Production*		
Add: Selling and Distribution Overheads:		
Showroom rent and rates		
Lighting and heating		
Salesmen's salaries		
Commissions		
Travelling expenses of salesmen		
Sales printing and stationery		
Advertising		
Bad debts		
Postage		
Depreciation and expenses of delivery van		
Debt collection expenses		
Carriage freight outwards		
Samples and other free gifts		
IV. *Cost of Sales*		
Net profit (or loss)		
Sales		

Note: Items of expenses which are an appropriation of profit should not form a part of the costs of a product. Examples of such expenses are: (i) Income Tax; (ii) Dividends to shareholders; (iii) Commission (out of profit) to Managing Directors or Partners; (iv) Capital loss, that is, loss arising out of sale of assets; (v) Interest on loan; (vi) Donations; (vii) Capital expenditure; (viii) Discount on shares and debentures; (ix) Underwriting commission; (x) Writing off goodwill.

Example 2.2

Vijay Industries manufactures a product X. On 1st January 2007, there were 5000 units of finished product in stock. Other stocks on 1st January 2007 were as follows:

Works-in-progress	Rs. 57,400
Raw materials	Rs. 1,16,200

The information available from cost records for the year ended 31st December 2007 was as follows:

	Rs.
Direct materials	9,06,900
Direct labour	3,26,400
Freight on raw materials purchased	55,700
Indirect labour	1,21,600
Other factory overheads	3,17,300
Stock of raw materials on 31.12.2007	96,400
Work in progress on 31.12.2007	78,207
Sales (150000 units)	30,00,000
Indirect materials	2,13,900

There are 15000 units of finished stock in hand on 31st December 2007. You are required to prepare:

A statement of cost and profit assuming that opening stock of finished goods is to be valued at the same cost per unit as the finished stock at the end of the period.

Solution:

Statement of Cost and Profit of Product X

	Particulars	*Amount (Rs.)*	*Amount (Rs.)*
Opening Stock of Raw Materials		1,16,200	
Add:	Direct materials	9,06,900	
Add:	Freight on raw materials purchased	55,700	
		10,78,800	
Less:	Closing stock of raw materials	96,400	
	Value of Raw Materials Consumed		9,82,400
Add:	Direct wages		3,26,400
	Prime Cost		13,08,800
Add:	Factory overheads:		
	Indirect materials	2,13,900	
	Indirect labour	1,21,600	
	Other factory overheads	3,17,300	
		6,52,800	
Add:	Opening work-in-progress	57,400	
		7,10,200	

(*Contd.*)

Contd.

Particulars		*Amount (Rs.)*	*Amount (Rs.)*
Less:	Closing work-in-progress	78,200	6,32,000
Works Cost of Goods Manufactured			19,40,800
Add:	Opening stock of finished goods 5000 units @ Rs 12.13		60,650
			20,01,450
Less:	Closing stock of finished goods 15000 units @ Rs 12.13		1,81,950
Cost of Goods Sold			18,19,500
	Profit		11,80,500
	Sales		30,00,000

Working Notes:

Units produced during the year are not given and therefore have been computed as follows:

$$\text{Sales} = \text{Opening stock} + \text{Units produced} - \text{Closing stock}$$

$$150000 = 5000 + X - 15000$$

$$-X = 5000 - 15,000 - 1,50,000$$

Hence $X =$ 1,60,000 units

$$\text{Value of closing stock} = \frac{\text{Total cost}}{\text{Units produced}} = \frac{\text{Rs. } 19,40,800}{1,60,000} = \text{Rs. } 12.13 \text{ per unit}$$

$$= 15000 \text{ units} \times \text{Rs. } 12.13 = \text{Rs. } 1,81,950$$

Value of opening stock of 5000 units × Rs. 12.13 = Rs. 60,650

Example 2.3

The following particulars relating to the year 2007 have been taken from the books of a chemical works manufacturing and selling a chemical mixture:

Stock on January 1, 2007	*kg*	*Rs.*
Raw materials	2000	2,000
Finished mixture	500	1,750
Factory stores		7,250
Purchases:		
Raw materials	1,60,000	1,80,000
Factory stores		24,250
Sales:		
Finished mixture	1,53,050	9,18,000
Factory scrap		8,170
Factory wages		1,78,650
Power		30,400
Depreciation of machinery		18,000

(*Contd.*)

Contd.

Stock on January 1, 2007	*kg*	*Rs.*
Salaries:		
Factory		72,220
Office		37,220
Selling		41,500
Expenses:		
Direct		18,500
Office		18,200
Selling		18,000
Stock on December 31, 2007		
Raw materials	1200	
Finished mixture	450	
Factory stores		5,550

The stock of finished mixture at the end of 2007 is to be valued at the factory cost of the mixture for that year. The purchase of raw materials remained unchanged throughout 2007.

Prepare a statement giving the maximum possible information about cost and its break-up for the year 2007.

Solution:

Statement of Cost for the Year 2007

		Quantity (kg)	*Amount (Rs.)*
Raw materials consumed:			
Opening stock		2,000	2,000
Add: Purchases		1,60,000	1,80,000
		1,62,000	1,82,000
Less: Closing stock of raw materials at current prices		1,200	1,350
Cost of raw materials consumed		1,60,800	1,80,650
Factory wages			1,78,650
Direct expenses			18,500
Prime Cost		1,60,800	3,77,800
Add: Factory overheads (Factory stores)			
Opening stock	7,250		
Add: Purchases	24,250		
	31,500		
Less: Closing stock	5,550		
Factory stores consumed	25,950		
Power	30,400		
Depreciation	18,000		
Salaries	72,220		1,46,570
			5,24,370

(*Contd.*)

Contd.

			Quantity (kg)	*Amount (Rs.)*
Less:	Sale of scrap		7,800	8,170
	Factory Cost		1,53,000	5,16,200
Add:	Opening stock of finished mixture		500	1,750
			1,53,500	5,17,950
Less:	Closing stock of finished mixute (valued at		450	1,518
	factory cost of current year production)		1,53,050	5,16,432
Add:	Office overheads:			
	Salaries	37,220		
	Expenses	18,200		55,420
Cost of production of finished mixture sold				5,71,852
Add:	Selling and distribution overhead:			
	Salaries	41,500		
	Expenses	18,000		59,500
Cost of goods sold or cost of sales:				6,31,352
	Profit			2,86,648
	Sales		1,53,050 kg	9,18,000

Working Notes:

1. Value of closing stock of raw materials $\left(\frac{\text{Rs. } 1{,}80{,}000}{\text{Rs. } 1{,}60{,}000} \times 1{,}200 \text{ kg}\right) = \text{Rs. } 1{,}350$

2. Value of factory scrap given in the question is Rs. 8,170. Hence quantity of factory scrap will be:

		(kg)
	Sales	1,53,050
Add:	Closing stock	450
		1,53,500
Less:	Opening stock	500
Produced during the year		1,53,000
Inputs introduced		1,60,800
	Scrap	7,800

Example 2.4

The following figures are extracted from the trial balance of Gogetter Co. on 30th September, 2007:

Inventories:	*Rs.*	*Rs.*
Finished Stock	80,000	
Raw Materials	1,40,000	
Work-in-Process	2,00,000	
Office appliances	17,400	
Plant and machinery	4,60,500	
Buildings	2,00,000	

(*Contd.*)

	Rs.	*Rs.*
Sales		7,68,000
Sales return and rebates	14,000	
Materials purchases	3,20,000	
Freight incurred on materials	16,000	
Purchases returns		4,800
Direct labour	1,60,000	
Indirect labour	18,000	
Factory supervision	10,000	
Repairs and upkeep factory	14,000	
Heat, light and power	65,000	
Rates and taxes	6,300	
Miscellaneous factory expenses	18,700	
Sales commission	33,600	
Sales travelling	11,000	
Sales promotion	22,500	
Distribution deptt. sales and expenses	18,000	
Office salaries and expenses	8,600	
Interest on borrowed funds	2,000	
Further details are abailable as follows:		
(i) Closing Inventories:		
Finished goods	1,15,000	
Raw materials	1,80,000	
Work-in-process	1,92,000	
(ii) Accrued Expenses on:		
Direct labour	8,000	
Indirect labour	1,200	
Interest on borrowed funds	2,000	
(iii) Depreciation to be provided on:		
Office appliance	5%	
Plant and machinery	10%	
Buildings	4%	

(iv) Distribution of the Following Costs:

Heat, light and power to factory, office and selling in the ratio 8:1:1.

Rates and taxes two-thirds to factory and one-third to office. Depreciation on buildings to factory, office and selling in the ratio 8:1:1.

With the help of the above information, you are required to prepare a condensed profit and loss statement of Gogetter Co. for the year ended 30th September, 2007 along with supporting schedules:

(a) Cost of sales.
(b) Selling and distribution expenses.
(c) Administration expense.

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Solution:

Gogetter Company Profit and Loss Statement
For the Year Ended 30th September, 2007

Gross Sales	Rs. 7,68,000	Rs.
Less: Returns	14,000	7,54,000
Less: Cost of sales (Schedule 1)		7,14,020
Net Operating Profit		39,980
Less: Interest on borrowed funds		4,000
Net Profit		35,980

(i) Schedule 1: Cost of Sales

Raw Material:	Rs.	Rs.
Opening Balance		1,40,000
Add: Material purchased	3,20,000	
Add: Freight on material	16,000	
Less: Purchased returns	(4,800)	3,31,200
Cost of materials available		4,71,200
Less: Closing stock		1,80,000
Raw materials consumed		2,91,200
Direct labour		1,68,000
Prime Cost		4,59,200
Factory Overheads:		
Indirect labour	19,200	
Factory supervision	10,000	
Repairs and factory upkeep	14,000	
Heat, light and power	52,000	
Rates and taxes	4,200	
Miscellaneous factory expenses	18,700	
Depreciation of plant	46,050	
Depreciation of buildings	6,400	1,70,550
Gross Works Cost		6,29,750
Add: Opening work-in-process		2,00,000
		8,29,750
Less: Closing work-in-process		1,92,000
Works Cost		6,37,750
Add: Administration expenses (Schedule 3)		18,870
Cost of Production		6,56,620
Add: Opening stock of finished goods		80,000
		7,36,620
Less: Closing stock of finished goods		1,15,000
Cost of Production of Goods Sold		6,21,620
Add: Selling and distribution overheads (Schedule 2)		92,400
Cost of sales		7,14,020

(ii) Schedule 2: Selling and Distribution Overheads (Expenses)	
	Rs.
Sales commission	33,600
Sales travelling	11,000
Sales promotion	22,500
Distribution deptt: Salaries and expenses	18,000
Heat, light and power	6,500
Depreciation of buildings	800
	92,400

(iii) Schedule 3: Adiministrative Overheads (Expenses)	
Office salaries and expenses	8,600
Depreciation of office appliances	870
Depreciation of buildings	800
Heat, light and power	6,500
Rates and taxes	2,100
	18,870

Example 2.5

The following inventory data relates to XYZ Ltd:

	Inventories	
	Beginning	*Ending*
Finished goods	Rs. 1,10,000	95,000
Work-in-progress	Rs. 70,000	80,000
Raw materials	Rs. 90,000	95,000
Additional information:		
Cost of goods available for sale		Rs. 6,84,000
Total goods processed during the period		Rs. 6,54,000
Factory overheads		Rs. 1,67,000
Direct materials used		Rs. 1,93,000

Requirements:

(i) Determine raw materials purchases.
(ii) Determine the direct labour cost incurred.
(iii) Determine the cost of goods sold *(B. Com. (Hons.) Delhi 1999)*

Solution:

		Rs.
(i)	*Raw Materials purchases*	
	Direct Materials used	1,93,000
Add:	Closing Stock	95,000
		2,88,000
Less:	Opening Stock	90,000
		1,98,000
(ii)	*Direct Labour cost incurred*	
	Goods processed during the period	6,54,000
Add:	Closing Work-in-process	80,000
		7,34,000

(*Contd.*)

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Contd.

		Rs.
Less:	Opening Work-in-process	70,000
	Cost of goods introduced during the period for processing	6,64,000
Less:	Factory overheads	1,67,000
	Prime Cost	4,97,000
Less:	Direct Materials used	1,93,000
	Direct Labour cost incurred	3,04,000
(iii)	*Cost of goods sold*	
	Cost of goods available for sale	6,84,000
Add:	Opening Stock of Finished Goods	1,10,000
		7,94,000
Less:	Closing Stock of Finished Goods	95,000
	Cost of goods sold	6,99,000

Example 2.6

X Ltd. manufactures four brands of toys —*A*, *B*, *C* and *D*. If the company limits the manufacture to just one brand, the monthly production will be:

A—50000 units
B—100000 units
C—150000 units
D—300000 units

You are given the following set of information from which you are requested to find out the profit or loss made on each brand showing clearly the following elements—

(a) Direct Cost
(b) Works Cost
(c) Total Cost

	A	*B*	*C*	*D*
Actual production (units)	6750	18000	40500	94500
Direct wages (Rs.)	15000	27500	37500	105000
Direct materials cost (Rs.)	50000	92500	127500	380000
Selling price per unit (Rs.)	20	15	10	8

Factory overhead expenditure for the month was Rs. 162000. Selling and distribution cost should be assumed @ 20% of works cost. Factory overhead expenses should be allocated to each brand on the basis of units which could have been produced in a month when single brand production was in operation.

(ICWA Inter.)

Solution:

The relative ratios of each brand of products are as follows:

1 Unit of *A* = 2 units of *B* = 3 units of *C* = 6 units of *D*. Therefore, the overhead ratio in the inverse order should be 1 : 2: 3: 6. In case of *D*, the overhead expense rate will be

$$\frac{\text{Rs. } 1,62,000}{6750 \times 6 + 18000 \times 3 + 40500 \times 2 + 94500}$$

$$= \text{Rs. } \frac{162000}{270000}$$

$$= \text{Re } 0.60$$

The overhead expense rate for the various brands are :

A — Rs. 6×0.60 = Rs. 3.60

B — Rs. 3×0.60 = Rs. 1.80

C — Rs. 2×0.60 = Rs. 1.20

D — Re. 1×0.60 = Re 0.60

This follows the logic that the rate should be highest in case of brand which will be produced in least number when single brand production is in operation.

Statement of Profitability Brands

	A *Rs.*	*B* *Rs.*	*C* *Rs.*	*D* *Rs.*	*Total* *Rs.*
Direct materials	50000	92500	127500	380000	650000
Direct wages	15000	27500	37500	105000	185000
Prime cost	65000	120000	165000	485000	835000
Factory overhead	24300	32400	48600	56700	162000
Works cost	89300	152400	213600	541700	997000
Selling and distribution cost (20% of works cost)	17860	30480	42720	108340	199400
Total Cost	107160	182880	256320	650040	1196400
Sales	135000	270000	405000	756000	1566000
Profit	27840	87120	148680	105960	369600

Example 2.7

On June 30, 2008, a flash flood damaged the warehouse and factory of ABC Corporation completely destroying the work-in-progress inventory. There was no damage to either the raw materials or finished goods inventories. A physical verification taken after the flood revealed the following valuations:

Raw Materials	Rs.	62,000
Work-in-progress		0
Finished Goods	Rs.	1,19,000
The inventory on Jan. 1, 2008, consisted of the following:		
Raw Materials	Rs.	30,000
Work-in-progress	Rs.	1,00,000
Finished Goods	Rs.	1,40,000
		2,70,000

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A review of the books and records disclosed that the gross profit margin historically approximated 25% of sales. The sales for the first six months of 2008 were Rs. 3,40,000. Raw Material purchases were Rs. 1,15,000, Direct Labour costs for this period were Rs. 80,000 and manufacturing overhead has historically been 50% of direct labour. Compute the cost of work-in-progress inventory lost at June 30, 2008 by preparing a statement of cost and profit. *(B. Com. (Hons.) Delhi 1998 Adapted)*

Solution

Computation of Work-in-Progress Inventory Lost on June 30, 2008

Sales	Rs.	3,40,000
Less: Gross Profit @ 25%		85,000
Cost of Goods sold		2,55,000
Add: Closing Stock of Finished Goods		1,19,000
		3,74,000
Less: Opening Stock of Finished Goods		1,40.000
Cost of Finished Goods Produced (1)		2,34,000
Less: Raw Materials Consumed:		
Purchases	1,15,000	
Add: Opening Stock	30,000	
	1,45,000	
Less: Closing Stock	62,000	
	83,000	
Add: Wages	80,000	
Manufacturing Overhead	40,000	
Opening Stock of Work-in-progress	1,00,000	
		3,03,000
Closing stock of work-in-progress		69,000
This can be verified as follows:		Rs.
Raw Materials Consumed		83,000
Direct Wages		80,000
Manufacturing Overhead		40,000
Work-in-progress		1,00,000
		3,03,000
Less: Closing stock of work-in-progress		69,000
Work Costs		2,34,000
Add: Opening stock of Finished Goods		1,40,000
		3,74,000
Less: Closing Stock of Finished goods		1,19,000
Cost of Goods sold		2,55,000
Add: Gross profit @ 25%		85,000
Sales		3,40,000

Example 2.8

The Vardhman Ltd. manufactures one product. A summary of its activities for the year 2008 is given below:

	Units	Rs.
Sales	80,000	8,00,000
Material inventory 1-1-08		40,000
Material inventory 31-12-08		32,000
W.I.P. 1-1-08		55,000
W.I.P. 31-12-08		72,000
Finished goods 1-1-08	16,000	64,000
Finished goods 31-12-08	34,000	1,51,265
Material Purchases		1,52,000
Direct Labour		1,45,000
Manufacturing overhead		1,08,000
Selling expenses		50,000
General expenses		40,000

Prepare a cost sheet. *(B.Com(Hons), Delhi, 2003)*

Solution:

Cost Sheet for 2008

	Rs.	*Rs.*
Opening stock of raw material	40,000	
Add: Purchase of raw material	1,52,000	
	1,92,000	
Less: Closing stock of raw material	32,000	
Raw material consumed		1,60,000
Direct Labour		1,45,000
Prime Cost		3,05,000
Manufacturing overhead	1,08,000	
Add: W.I.P. (1-1-08)	55,000	
	1,63,000	
Less: W.I.P. (31-12-08)	72,000	91,000
Factory Cost		3,96,000
General Expenses		40,000
Cost of Production **(Units 98,000)**		4,36,000
Add: Opening stock of Finished Goods (Units 16,000)		64,000
		5,00,000
Less: Closing stock of Finished Goods (Units 34,000) (Rs. 4.489 per unit)		1,51,265
Cost of Good Sold		3,48,735
Add: Selling Expense		50,000
Cost of Sales		3,98,735
Profit (Rs. 5.0125 per unit)		4,01,265
Sales (80,000 Units)		8,00,000

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Example 2.9

The particulars obtained from the records of M/s Jain Industries for the year 2007 are given below, from which you are required to prepare a cost sheet and a statement showing estimated cost of 1000 units in future:

	Rs.
Opening Stock:	
Raw materials	1,40,000
Finished products	20,000
Purchases	2,10,000
Factory wages	3,80,000
Factory overheads	70,000
Office overheads	40,000
Closing Stock:	
Raw materials	19,600
Finished goods	1,60,000
Sales	7,56,000

At the end of the year, the number of units produced including the closing stock and the number of units sold was 4,000.

On the basis of the above the industry wanted to supply 1000 units in future. It is estimated that the prices of raw materials and labour may rise by 15% and 10% respectively. Assume that the same percentage of profit on sales will be made. *(B.Com.(Hons), Delhi 2004)*

Solution: Cost sheet for the year 2007 Output: 4000 units

Particulars	*Rs.*	*Amount Total Rs.*	*Amount per unit Rs.*
Opening stock of Raw Materials	140000		
Purchase of Raw Materials	210000		
	350000		
Less: Closing stock or Raw Material	19600		
Cost of Materials consumed		330400	82.60
Factory wages		380000	95.00
	Prime cost	710400	177.60
Factory overhead		70000	17.50
	Work cost	780400	195.10
Office Overhead		40000	10.00
	Total cost of production	820400	205.10
Opening completed stock		20000	
Total cost of Production during the period		840400	
Less: Closing stock of completed goods		160000	
	Cost of sales	680400	
	Profit	75600	
	Sales	756000	

Estimated cost of 1000 units

Particulars	*Rs.*	*Amount Total Rs.*	*Amount per unit Rs.*
Material consumed (1000 × Rs. 82.60)	82600		
+ 15% increase	12,390	94990	94.99
Factory wages 1000 × Rs. 95 =	95000		
+ 10% increase	9500	104500	104.50
Prime cost		199490	199.49
Factory overhead Rs. 17.50 × 1000		17500	17.50
	Work cost	216990	216.99
Office overheads Rs. 10 × 1000 =		10000	10.00
	Total cost	226990	226.99
Profit 10% on selling price		25221	25.22
	Selling Price	252211	252.21

$$\% \text{ of Profit on sales} = \frac{75600}{756000} \times 100 = 10\%$$

Example 2.10

The cost structure of an article, the selling price of which is Rs. 45,000 is as follows:

Direct material	50%
Direct labour	20%
Overheads	30%

An increase of 15% in the cost of materials and 25% in the cost of labour is anticipated. These increased costs in relation to the present selling price would cause a 25% decrease in the amount of present profit per article. You are required:

(i) To prepare a statement of profit per article at present.
(ii) The revised selling price to produce the same percentage of profit to sales as before.

(B.Com. (Hons), Delhi, 2002, 2006)

Solution:

Let the total cost = x

Profit = y

When Total cost = x, Material cost 50% that is, $0.5x$, Labour cost 20% that is, $0.2x$, Overheads 30% = $0.3x$; So,

$$0.5x + 0.2x + 0.3x + y = 45{,}000$$

$$\boxed{x + y = 45{,}000} \quad (1)$$

When material cost increased by 15%, then raw material cost = $0.575x$

Labour cost increased by 25%, then new labour cost = $0.25x$

Profit will decrease by 25%, so new profit = $0.75y$

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So new Equation

$$0.575x + 0.25x + 0.3x + 0.75y = 45{,}000$$

$$\boxed{1.125x + 0.75y = 45{,}000} \quad (2)$$

By comparing equations 1 and 2

$$x + y = 45{,}000 \quad (1)$$

$$1.125x + 0.75y = 45{,}000 \quad (2)$$

By solving the equation

$$x = 30{,}000$$

$$y = 15{,}000$$

(i) Statement of Profit per article

Material cost	= 15,000
Direct labour	= 6,000
Overhead	= 9,000
Cost	30,000
Profit	15,000
Sales	45,000

$$\text{Percentage of profit on cost} = \frac{15{,}000}{30{,}000} \times 100 = 50\%$$

(ii) After increase in Cost

	Rs.
New Material cost =	17,250
Direct Labour =	7,500
Overhead =	9,000
New cost	33,750
To maintain same rate of Profit	
Profit is 50% of cost	16,875
New Selling Price	50,625

Example 2.11

A company is considering a contract which requires among other things, 50 kg of material M. 80 kg of material M are in stock which were purchased for Rs. 2 per kg. The replacement price is Rs. 2.15 per kg. The material is in stock as a result of buying error and the company has no other use for it. If not used on this contract, it could be sold for Rs. 1.80 per kg. What is the relevant cost of the material to be used in this contract? *(B.Com; Delhi, 2004)*

Solution:

Relevant costs by nature are those costs which influence a particular decision. Relevant costs are always future costs and are only incremental (avoidable) costs. Avoidable costs are those costs which are not incurred from one alternative to another.

In this context, relevant cost of the material to be used is Rs. 1.80 per kg. The company has no other use for the material. If this material is not used in this contract, it could be sold for Rs. 1.80 per kg. If sold in the market, the company will get Rs. 1.80 per kg. If used on the contract, the company would be getting Rs. 1.80 per kg and thereby can earn some profit also on the contract. Therefore, relevant cost of the material is Rs. 1.80 per kg.

Example 2.12

From the understated particulars, you are required to prepare a monthly cost sheet of Soap Manufacturers Ltd. showing therein:

(i) Prime cost;
(ii) Works cost;
(iii) Cost of production;
(iv) Cost of sales; and
(v) Profit per unit.

Opening Inventory (1-1-2008):	Rs.
Raw materials	6,000
Work-in-progress	9,620
Finished goods (1,000 units)	13,680
Closing Inventory (31-1-2008):	
Raw materials	7,000
Work-in-progress	8,020
Finished goods	?
Donations to home for destitutes	2,100
Raw-materials purchased	72,000
Import duty on raw materials purchased	14,400
Productive wages	18,000
Machine hours worked	21,600 hours
Machine hour rate	Rs. 1.50
Chargeable expenses	Rs. 2,000
Office and Administration expenses	Re. 1 per unit
Selling expenses	Re. 0.90 per unit
Units sold	8,000 units
Units produced	8,200 units
Profit on sale	10%

(B. Com. Delhi, 2005)

Solution:

Cost Sheet

Particulars		*Total (Rs).*	*Per unit (Rs.)*
Material consumed–	Rs.		
Opening stock	6000		
Purchases	72000		
Import Duty	14400		
	92400		
Less: Closing stock of raw material	7000	85400	10.41
Productive wages		18000	2.20
Chargeable expenses		2000	0.24
(i) Prime Cost		105400	12.85

(*Contd.*)

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Particulars		*Total (Rs).*	*Per unit (Rs.)*
Add: Factory overheads—			
21600 Machine hrs @ Rs. 1.50	32400		
+ opening W.I.P.	9620		
	42020		
– closing W.I.P.	8020	34000	4.15
(ii) Work Cost		139400	17.00
Office and Adm. Overheads @ Re. 1 per unit		8200	1.00
(iii) Cost of Production		147600	18.00
Add: Opening stock of finished goods (1000 units)		13680	
		161280	
Less: Closing stock of finished goods [1000 (opening units) + 8200 (produced) – 8000 (sold) = 1200 units] [1200 units × Rs. 18 (per unit)]		21600	
		139680	17.46
Add: Selling overheads @ Re. 0.90 per unit(8000 × 0.90)		7200	0.90
Cost of Sales		146880	18.36
Profit (1/9 × 146880) which is 10% of sales		16320	2.04
Sales (8000 units)		163200	20.40

Example 2.13

Popeye Company is a metal and wood cutting manufacture, selling products to the home construction market. Consider the following data for the month of October, 2004.

	Rs.
Sandpaper	5,000
Material-handling costs	1,75,000
Lubricants and Coolants	12,500
Miscellaneous indirect manufacturing labour	1,00,000
Direct manufacturing labour	7,50,000
Direct materials, October 1, 2004	1,00,000
Direct materials, October 31, 2004	1,25,000
Finished goods, October 1, 2004	2,50,000
Finished goods, October 31, 2004	3,75,000
Work-in-process, October 1, 2004	25,000
Work-in-process, October 31, 2004	35,000
Plant-leasing costs	1,35,000

	Rs.
Depreciation-plant equipment	90,000
Property taxes on plant equipment	10,000
Fire insurance on plant equipment	7,500
Direct materials purchased	11,50,000
Sales revenues	34,00,000
Marketing promotions	1,50,000
Marketing salaries	2,50,000
Distribution costs	1,75,000
Customer-service costs	2,50,000

Required

(i) Prepare an income statement with a separate supporting schedule of cost of goods manufactured.

(ii) For all manufacturing items, indicate by *V* or *F* whether each is basically a variable cost or a fixed cost (where the cost object is a product unit). *(CA, PE, Exam II, Group II, Nov. 2004)*

Solution:

Popeye Company 'Schedule for cost of goods manufactured' for the month ending Oct 2004

Direct materials	*Rs.*	*Rs.*
Beginning Inventory	1,00,000	
Purchase of Direct Materials	11,50,000	
Cost of direct materials available for use	12,50,000	
Ending inventory	1,25,000	
Direct materials used		11,25,000(V)
Direct manufacturing labour		7,50,000(V)
Indirect manufacturing costs		
Sand Paper	5,000(V)	
Material-handling cost	1,75,000(V)	
Lubricants and coolants	12,500(V)	
Misc. indirect manufacturing labour	1,00,000(V)	
Plant leasing cost	1,35,000(F)	
Depreciation-plant and equipment	90,000(F)	
Property tax-plant and equipment	10,000(F)	
Fire insurance-plant and equipment	7,500(F)	5,35,000
Manufacturing cost incurred during the month of October, 2004		24,10,000
Add: Op. work-in-progress		25,000
		24,35,000
Less: Cl. Work-in-progress		35,000
Cost of goods manufactured (to income statement)		24,00,000

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Popeye Company: Income Statement for the month ending Oct 31, 2004

	Rs.	*Rs.*
Revenues		*34,00,000*
Cost of goods sold:		
Beginning finished goods	2,50,000	
Cost of goods manufactured	24,00,000	
Cost of goods available for sale	26,50,000	
Ending finished goods	3,75,000	22,75,000
Gross Margin		11,25,000
Marketing, Distribution and Customer Service Costs:		
Marketing promotions	1,50,000	
Marketing salaries	2,50,000	
Distribution costs	1,75,000	
Customer service cost	2,50,000	8,25,000
Operating Income		3,00,000

Example 2.14

A fire occurred in the factory premises on October 31, 2003. The accounting records have been destroyed. Certain accounting records were kept in another building. They reveal the following for the period September 1, 2003 to October 31, 2003.

(i)	Direct materials purchased	Rs. 2,50,000
(ii)	Work-in-process inventory, 1.9.2003	Rs. 40,000
(iii)	Direct materials inventory, 1.9.2003	Rs. 20,000
(iv)	Finished goods inventory, 1.9.2003	Rs. 37,750
(v)	Indirect manufacturing costs	40% of conversion cost
(vi)	Sales revenues	Rs. 7,50,000
(vii)	Direct manufacturing labour	Rs. 2,22,250
(viii)	Prime costs	Rs. 3,97,750
(ix)	Gross margin percentage based on revenues	30%
(x)	Cost of goods available for sale	Rs. 5,55,775

The loss is fully covered by insurance company. The insurance company wants to know the historical cost of the inventories as a basis for negotiating a settlement, although the settlement is actually to be based on replacement cost, not historical cost.

Required

(i) Finished goods inventory, 31.10.2003
(ii) Work-in-process inventory, 31.10.2003
(iii) Direct materials inventory, 31.10.2003 *(CA, PE, Exam II, Group II, Nov. 2003)*

Solution:

Working Notes

1. *Direct material inventory cost (used during the month):*
   = Prime cost – Direct manufacturing labour cost
   = Rs. 3,97,750 – Rs. 2,22,250 = Rs. 1,75,500
2. *Conversion and indirect manufacturing cost:*

Conversion cost = (Direct manufacturing cost + Indirect manufacturing cost)
But indirect manufacturing cost = 40% of conversion cost
or Conversion cost = Direct manufacturing cost + 40% of conversion cost
or 0.60 conversion cost = Direct manufacturing cost

$$\text{or Conversion cost} = \frac{\text{Direct manufacturing cost}}{0.60}$$

$$= \frac{\text{Rs. } 2,22,250}{0.60}$$

= Rs. 3,70,417
or Indirect manufacturing cost = 40% × Rs. 3,70,417
= Rs. 1,48,167

3. *Cost of goods manufactured*

	Rs.
Cost of goods available for sale	5,55,775
Less: Finished goods 1.9.2003	37,750
Cost of goods manufactured	5,18,025

(i) Finished goods inventory, 31.10.2003

	Rs.
Sales revenue	7,50,000
Less: Gross margin (30% of revenue)	2,25,000
Cost of goods sold: (a)	5,25,000
Cost of goods available for sale: (b)	5,55,775
Finished good inventory, 31.10.2003: {(b) – (a)}	30,775

(ii) Work-in-process inventory, 31.10.2003:

	Rs.
Prime cost	3,97,750
Add: Indirect manufacturing cost (*Refer to working note 2*)	1,48,167
Add: Opening work-in-process, 1.9.2003	40,000
Manufacturing cost to account for	5,85,917
Less: Cost of goods manufactured	5,18,025
Work-in-process inventory, 31.10.2003	67,892

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(iii) Direct material inventory, 31.10.2003

	Rs.
Direct materials inventory, 1.9.2003	20,000
Add: Direct material purchased	2,50,000
	2,70,000
Less: Direct material inventory (used during the month) (*Refer to working note 1*)	1,75,500
Direct material inventory, 31.10.2003	94,500

Example 2.15

A company manufactures radios, which are sold at Rs. 1,600 per unit. The total cost is composed of 30% for direct materials, 40% for direct wages and 30% for overheads. An increase in material price by 30% and in wage rates by 10% is expected in the forthcoming year, as a result of which the profit at current selling price may decrease by 40% of the present profit per unit. You are required to prepare a statement showing current and future profits at present selling price.

How much selling price should be increased to maintain the present rate of profit?

(CA, PE, Exam II, Group II, May 2001)

Solution:

Let X be the cost, Y be the profit and Rs. 1,600 selling price per unit of radio manufactured by a company. Hence

$$X + Y = 1{,}600 \quad \text{(i)}$$

Statement of present and future costs of a radio

Particulars	*Present cost* Rs. (a)	*Increase in cost (Rs.)* (b)	*Anticipated future cost (Rs.)* (c) = (a) + (b)
Direct material	0.3 X	0.09 X	0.39 X
Direct labour	0.4 X	0.04 X	0.44 X
Overheads	0.3 X		0.30 X
Total	X	0.13 X	1.13 X

An increase in material price and wage rates resulted into a decrease in current profit by 40 percent at present selling price; therefore we have:

$$1.13\,X + 0.6\,Y = 1{,}600 \quad \text{(ii)}$$

On solving (i) and (ii) we get:

$$X = \text{Rs. } 1{,}207.55$$

$$Y = \text{Rs. } 392.45$$

Current profit Rs. 392.45 or 32.5% of cost
Future profit Rs. 235.47

Statement of revised selling price to maintain the present rate of profit

	Rs.
Direct material cost (*0.39 × Rs. 1,207.55*)	470.94
Direct labour cost (*0.44 × Rs. 1207.55*)	531.32
Overheads (*0.30 × Rs. 1,207.55*)	362.27
Total cost	1,364.53
Profit (*32.5% of total cost*)	443.47
Revised selling price	1,808.00

THEORY QUESTIONS

1. Define the term 'cost'. How is it different from expense?

2. What is meant by 'differential cost'?

3. What is the meaning of the term incremental cost? Does incremental cost mean the same thing as variable cost?

4. Explain the nature of product and period cost. How do they affect net income of a business enterprise?
(B. Com. (Hons), Delhi 1997, 2006)

5. "Product cost is a general term that denotes different costs allocated to products for different purposes." Describe three purposes. Explain the composition of 'product cost' for the purpose of external financial reporting along with its rationale. *(B.Com.(Hons), Delhi 1998)*

6. Distinguish between
(a) Expired cost and unexpired cost
(b) Direct and indirect costs *(B.Com. (Hons), Delhi, 1998, 2000)*

7. (a) Distinguish between fixed cost and variable costs.
(b) Explain the significance of 'dicision-making cost.'
(c) Elucidate the meaning and formulation of 'Product cost' for the purpose of income measurement and determination of financial position. *(B.Com. (Hons) Delhi 1999, 2001)*

8. Distinguish between
(a) Prime cost and conversion cost.
(b) Controllable and uncontrollable cost. *(B. Com. (Hons) Delhi 1999)*

9. Bring out clearly the significance of the following costs for management:
(a) Opportunity cost
(b) Sunk cost
(c) Imputed costs
(d) Out-of-pocket costs

10. Discuss the various costs used in decision-making and explain their characteristics.
(B. Com. (Hons), Delhi)

11. Distinguish between period costs and product costs. Why is this distinction considered important?
(B. Com. (Hons), Delhi)

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12. Distinguish between the following:
(i) Controllable cost and Non-controllable cost, and
(ii) Direct material and indirect material. *(B. Com. (Hons), Delhi)*

13. (a) Distinguish between out-of-pocket cost and opportunity cost.
(b) Explain and illustrate the distinction between 'direct cost' and 'indirect cost' specially from the point of view of decision making. *(B. Com. (Hons), Delhi, 1990)*

14. Explain whether you agree with each of the following statements:
(a) "All direct costs are variable."
(b) "Variable costs are controllable and fixed costs are not."
(c) "Sunk costs are irrelevant when providing decision-making information."

15. Lists two costs which are used in decision making but not entered in the accounting system under that designation.

16. Name a cost which is reflected in the accounting system but not used in decision making?

17. Explain briefly the following concepts:
(a) Sunk cost
(b) Differential cost
(c) Variance analysis
(d) Key factor
(e) Cost reduction *(B.Com. (Hons), Delhi, 2002)*

18. Enumerate the basic principles of cost control. *(B.Com. (Hons), Delhi, 2002)*

19. Explain the meaning of relevant costs in managerial decisions. Give examples.
(B.Com (Hons), Delhi, 2003, 2004)

20. What do you mean by cost reduction? How is it different from cost control?
(B.Com (Hons), Delhi, 2005, I.C.W.A. Inter, Stage 1, Dec. 2005)

21. "The term cost must be qualified according to its context". Comment.
(B.Com. (Hons), Delhi, 2002)

22. "Direct costs and variable costs are not necessarily the same". Comment.
(B.Com. (Hons), Delhi, 2006)

23. Explain the following with the suitable examples:
(a) Imputed cost
(b) Sunk cost *(B.Com. (Hons), Delhi, 2007)*

24. Distinguish between:
(a) Controllable cost and Non-controllable cost
(b) Variable cost and fixed cost
(c) Bin Card and Stores Ledger
(d) Costing and cost accounting
(e) Explicit and Implicit cost. *(B.Com. (Hons), Delhi, 2006)*

25. Explain the significance of cost reduction in the present global economy. Mention some important techniques used for cost reduction. Also, mention the important areas in a manufacturing company to be subjected to cost reduction drives.
(I.C.W.A. Inter, Stage 1, June 2004)

26. Answer the following
(i) Explicit and implicit costs
(ii) Period costs and discretionary costs
(CA, P.E., Exam II, Group II, May 2007)

27. Discuss cost classifications based on variability and controllability.
(CA, P.E., Exam II, Group II, Nov. 2004)

28. Distinguish between cost reduction and cost control.
(CA, PE, Exam II, Group II, Nov. 2002, May 2003, 2004, Nov. 2004, I.C.W.A., Inter, Stage I, Dec. 2006)

29. Explain the nature and scope of cost control and 'cost reduction'. Which of the two is superior?
(B.Com. (Hons), Delhi, 2007)

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30. Explain 'cost management'. *(B.Com. (Hons), Delhi, 2007)*

31. Distinguish between

(i) Cost control and cost reduction
(ii) Cost allocation and cost absorption
(iii) Controllable cost and uncontrollable cost
(iv) Direct and indirect labour costs *(CA. Inter, Nov. 2001)*

SELF EVALUATION QUESTIONS

1. Match the items in Column 1 with the best choice in Column 2

Column 1	*Column 2*
1. Total fixed costs	A Costs incurred during a period
2. Incurred costs	B Total amount remains constant
3. Cost of goods manufactured	C Expired costs
4. Total manufacturing costs	D Direct materials and direct labour
5. Unit variable cost	E Costs of completed production after adjustment for work in progress inventory
6. Prime costs	F Direct labour and factory overhead
7. Expenses that are matched against revenue	G Added cost of a new product
8. Materials, labour and factory overhead	H Remains constant per unit
9. Conversion costs	I Direct materials, direct labour and factory overhead.
10. Cost of goods sold	J Cost of goods manufactured, adjusted for changes in finished goods stock

2. Classify each of the following costs using the following classifications:

(a) Direct materials
(b) Direct labour
(c) Manufacturing overhead
(d) Non-manufacturing expense

(i) Managing Director's salary
(ii) Oil for a milling machine
(iii) Salary of the milling machine operator
(iv) Salary of the supervisor of assembly department for products A, B and C
(v) Depreciation on the factory building
(vi) Income tax expense
(vii) Depreciation on direct materials warehouse
(viii) Depreciation on the administrative office building
(ix) Rent on the finished goods warehouse
(x) Rent on the sales office
(xi) Insurance on the truck used for delivery of finished goods sold
(vii) Gasoline for the truck used for transfer of work in process from one department to another
(xiii) Contribution to Earthquake Relief Fund paid
(xiv) Interest on borrowed money

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3. Classify each of the following manufacturing costs using the following classifications:

(a) Fixed
(b) Variable
(c) Mixed

(i) Rent on the factory building
(ii) Salary of the supervisor of the casting department
(iii) Wages of machine operators
(iv) Overtime premium for machine operators
(v) Fire insurance on the factory equipment
(vi) Cost of water used to cool production machinery
(vii) Depreciation on production machinery
(viii) Cost of paint used on products
(ix) Cost of electricity used to operate production machinery
(x) Lubricants used for production machinery.

4. Classify each of the following costs of a manufacturing company using the following classifications:

A – Production overhead
B – Selling and distribution overhead
C – Administration overhead
D – Research and development overhead

(i) Depreciation of factory plant and equipment
(ii) Trade discount given to customers
(iii) Cost of oils used to lubricate production machinery
(iv) Motor vehicles licenses for lorries
(v) Cost of chemicals used in laboratory
(vi) Commission paid to sales representative
(vii) Salary of the secretary to the Finance Director
(viii) Holiday pay of machine operators
(ix) Salary of the security guard in raw materials warehouse
(x) Fees to advertising agency
(xi) Rent of finished goods warehouse
(xii) Insurance of the company's premises
(xiii) Salary of scientist in laboratory
(xiv) Salary of supervisor working in the factory
(xv) Cost of typewriter ribbons in the general office
(xvi) Protective clothing for machine operatives.

5. Choose the correct answer for the following multiple-choice questions:

(i) For a manufacturing company, which of the following is an example of a period rather than a product cost?

(a) depreciation on factory equipment
(b) wages of sales people
(c) wages of machine operators
(d) insurance on factory equipment

(ii) Prime costs and conversion costs share which common element of total cost?

(a) variable overhead
(b) fixed overhead
(c) direct materials
(d) direct labour

(iii) Indirect materials are

(a) a prime cost
(b) a fixed cost
(c) an irrelevant cost
(d) a factory overhead cost

(iv) Factory overhead

(a) is a prime cost
(b) can be a variable cost or a fixed cost
(c) can only be a fixed cost
(d) includes all factory labour

(v) Fixed cost per unit increases when

(a) Production increases
(b) Production decreases
(c) Variable cost per unit decreases
(d) Prime cost per unit decreases

(vi) Factory supplies for a manufacturing plant are generally

(a) Prime cost
(b) Period costs
(c) Variable costs
(d) Excluded from product costs

(vii) Costs that increase as the volume of activity decreases within the relevant range are:

(a) Average cost per unit
(b) Average variable cost per unit
(c) Total fixed costs
(d) Total variable costs

PROBLEMS

1. The following data are related to the manufacture of a standard product during the month of December 2001.

	Rs.
Raw materials consumed	15,000
Direct wages	9,000
Machine hours worked	900
Machine hours rate	5
Administrative overheads	20% on works cost
Selling overheads	Re 0.50 per unit
Units produced	17,100
Units sold	16,000 (at Rs. 4 per unit)

You are required to prepare a cost sheet from the above showing:
(a) The cost per unit.
(b) The profit per unit sold and profit for the period.

(CA, Inter)

Ans: Cost per unit Rs. 2; Profit per unit sold Rs. 1.50; and Profit Rs. 24,000.

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2. A factory produces a standard product. The following information is given to you from which you are required to prepare a cost sheet for January 2000.

	Rs
Raw materials consumed	91,000
Direct wages	29,000
Other direct expenses	11,000

Factory overheads 80% of direct wages
Office overheads 10% of works cost
Selling and distribution expenses Rs 2 per unit sold
Units produced and sold during the month 10,000
Also find the selling price per unit on the basis that profit mark up is uniformly made to yield a profit of 20% of the selling price. There was no stock or work-in-progress either at the beginning or at the end of the period.
Ans: Cost of sales Rs. 1,89,620; profit Rs. 47,405

3. From the following particulars of a manufacturing firm, prepare a statement showing:

(a) Cost of materials consumed
(b) Works cost
(c) Cost of production
(d) Percentage of works overhead to productive wages
(e) Percentage of general overhead to works cost

	Rs.
Stock of materials on January 1, 2002	40,000
Purchase of raw materials in January 2002	11,00,000
Stock of finished goods on 1.1. 2002	50,000
Productive wages	5,00,000
Finished goods sold	24,00,000
Works overhead charges	1,50,000
Office and general expenses	1,00,000
Stock of materials on 31.1.2002	1,40,000
Stock of finished goods on 31.1.2002	60,000

Ans. (a) Rs 10,00,000;
(b) 16,50,000;
(c) Rs 17,50,000;
(d) 30%; and
(e) 6.6%.

4. The following data have been extracted from the books of M/s Moonshine Industries for the calendar year 2002.

	(Rs. '000)
Opening stock of raw materials	25,000
Purchase of raw materials	85,000
Closing stock of raw materials	40,000
Carriage inward	5,000
Wages—Direct	75,000
—Indirect	10,000
Other direct charges	15,000
Rent and rates—Factory	5,000
—Office	500
Indirect consumption material	500
Depreciation—Plant etc.	1,500
—Office furniture	100

	Rs. '000
Salary—Office	2,500
—Salesman	2,000
Other factory expenses	5,700
Other office expenses	900
Managing Director's remuneration	12,000
Other selling expenses	1,000
Travelling expenses of salesmen	1,100
Carriage and freight outward	1,000
Sales	2,50,000
Advance income tax paid	15,000
Advertisement	2,000

The Managing Director's remuneration is to be allocated as Rs. 40,00,000 to the factory, Rs. 20,00,000 to the office and Rs. 60,00,000 to the selling departments. From the above information prepare (a) Prime cost (b) Works cost (c) Cost of production (d) Cost of sales and (e) Net profit.

Ans: Prime cost Rs. 16,50,00,000, Factory cost Rs. 19,17,00,000, Cost of production Rs. 19,77,00,000, Cost of sales Rs. 21,08,00,000 Profit Rs. 3,92,00,000. Income tax is not included in costs.

5. From the following particulars, prepare a cost sheet for the year ended 31.12.2002

	Rs.
Stock of finished goods (1.1.2002)	6,000
Stock of raw materials (1.1.2002)	40,000
Work-in-progress (1.1.2002)	15,000
Purchase of raw materials	4,75,000
Carriage inwards	12,500
Factory rent, taxes	7,250
Other production expenses	43,000
Stock of goods (31.12.2002)	15,000
Wages	1,75,000
Work manager's salary	30,000
Factory employees salary	60,000
Power expenses	9,500
General expenses	32,500
Sales for the year	8,60,000
Stock of raw materials	50,000
Work-in-progress (31.12.2002)	10,000

Ans: Prime cost Rs. 6,52,500; Factory cost Rs. 8,07,250;
Total cost Rs. 8,39,750,
Profit Rs. 29,250, Total sales Rs. 8,60,000.

6. A manufacturing company has shown Rs. 32,380 as "Establishment Expenses" which include the following expenses:

	('000) Rs.
1. Warehouse wages	3600
2. Office salaries	2260
3. Office lighting	140
4. Directors remuneration	2800
5. Rent, rates and insurance of warehouses	620
6. Warehouse lighting	540
7. Trade magazine	140

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	Rs.
8. Bank charges	200
9. Bad debts	340
10. Agents commission	11500
11. Warehouse repair	1020
12. Travelling expenses	1520
13. Rent, rates and insurance of office	460
14. Printing and stationery	3000
15. Donation	300
16. Discount allowed	3940

From the above information, find out the total of (i) selling expenses (ii) distribution expenses (iii) administration expenses and (iv) expenses which will not be considered in determining total costs. *(CA inter)*

Ans: (i) Selling expenses Rs. 13,360 (ii) Distribution expenses Rs. 5780 (iii) Administrative expenses Rs. 9,000 (iv) Expenses not to be considered Rs. 4,240.

7. The books of Adarsh Manufacturing Company present the following data for the month of April 2007:

Direct labour cost Rs. 17,500 being 175% of works overheads
Cost of goods sold excluding administrative expenses Rs. 56,000.
Inventory accounts showed the following opening and closing balances:

	April 1	*April 30*
Raw materials	Rs. 8,000	Rs. 10,600
Work-in-progress	10,500	14,500
Finished goods	17,600	19,000

Other data are:

Selling expenses	Rs. 3,500
General and administrative expenses	2,500
Sales for the month	75,000

You are required to:
(i) Compute the value of materials purchased
(ii) Prepare a cost statement showing the various elements of cost and also the profit earned.
(CA)

Ans. (i) Value of materials purchased Rs. 36,500
(ii) Cost of production of goods sold Rs. 56,000, Cost of sales Rs. 62,000.
Profit Rs. 13,000.

8. The following particulars relate to a company for a period of three months:

Raw materials 1.1. 2007	55,000
Raw materials 31.3.2007	35,000
Factory wages	80,000
Materials purchased	60,000
Sales	1,54,000
Indirect expenses	10,000
Stock of finished goods (1.1.2007)	Nil
Stock of finished goods (31.3.2007)	30,000
No. of units produced during the period was	2,000

Prepare a statement of cost for the period and compute the price to be quoted for 500 units in order to realise the same % of profit as for the period under review, assuming no alteration in wages and cost of materials.
Ans. Price to be quoted Rs. 46,750

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PART 2

ELEMENTS OF COST

Cost ascertainment is basic prerequisite for cost analysis, cost control and cost management by the management of an organisation. Therefore, knowledge of different elements of costs constituting a product or job is necessary to understand their significance, nature and behaviour in relation to change in output or activity. The different chapters in Part 2 discuss material costs, labour costs, factory overhead, administrative and selling and distribution overheads and issues relating to these costs for proper attention by the managers and accountants. Activity-based costing and some emerging concepts in cost accounting have also been explained in Part 2.

3. MATERIALS CONTROL
4. MATERIALS COSTING
5. LABOUR COSTS : ACCOUNTING AND CONTROL
6. FACTORY OVERHEADS : DISTRIBUTION
7. ADMINISTRATIVE AND SELLING AND DISTRIBUTION OVERHEADS
8. ACTIVITY-BASED COSTING

3 MATERIALS CONTROL

Learning Objectives

After reading this chapter, you should be able to:

1. explain what material is and the concept and objectives of material control;
2. discuss purchasing and receiving procedure;
3. discuss significant issues in materials procurement;
4. explain stores organisation, storage layout, issue of materials returned to storeroom and supplier;
5. discuss inventory system, its methods, nature of inventory, concept and different techniques of inventory control and
6. identify different material losses and their accounting treatment.

MATERIALS

The term "materials", generally used in manufacturing concerns, refers to raw materials used for production, sub-assemblies and fabricated parts. The terms "materials" and "stores" are sometimes used interchangeably. However, both the terms differ. "Stores" is wider in meaning and comprises many other items besides raw materials, such as tools, equipments, maintenance and repair items, factory supplies, components, jigs, fixtures. Sometimes, finished goods and partly finished goods are also included within the scope of this term.

CONCEPT AND OBJECTIVES OF MATERIALS CONTROL

Materials cost constitutes a prime part of the total cost of production of manufacturing firms. Proper accounting, therefore, for and control over materials purchase, consumptions, and inventories are important for effective management of a business firm. Materials control basically aims at efficient purchasing of materials, their efficient storing and efficient use or consumption.

Materials control consists of controls at two levels: (i) quantity controls, and (ii) financial controls. For instance, the production department in a manufacturing company aims at quantity controls, i.e., lesser and lesser units should be used in the production department. Although lesser units would result in lower investments on purchase of materials, yet the user (production) department normally does not think in terms of expenditure. In contrast, the finance manager is interested in keeping the investments on materials at the

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lowest point. In materials control, balance has to be maintained between two opposing needs, that is, (i) maintenance of sufficient inventory for efficient production and (ii) maintenance of investment in inventory at the lowest level. In detail, the following are the objectives in a good system of materials control:

1. Materials of the desired quality will be available when needed for efficient and uninterrupted production.
2. Material will be purchased only when need exists and in economic quantities.
3. The investment in materials will be maintained at the lowest level consistent with operating requirements.
4. Purchase of materials will be made at the most favourable prices under the best possible terms.
5. Materials are protected against loss by fire, theft, handling with the help of proper physical controls.
6. Materials should be stored in such a way that they can provide minimum of handling time and cost.
7. Vouchers will be approved for payment only if the material has been received and is available for issue.
8. Issues of material are properly authorised and properly accounted for.
9. Materials are, at all times, charged as the responsibility of some individual.

PURCHASING AND RECEIVING PROCEDURE

Purchasing procedures vary with different business firms, but all of them follow a general pattern in the purchases and receipt of materials and payment of obligations. The important steps may be listed as follows:

1. Purchase requisition A form known as a purchase requisition is commonly used as a formal request to the purchasing department to order goods or services. The purchase requisition serves three general purposes:

(i) It automatically starts the purchasing process and informs the purchasing department of the need for the purchase of materials.
(ii) It fixes the responsibility of the department/personnel making the purchase requisition.
(iii) It can be used for future reference.

Usually, purchase requisitions are prepared by the storekeepers for regular store items which are below or approaching the minimum level of stock or to replace stock of materials and parts in stores. The production control department can also give requisitions for the purchase of specialised materials. A typical purchase requisition contains details, such as number, date, department, quantity, description, specification, signature of the person initiating the requisition, and signature of one or more officers approving the purchase (see Fig. 3.1). Copies of the purchase requisition are sent to the purchasing department and accounting department.

2. Purchase order After the requisition is received duly approved, the purchasing department places an order with a supplier, offering to buy certain materials at stated prices and terms. The purchase order is a formal contract for the supply of materials. The order should clearly state the materials required and the price; and provide information, such as delivery period and the department for whom the materials are purchased (Fig. 3.2). Copies of the purchase order are sent to the department concerned, the sender of the purchase requisition, and the stores department advising them to expect the materials as specified and where to send them upon receipt. Copies of the purchase requisition and the purchase order are sent to accounting department, to be used in checking the supplier's invoice when a voucher is being prepared for payment.

3. Receiving materials The receiving department performs the function of unloading and unpacking materials which are received by an organisation. This will need an inspection report which is sometimes incorporated in the receiving report, indicating the items accepted and rejected, with reason.

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ABC Company Limited
Purchase Requisition

Purchase Requisition No. _____
Purchase Order No. _____
Date _____

Department _____
Delivery Required _____

Item No.	*Quantity*	*Particulars of articles*	*Grade or quality*	*Remarks*

Requested by _____ Checked by _____ Approved by

Fig. 3.1 Purchase Requisition

ABC Company Limited Purchase Order

Date _____
Supplier _____
_____
_____

Purchase Order No. _____
Requisition No. _____
Department No. _____
Date Required _____

Please supply the following items on the terms and conditions mentioned herewith:

Item No.	*Quantity*	*Particulars about items*	*Rate per unit*	*Total cost*	*Remarks*

Purchase Manager

Terms and Conditions:
_____
_____
_____
_____
_____

Fig. 3.2 Purchase Order

Several copies of the receiving report or goods received note (Fig. 3.3) are prepared, one going to each department interested in the arrival of materials, including stores, buying and accounts departments.

ABC Company Limited
Materials Receiving Report

Purchase Order No. _____
Date _____

Received from _____
(Vendor's Name and Address)
_____
_____
_____
_____

Items No.	*Quantity received*	*Particulars*	*Weight, if any*	*Remarks*

Counted by _____ Approved by _____

Inspected by _____

Fig. 3.3 Materials Receiving Report

4. Approval of invoices Invoice approval indicates that goods according to the purchase order have been received and payment can now be made. However, if the goods or equipment received are not of the type ordered, or are not in accordance with specifications, or are damaged, the purchasing department issues a return order indicating that the goods are to be returned to the supplier.
5. Marking payment After the purchase invoice total is approved, the process of making payment begins. Payment depends on the terms agreed upon on any particular order, and any terms which differ from normal practice should be considered individually. When it is found that items written on the invoice qualify for payment, a remittance advice is prepared after providing for deduction on discounts, if any.

Creating a Purchase Department

It is useful to set up a separate purchase department to perform purchasing activities relating to purchase of materials and other stores. The organisation of the purchase department depends on the size of the organisation and the quantum of purchases it is likely to make. A purchase department generally performs the following functions:

(i) Purchasing materials and stores after receiving requisitions from the stores department for regular or routine items or from the departmental head, works manager or planning department for the purchase of special items, if any.
(ii) Purchasing materials of right quality.
(iii) Determining the quantity, quality, items, price, time to buy and the supplier from whom purchases are to be made.

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(iv) Possessing knowledge about possible sources of supply, prices of materials and supplies prevailing in the market, terms and conditions relating to purchases, market trends, usual lead time taken by the suppliers.
(v) Having expertise in drafting of purchase agreements and contracts.
(vi) Avoiding the purchase of obsolete, deteriorated and surplus materials.
(vii) Purchasing at the most favourable terms and conditions, at the lowest rates and from the best market and the most reliable suppliers.
(viii) Ensuring timely delivery of purchased items.
(ix) Comparing the invoice received from the suppliers with the purchase order to ensure that materials received are of right quality, in right quantity and at right prices.
(x) Knowing the defaulters suppliers.
(xi) Having information about consumption and usage pattern of materials of production and other departments and stock levels maintained by them and the stores department.
(xii) Preparing a latest list of approved suppliers along with brief particulars about their dealing terms.
(xiii) Possessing details about materials and stores received, on order, and outstanding.

Qualities of Purchase Manager

A purchase manager or a purchaser should possess the following qualities:

(i) Having information and knowledge about all aspects of materials to be purchased such as quantity, specifications, quality, price, purchasing procedures, etc.
(ii) Having knowledge about the sources of supply, market conditions, terms of delivery, qualities and dealings of different suppliers.
(iii) Knowing the policy of management, funds position, requirements of manufacturing units and stores departments.
(iv) Having good information base such as price lists, business journals and periodicals, catalogues, industrial directories to enable him to find the best market for the purchase of materials.
(v) Having knowledge about government policies, taxes on purchase of such materials, import and export restrictions thereon.
(vi) Having fair knowledge about the legal provisions and rules relating to making of agreement and contract.
(vii) Having expertise and skill to organise and manage his department efficiently and in coordination and cooperation with other departments of the organisation.

SOME ISSUES IN MATERIALS PROCUREMENT

It is generally accepted that quantities be bought in economic size so that there may not be over-stocking. If a company purchases in large quantities, the cost of carrying the inventory would be high because of the high investment involved. Working capital which could have been used for other productive purposes has to be diverted. Over-stocking requires more storage space which, in turn, means increase in insurance expenses, storage costs and deterioration in quality and depreciation in quantity. In contrast, if purchases are made in small quantities (under-stocking), frequent orders would have to be placed for the purchase of materials. There will be danger of "stock outs" also. Because of under-stocking, production is likely to suffer; materials have to be purchased immediately at high prices; low output would increase cost and decrease profit; the other department's work may be adversely affected.

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Economic Order Quantity (*EOQ*) (Reorder Quantity)

The *EOQ* is the optimum or the most favourable quantity which should be purchased each time the purchases are to be made. The *EOQ* is one where the costs of carrying inventory is equal or almost equal to the cost of not carrying inventory (cost of placing orders). Also at *EOQ* level, the total of these two costs is minimum.

The cost of carrying the inventory is the real out-of-pocket cost associated with having inventory on hand, such as warehouse charges, insurance, heat, light, and losses due to spoilage, breakage, pilferage. Another opportunity cost, which is not the out-of-pocket cost, is important and should be considered, that is, cost incurred (capital used) in purchasing the inventory. If funds have been borrowed to finance the inventory purchase, interest payments on borrowed funds will be the direct cost. Carrying or holding costs of inventory are explicit as well as implicit. That is, some costs are readily ascertained from accounting records while others require extensive study to estimate them because they are not expressly stated. Insurance on inventory is an explicit cost while the cost of funds invested in inventory are implicit costs. Generally, inventory carrying costs are considered to be proportional to the value of inventory carried.

The costs of not carrying adequate inventory arise because of frequent placing of order at short intervals. This includes costs, such as extra purchasing, handling and transportation costs, higher price due to small order quantities, frequent stock-outs resulting in disruption of production schedules, overtime and extra set up time, loss of sales and customer goodwill, etc.

The costs of carrying the inventory, and ordering costs change in the reverse order. The costs of placing the order decrease as the size of the order increase since with a bigger size of order, the number of the order will be lower. However, simultaneously the costs of carrying the inventory will go up because purchases have been made in large quantities. It may be possible to have a point which provides the lowest total cost and this point (ideal size) is known as the *EOQ*. This equilibrium can be determined mathematically as follows:

$$EOQ = \sqrt{\frac{2 \times U \times O}{IC}}$$

where U = Annual usage in units
O = Cost of placing an order
I = Per cent cost of carrying inventory
C = Cost per unit of material

Assume

Annual usage units	= 6,000
Cost of placing an order	= Rs. 30
Carrying cost as a per cent of inventory	= 20%
Cost per unit of material	= Rs. 5

Then,

$$EOQ = \sqrt{\frac{2 \times 6{,}000 \times 30}{5 \times 20\%}}$$

$$= \sqrt{3{,}60{,}000}$$

$$= 600 \text{ units}$$

In the above example, the *EOQ* is 600 units. That is, ten orders per year are needed. At the level of 600 units, the ordering costs and the carrying costs are equal and also the total cost is at minimum as it is clear from Table 3.1.

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Table 3.1 TABLE SHOWING ECONOMIC ORDER QUANTITY

Annual usage	*Orders per year*	*Units per order*	*Average inventory (units)*	*Value per order (Rs.)*	*Average inventory amount (Rs.)*	*Order cost (Rs.)*	*Carrying cost (20%)*	*Total cost (Rs.)*
6,000	1	6,000	3,000	30,000	15,000	30	3,000	3030
units	2	3,000	1,500	15,000	7,500	60	1,500	1560
	3	2,000	1,000	10,000	5,000	90	1,000	1090
	4	1,500	750	7,500	3,750	120	750	870
	5	1,200	600	6,000	3,000	150	600	750
	6	1,000	500	5,000	2,500	180	500	680
	7	857	429	4,285	2,142	210	428	638
	8	750	375	3,750	1,875	240	376	616
	9	667	334	3,335	1,668	270	334	604
	10	600	300	3,000	1,500	300	300	600
	11	545	273	2,725	1,363	330	272	602
	12	500	250	2,500	1,250	360	250	610

Table 3.1 shows that quantities of other orders resulting in more or less than ten orders per year are not so economical as they involve higher total costs.

The *EOQ* formula is sometimes expressed in the following manner which is not in any way different from the formula explained earlier.

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

where U = Annual demand or consumption or purchased quantity (in units)

P = Cost of placing an order

S = Annual cost of carrying inventory per unit (Storage and interest)

Similarly, *EOQ* formula may be expressed in any other manner with the same answer of economic order quantity.

The ordering costs, holding costs, total costs and *EOQ* can be shown graphically also as displayed in Fig. 3.4.

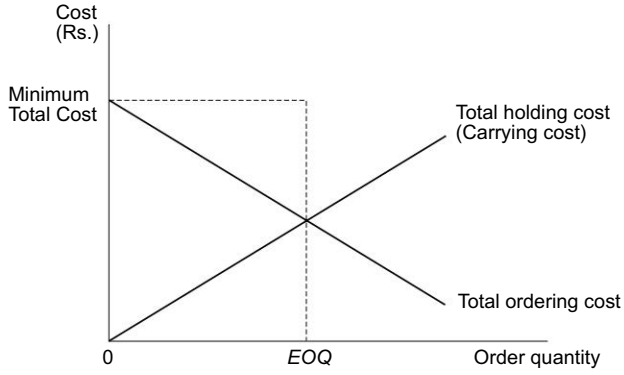


Fig. 3.4 Behaviour of Carrying Costs, Ordering Costs, Minimum Total Costs and Economic Order Quantity

When to Order (Reorder Level)

The *EOQ* determines how much to buy at a particular time. But the question "when to buy" is equally important for business firms. This question is easy to answer only if we know the lead time—the time interval between placing an order and receiving delivery—and know the *EOQ*, and are certain of the consumption pattern during lead time. The order point or re-order level is a point or quantity level at which if materials in stores reach, the order for supply of materials must be placed. This point automatically initiates a new order. The order point is calculated from three factors:

1. The expected usage.
2. The time interval between initiating an order and its receipt, referred to as the lead time.
3. The minimum inventory, or safety stock.

Some business firms fix re-order level taking into account maximum usage and maximum lead time so that the stock will not reach the zero level.

The formula for computing re-order level is:

(1) Re-order level = Safety stock + (Average usage × Average re-order period or lead time)

In terms of maximum usage and maximum lead time, the formula for re-order level is as follows:

(2) Re-order level = Maximum re-order period × Maximum usage

It is advisable to use the first formula given above to calculate re-order level. However, when adequate information is not given about the factors of this formula, the second formula can be used if information is available about the factors of this formula.

For example, if daily usage is 400 units of material which have a lead time of 20 days and the safety (minimum) stock is 500 units, the order point will be calculated as follows:

Daily consumption × lead time = 400 × 20	=	8,000 units
Add safety stock	=	500 units
Order point units		8,500 units

The order point is determined after considering the worst possible expected conditions. This only ensures that the minimum stock will always remain in the inventory and will not be used atleast in the short run. However, situations may arise where there will be stock-out and thus, the order point may not be an absolutely accurate forecasting.

Determination of Safety or Minimum Stock Level

It is advisable to carry a reserve or safety stock to prevent stock-out. The safety stock should be used only in abnormal circumstances, and the working stock in ideal or normal conditions. Therefore, for normal working conditions, the stock should not be allowed to fall below the safety limit, kept only for emergencies. If the usage pattern is known with certainty, and the lead time is also known accurately, then no safety stock would be needed. However, if either usage or lead time is subject to variation then it is necessary for a business firm to maintain safety stock levels equal to the difference between the expected usage over lead time and the maximum usage over lead time that the firm feels is necessary for cost minimisation. The safety stock level can be computed by using the following formula:

Safety or minimum stock level = Ordering level – (Average rate of consumption × Re-order period)

Maximum Stock Level

The maximum level ensures that the stocks will not exceed this limit although there may be low demand for materials or quick delivery from the suppliers. Maximum stock level can be computed as follows:

Maximum stock level = Re-order level + *EOQ* – (Minimum consumption × Minimum re-order period)

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Some factors to be considered in deciding the maximum stock level are as follows:

(i) Holding or carrying cost of inventory
(ii) Availability of storage facility
(iii) Seasonal nature of some products such as agricultural products
(iv) Availability of funds
(v) Future price trends of raw materials or components
(vi) Government policies or restrictions
(vii) Properties of some raw materials such as explosive, chemical, inflammable
(viii) Availability of raw materials in the international market.

Danger level

Generally the danger level of stock is indicated below the safety or minimum stock level. Sometimes, depending on the practices of the firm and circumstances prevailing, the danger level is determined between reorder level and minimum level. In the second case (danger level being between reorder level and minimum level), the firm can only take steps to ensure that materials ordered will arrive in time.

Average stock level

Average stock level is computed in the following manner:

$$= \frac{\text{Minimum} + \text{Maximum stock}}{2}$$

or

$$= \frac{\text{Minimum level} + \text{Re-order quantity}}{2}$$

The following example further illustrates the different stock levels.

Maximum usage (units)	650 per day
Minimum usage (units)	300 per day
Normal usage (units)	500 per day
Economic order quantity (units)	75000
Re-order period—lead time	25 to 30 days
Minimum level (units) (10 days at normal usage)	5000

The different stock levels will be as follows:

Re-order level = Normal usage × Normal lead time + Minimum level
= (500 × 30) + 5000
= 20000 units

Maximum level = Re-order level + *EOQ* – Minimum quantity used in re-order period
= 20,000 + 75000 – (300 × 25)
= 87500 units

$$\text{Average level} = \frac{\text{Maximum} + \text{Minimum}}{2}$$

$$= \frac{87500 + 5000}{2}$$

= 46250 units

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After placing an order, if usage goes above average or if the lead time is longer than expected, then the stock will fall below minimum. However, stock will not be exhausted, so long as the maximum usage and maximum re-order periods are not exceeded. In the above example, maximum usage during the lead time would cause an extra 4500 units (30 days × 150 units) to be consumed. Therefore, in this situation, the purchasing officer should try to chase supplies to ensure that delivery promises are kept.

The different stock levels, as found in the above example, are displayed in Fig. 3.5.

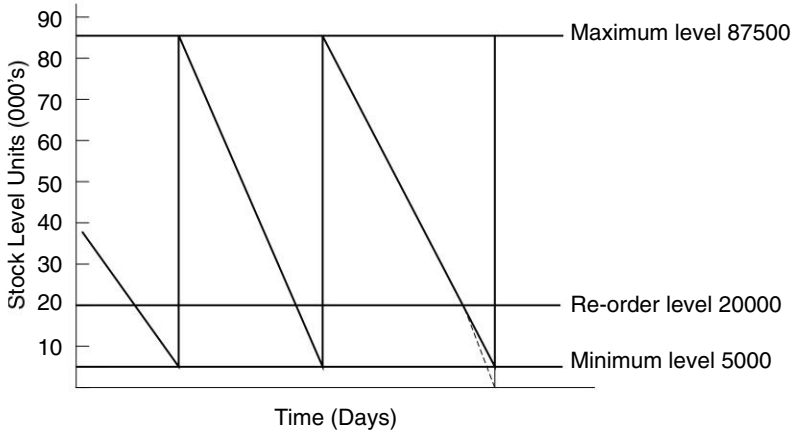


Fig. 3.5 Stock Levels

Example 3.1

Compute the economic batch quantity for a company using batch costing with the following information:

Annual demand for the component	400 units
Setting up and order processing cost	Rs. 50
Cost of manufacturing one unit	Rs. 100
Rate of interest p.a.	10%

(B.Com, Delhi, 2004)

Solution:

Economic order quantity or $(EOQ) = \sqrt{\frac{2 \times U \times O}{IC}}$

where, U = Annual usage (or consumption in units)
O = ordering cost per order
I = Per cent cost of carrying inventory
C = Annual storage cost per unit.

In the given question
U = 400 units
O = Rs. 50
IC = 100 × 10% = Rs. 10

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Hence

$$EOQ = \sqrt{\frac{2 \times 400 \times 50}{10}} = \sqrt{4000} = 63.25 \text{ units (app.)}$$

Example 3.2

P. Ltd., is engaged in the manufacture of industrial pumps of a standard description. The company uses about 75,000 valves per year for its production and the usage is fairly constant at 6,250 valves per month. The valves cost Rs. 1.50 per unit when brought in quantities and the carrying cost is estimated to be 20% of average inventory investment on the annual basis. The cost to place an order and process the delivery is Rs. 18. It takes 45 days to receive delivery from the date of an order and a safety stock of 3,200 valves is desired.

You are required to determine:

(i) the most economical order quantity; and
(ii) the reorder point.

(B.Com.(Hons), Delhi, 2002)

Solution:

$$EOQ = \sqrt{\frac{2CO}{1}}$$

EOQ = Economic Order Quantity

C = Annual requirement that is, 75,000 valves

O = Cost of placing an order that is, Rs. 18

I = Annual carrying cost of one unit that is, = Rs. $1.50 \times \frac{20}{100} = 0.30$

$$EOQ = \sqrt{\frac{2 \times 75{,}000 \times 18}{.30}}$$

$$= \sqrt{\frac{2 \times 75{,}000 \times 18 \times 100}{.30}} = \sqrt{90,00,000}$$

= 3,000 units.

Reorder point = Safety stock + Lead time consumption

$$= 3{,}200 + \frac{6{,}250 \times 45}{30 \text{ days}}$$

= 3,200 + 9,375 = 12,575 Units.

Example 3.3

A company manufactures a product having a monthly demand of 2000 units. For one unit of finished product 2 kg of a particular raw material item is needed. The purchase price of the materials is Rs. 20 per kg. The ordering cost is Rs. 120 per order and the holding cost is 10% per annum. Calculate:

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(i) Economic order quantity, and
(ii) Annual cost of purchasing and storage of the raw material at that quantity.

(B.Com.(Hons), Delhi, 2004)

Solution:

Monthly demand = 2000 units
Annual demand = 2000 × 12 = 24,000 units
Raw material required for one unit = 2 kg
Annual Requirement of material in units = 24,000 × 2 = 48,000 kg
Purchase price of material = Rs. 20 per kg
Annual requirement of material in Rs: 48,000 × 20 = Rs. 9,60,000
Ordering cost Rs. 120 per order
Holding/carrying cost is 10% per annum.

Formula $EOQ = \sqrt{\frac{2CO}{I}}$

where C = Annual requirement of material in units = 48,000 kg
O = Cost of placing an order that is Rs. 120
I = Holding/Carrying cost = 10%.
(10% of Material Price that is Rs. 20)

$$EOQ \text{ (in kg)} = \sqrt{\frac{2 \times 48{,}000 \times 120}{20 \times 10\%}}$$

$$= \sqrt{\frac{2 \times 48{,}000 \times 120}{2}}$$

$$= \sqrt{57,60,000} = 2400 \text{ kg}$$

or

$$EOQ \text{ (in Rs.)} = \sqrt{\frac{2 \times 960{,}000 \times 120}{\frac{10}{100}}}$$

$$= \sqrt{\frac{2 \times 960{,}000 \times 120 \times 100}{10}}$$

$$= \sqrt{2,30,40,00,000}$$

= Rs. 48,000

Calculation of Annual Cost of Purchasing and Storage

	Rs.
Purchase price of 48,000 kg @ Rs. Rs. 20 per kg	9,60,000
Add: Carrying cost: 24,00 kg. × Rs. 20 × 10%	4,800
Add: Order cost of 20 order @ Rs. 120 per order	

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No. of order $\frac{48,000 \text{ kg}}{2400 \text{ kg}} = 20$

	Rs.
	2,400
	9,67,200

Note: Lead time is not given in the question. Hence it is ignored.

Example 3.4

A producer has estimated annual purchase requirement of 30,000 units of a material. Unit price of material is Rs. 50. Annual cost of carrying inventory is 20%. Ordering cost for an order is Rs. 60. Find out Economic Order Quantity (*EOQ*). *(B.Com. (Hons), Delhi, 2004)*

Solution:

Formula for the calculation of economic ordering quantity is;

$$EOQ = \sqrt{\frac{2CO}{I}}$$

where C = Annual usage of material that is 30,000 units.

O = Cost of placing one order that is, Rs. 60

I = Annual carrying cost of one units, that is, Rs. $\frac{50 \times 20}{100}$ = Rs. 10

$$EOQ = \sqrt{\frac{2 \times 30,000 \times 60}{10}}$$

$\sqrt{3,60,000}$ = 600 units.

Example 3.5

Annual requirement of a particular item of inventory is 10,000 units. Inventory carrying cost per unit per year is 20% and ordering cost is Rs. 40 per order. The price quoted by the supplier is Rs. 4/unit. However, the supplier is ready to give a discount of 5% for orders of 1,500 units or more. Is it worthwhile to avail of the discount offer? *(B.Com. (Hons), Delhi 2006)*

Solution:

$$EOQ = \sqrt{\frac{2 \times U \times P}{S}}$$

where EOQ = Economic Order Quantity

U = Annual requirement, 10,000 units

P = Cost of placing an order, Rs. 40 per order

S = Annual carrying cost per unit, 20% of Rs. 4 = Re. 0.80

$$EOQ = \sqrt{\frac{2 \times 10,000 \times 40}{0.8}} = \sqrt{10,00,000} = 1000 \text{ units}$$

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Discount offer: When order size is 1500 units, the No. of order = 6. If a discount of 5% on the price of the component is available when order size is 1500 units or more, total cost shall be:

		Rs.
Ordering cost 6×40		240
Add: Storage cost $\left(\frac{1500}{2} \times 0.76\right)$		570
	Total cost	810
Saving on account of discount $\left(10,000 \times 4 \times \frac{5}{100}\right)$		2000
	Net saving	1,190

Since the net saving is Rs. 1,190 so this offer should be accepted for making an order of 1500 units and availing a discount of 5%.

Note: Annual carrying cost per unit after 5% discount will be Re. 0.80 – 5% of Re. 0.80 ie Re. 0.76.

Example 3.6

Calculate the maximum stock level from the following:

EOQ—300 units
Usage rate—25 to 75 units per week
Reorder period—4 to 6 weeks.

(B.Com. Delhi, 2002)

Solution:

Maximum Stock Level = Re-order Level + Re-order Quantity (EOQ) –(Minimum Rate of Consumption × Minimum Re-order period)
= 450 units* + 300 units – (25 units × 4 weeks) = **650 units**
* Re-order Level = Maximum usages per period × Maximum Re-order period = 75 units × 6 weeks = 450 units.

Note: The other formula of re-order level that is, Re-order level = Safety stock + (Average usage × Average re-order period) cannot be used in this question as information is not given about factors of the formula.

Example 3.7

From the following information relation to a type of raw material, calculate EOQ:

Monthly demand	200 units
Unit price	Rs. 5
Order cost per order	Rs. 12
Storage cost	2% p.a.
Interest rate	10% p.a.

(B.Com. Delhi, 2007)

Solution:

$$EOQ = \sqrt{\frac{2 \times U \times P}{S}}$$

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U = Annual Usage = 200 × 12 = 2400
P = Cost of Placing an order = Rs. 12
S = Cost of storing one unit for a year
= (10% + 2%) of Rs. 5
= 12% of Rs. 5 = 0.60

$$= \sqrt{\frac{2 \times 2400 \times 12}{0.60}}$$

$$= \sqrt{96,000} = 309.83 \text{ or } 310 \text{ unit (approx.)}$$

Example 3.8

If the minimum stock level and average stock level of raw-material *A* are 4,000 and 9,000 units respectively, find out its 'Re-order quantity'. *(CA Inter, May 1997)*

Solution:

Minimum Stock Level of Material *A*	=	4,000 units
Average Stock Level of Material *A*	=	9,000 units
Average Stock Level	=	Minimum Stock Level + 1/2 Re-order Quantity
or 1/2 Reorder Quantity	=	9,000 units – 4,000 units
	=	5,000 units
or Re-order quantity	=	10,000 units.

Example 3.9

From the details given below, calculate:

(i) Re-ordering Level
(ii) Maximum Level
(iii) Minimum Level
(iv) Danger Level

Cost of placing a purchase order is Rs. 20
Number of units to be purchased during the year is 5,000.
Purchase price per unit inclusive of transportation cost is Rs. 50.
Annual cost of storage per unit is Rs. 5

Details of lead time:	Average 10 days, Maximum 15 days, Minimum 6 days. For emergency purchases 4 days.
Rate of Consumption	Average : 15 units per day, Maximum : 20 units *(CA Inter, May 1996)*

Solution:

(i) Re-ordering Level (*ROL*)	= Maximum Usage per day × Maximum Re-order period
	= 20 units per day × 15 days
	= 300 units
(ii) Maximum Level (*WN* 1 and 2)	= *ROL* + *ROQ* – (Min. Rate of Consumption × Min. Re-order Period)
	= 300 units + 200 units – (10 units per day × 6 days)
	= 440 units.

(iii) Minimum Level = *ROL* – (Average rate of consumption × Average reorder period)
= 300 units – (15 units per day × 10 days)
= 150 units.

(iv) Danger Level = Average consumption × Lead time for emergency purchases
= 15 units per day × 4 days
= 60 units.

Working Notes:

1. $$ROQ = \sqrt{\frac{2U \times P}{S}} = \sqrt{\frac{2 \times 5000 \text{ units} \times \text{Rs. } 20}{\text{Rs. } 5}}$$

$$= 200 \text{ units}$$

where ROQ = Reorder Quantity
U = Annual Consumption
P = Cost per order
S = Storage Cost per unit

2. Average Rate of Consumption

$$= \frac{\text{Minimum Rate of Consumption } (x) + \text{Maximum Rate of Consumption}}{2}$$

$$15 \text{ units per day} = \frac{x + 20 \text{ units per day}}{2}$$

or x = 10 units per day.

Example 3.10

G. Ltd. produces a product which has a monthly demand of 4,000 units. The product requires a component *X* which is purchased at Rs. 20. For every finished product, one unit of component is required. The ordering cost is Rs. 120 per order and the holding cost is 10% p.a.
You are required to calculate:

(i) Economic order quantity.
(ii) If the minimum lot size to be supplied is 4,000 units, what is the extra cost, the company has to incur?
(iii) What is the minimum carrying cost, the company has to incur? *(CA Inter, May 1999)*

Solution:

(i) *Computation of Economic Ordering Quantity*

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

where U = Annual Consumption
P = Cost of Placing an Order
S = Storage Cost per unit per annum

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$$= \sqrt{\frac{2 \times 48,000 \text{ units} \times \text{Rs. } 120}{10\% \times \text{Rs. } 20}} = \sqrt{5,76,000}$$

= 24,00 units.

(ii) *Extra cost incurred by the company*

Total cost when order size is 4000 units

= Total Ordering Cost + Total Carrying Cost

= 12 orders × 120 + 4,000 × 1/2 × 20 × 10/100

= Rs. 1,440 + Rs. 4,000 = Rs. 5,440

Total cost when order size is 2400 units

Total Cost = 20 orders × Rs. 120 + 2,400 × 1/2 × 20 × 10/100

= Rs. 2,400 + Rs. 2,400 = Rs. 4,800

Extra Cost incurred by the company = Rs. 5,440 – Rs. 4,800 = Rs. 640

(iii) *Minimum Carrying Cost*

The carrying or storage cost depends upon the size of the order. It will be minimum when the order size is least.

In the question the two order sizes are 2,400 units and 4,000 units. Hence, 2,400 units is the least of the two order sizes. At this order size carrying cost will be minimum.

The minimum carrying cost in this case will be as under:

Minimum Carrying Cost = 1/2 × 2,400 units × 10/100 × Rs. 20 = Rs. 2,400

Example 3.11

M/s Tubes Ltd. are the manufacturers of picture tubes for T.V. The following are the details of their operation during 2007:

Average monthly market demand	2,000 tubes
Ordering cost	Rs. 100 per order
Inventory carrying cost	20% per annum
Cost of tubes	Rs. 500 per tube
Normal usage	100 tubes per week
Minimum usage	50 tubes per week
Maximum usage	200 tubes per week
Lead time to supply	6–8 weeks

Compute from the above:

1. Economic Order Quantity. If the supplier is willing to supply quarterly 1,500 units at a discount of 5%, is it worth accepting?
2. Maximum level of stock.
3. Minimum level of stock.
4. Reorder level. *(CA Inter, May 1998, May 2000)*

Solution:

1. $$EOQ = \sqrt{\frac{2UP}{S}}$$

where U = Annual usage of tubes

= Normal usage per week × 52 weeks

= 100 tubes × 52 weeks = 5,200 tubes

P = Ordering cost per order = Rs. 100 per order

S = Inventory carrying cost per unit per annum

= 20% × Rs. 500 = Rs. 100 per unit per annum

$$EOQ = \sqrt{\frac{2 \times 5{,}200 \text{ units} \times \text{Rs.}100}{\text{Rs.}100}} = 102 \text{ tubes (approx.)}$$

Evaluation of offer. If the supplier is willing to supply 1,500 units at a discount of 5%:

(i) Total Cost (when order size is 1500 units):

= Cost of 5,200 Units + Ordering Cost + Carrying Cost

$$= 5{,}200 \text{ units} \times \text{Rs. } 475 + \frac{5{,}200 \text{ units}}{1{,}500 \text{ units}} \times \text{Rs. } 100 + \frac{1}{2} \times 1{,}500 \text{ units} \times 20\% \times \text{Rs. } 475$$

= Rs. 24,70,000 + Rs. 346.67 + Rs. 71,250

= Rs. 25,41,596.67

(ii) Total Cost (when order size is 102 units):

$$= 5{,}200 \text{ units} \times \text{Rs. } 500 + \frac{5{,}200 \text{ units}}{102 \text{ units}} \times \text{Rs. } 100 + \frac{1}{2} \times 102 \text{ units} \times 20\% \times \text{Rs. } 500$$

= Rs. 26,00,000 + Rs. 5,098.03 + Rs. 5,100

= Rs. 26,10,198.03

The above calculation shows the total cost under quarterly supply of 1,500 units with 5% discount is lower than that when order size is 102 units. Therefore, the offer should be accepted. However, while accepting this offer consideration of capital blocked on order size of 1,500 units per quarter has been ignored.

2. *Maximum Level of Stock*

= Re-order level + Re-order quantity – (Min. usage × Min. Re-order period)

= 1,600 units + 102 units – 50 units × 6 weeks

= 1,402 units.

3. *Minimum Level of Stock*

= Re-order level – (Normal usage × Average Re-order period)

= 1,600 units – 100 units × 7 weeks = 900 units.

4. *Reorder Level*

= Maximum Consumption × Maximum Re-order Period

= 200 units × 8 weeks

= 1,600 units.

Example 3.12

Shagoon India Ltd. provides the following information in respect of material *X*

Supply period	:	5 to 15 days
Rate of Consumption	:	
Average	:	15 units per day
Maximum	:	20 units per day
Yearly	:	5,000 units

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Ordering costs are Rs. 20 per order.
Purchase price per unit is Rs. 50.
Storage costs are 10% of unit value.

Compute:

(i) Reorder Level
(ii) Minimum Level
(iii) Maximum Level *(B. Com. (Hons), Delhi 1998)*

Solution:

(i) Re-ordering Level = Maximum Usage per period × Maximum Re-order per period
= 20 units per day × 15 days
= 300 units

(ii) Maximum Level = *ROL* + *ROQ* – (Min. Rate of Consumption × Min. Re-order Period)
= 300 units + 200 units – (10 units per day × 5 days)
= 450 units

(iii) Minimum Level = *ROL* – (Average Rate of Consumption × Average Re-order Period)
= 300 units – (15 units per day × 10 days)
= 150 units

Working Notes:

1. $$ROQ = \sqrt{\frac{2U \times P}{S}} = \sqrt{\frac{2 \times 5000 \text{ units} \times \text{Rs. } 20}{\text{Rs. } 5}} = 200 \text{ units}$$

where ROQ = Reorder Quantity
U = Annual Consumption
P = Cost per order
S = Storage cost per unit

2. Average Rate of Consumption

$$= \frac{\text{Minimum Rate of Consumption } (x) + \text{Maximum Rate of Consumption}}{2}$$

$$15 \text{ units per day} = \frac{x + 20 \text{ units per day}}{2}$$

or x = 10 units per day.

Example 3.13

From the following data, calculate the economic order quantity and the re-order point for Part *Z*:

Working days in a year	200
Safety stock	400 units
Lead time	10 days
Order costs	Rs. 300 per order
Holding cost	15% of cost
Annual consumption	10,000 units
Cost per unit	Rs. 10

Solution:

$$EOQ = \sqrt{\frac{2U \times P}{S}}$$

$$\sqrt{\frac{2 \times 10,000 \times \text{Rs } 300}{15\% \times 10}} = \sqrt{\frac{6,000,000}{1.5}} = \sqrt{4000000} = 2000 \text{ units}$$

Trial and error calculation to arrive at the above answer:

Times ordered	4	5	6
Order size (units)	2,500	2,000	1,666
Average stock (units)	1,250	1,000	833
Holding costs (Rs.)	1,875	1,500	1,250
Order costs (Rs.)	1,200	1,500	1,800
Holding cost has been calculated as follows:	Rs. 3,075	Rs. 3,000	Rs. 3050

Average stock units × Cost per unit × 15%

Economic order quantity : 2,000 units, order 5 times per annum.

Re-order point:

Daily consumption × lead time (10,000 ÷ 200) × 10 =	500
Add safety stock	400
Re-order point	900 units

Holding cost has been calculated as follows :

Average stock units × cost per unit × 15%

Example 3.14

Eats Ltd. supplies a number of products to bakers and confectioners. One of their products consists of packets of cake decorations. The cake decorations are sold in packets of twelve decorations for Rs. 20 per packet. The demand for the cake decorations is very constant and has over a long period of time been at the rate of 2,000 packets per month. The packets cost Eats Ltd. Rs. 10 each from the manufacturer and a lead time of four days is required from date of order to date of delivery. Ordering costs are Rs. 1.20 per order and the holding or carrying cost is 10 per cent per annum.

(a) Calculate the following:
  (i) the economic order quantity:
  (ii) the number of orders to be placed per annum:
  (iii) the total cost of buying and carrying cake decorations per annum.

(b) Assume that the present stock level is 200 packets and that no buffer stocks are kept. When must the next order be given to the supplier? (For purposes of your calculation one year consists of 360 days).

(c) There are certain major difficulties often experienced by firms in seeking to use the *EOQ* Formula. List them briefly.

Solution:

(a) (i) $EOQ = \sqrt{\frac{2U \times P}{S}}$

$$\sqrt{\frac{2 \times 24,000 \times 1.20}{0.10 \times 10}} = \sqrt{\frac{57,600}{1}} = 240 \text{ units}$$

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(ii) Number of orders to be placed per annum

$$\frac{\text{Annual usage}}{EOQ} = \frac{24,000}{240} = 100 \text{ orders}$$

(iii)	Cost of buying 100 orders × Rs. 1.20	Rs. 120
	Cost of holding = average stock × holding cost per unit = 120 units × Re. 1	Rs. 120
	Total cost of buying and holding cake decorations per annum	Rs. 240

(b) $\frac{200}{2,000} = \frac{1}{10}$ th of a month or 3 days supply.

With a lead time of four days the order must be placed tomorrow without fail.

(c) Difficulties often experienced by firms in seeking to use the *EOQ* formula are difficulty of estimating, with accuracy, such items as the annual demand for stock items, the cost of ordering and the cost of carrying. Also the *EOQ* formula makes the assumption that stock is used at a constant rate throughout the year. This may not be so.

Example 3.15

The Purchase Department of your organisation has received an offer of quantity discounts on its orders of materials as under:

Price per tonne Rs.	*Tonnes*
1,200	Less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above.

The annual requirement for the material is 5,000 tonnes. The ordering cost per order is Rs. 1,200 and the carrying cost is estimated at 20% per annum.

You are required to compute the most economic order quantity presenting the information in a tabular form. *(B. Com. (Hons), Delhi 2001)*

Solution:

Ordering quantity (Tonnes) EOQ	*Price per tonne (Rs.)*	*Purchasing cost of 5,000 tonnes (Rs.)* $5,000 \times$ *Per order delivery cost*	*Ordering cost (Rs.)* $\frac{5,000 \times 1,200}{\text{Ordering quantity}}$	*Inventory carrying (Rs.)* $\frac{EOQ}{2} \times$ *price per tonne* $\times 20\%$	*Total cost (Rs.)*
400	1,200	60,00,000	15,000	48,000	60,63,000
500	1,180	59,00,000	12,000	59,000	59,71,000
1,000	1,160	58,00,000	6,000	1,16,000	59,22,000
2,000	1,140	57,00,000	3,000	2,28,000	59,31,000
3,000	1,120	56,00,000	2,000	3,36,000	59,38,000

The table shows that most economical purchase level is at a level where the ordering quantity is 1,000 tonnes, since at this level the total cost (that is inventory carrying cost and ordering cost) is the minimum.

Example 3.16

Shriram Enterprises manufactures a special product *ZED*. The following particulars were collected for the year 2002:

(a) Monthly demand of *ZED* 1,000 units.
(b) Cost of placing an order Rs. 100.
(c) Annual carrying cost per unit Rs. 15.
(d) Normal usage 50 units per week.
(e) Minimum usage 25 units per week.
(f) Maximum usage 75 units per week.
(g) Re-order period 4 to 6 weeks.

Compute from the above

1. Re-order quantity
2. Re-order level
3. Minimum level
4. Maximum level
5. Average stock level

Solution:

1. Re-order quantity (of units used)

$$= \sqrt{\frac{2U \times P}{S}}$$

where U = Annual demand of input units
P = Cost of placing an order
S = Annual carrying cost per unit

$$= \sqrt{\frac{2 \times 2,600 \times \text{Rs. } 100}{\text{Rs. } 15}} = \sqrt{34667}$$

= 186 units (approx.)

2. Re-order level = Maximum re-order period × Maximum usage
= 6 weeks × 75 units
= 450

3. Minimum level = Re-order level – (Normal usage × Average re-order period)
= 450 units – (50 units × 5 weeks)
= 450 units – 250 units = 200 units

4. Maximum level = Re-order level + Re-order quantity – (Minimum usage × Minimum order period)
= 450 units + 186 units – (25 units × 4 weeks)
= 536 units.

5. Average stock level = 1/2 (Minimum stock level + Maximum stock level)
= 1/2 (200 units + 536 units)
= 368 units

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Working Notes:

U = Annual demand of input units for 12,000 units of *ZED*.
= 52 weeks × Normal usage of input units per week.
= 52 weeks × 50 units of input per week
= 2,600 units

Example 3.17

A company uses three raw materials *A*, *B* and *C* for a particular product for which the following data apply:

Raw material	*Usage per unit of product kg*	*Re-order quantity (kg)*	*Price per kg*	*Delivery (in weeks) Min.*	*Av.*	*Max.*	*Re-order level (kg)*	*Minimum level (kg)*
A	10	10,000	0.10	1	2	3	8,000	
B	4	5,000	0.30	3	4	5	4,750	
C	6	10,000	0.15	2	3	4		2,000

Weekly production varies from 175 to 225 units, averaging 200 units of the said product. What would be the following quantities:

(i) Minimum stock of *A*?
(ii) Maximum stock of *B*?
(iii) Re-order level of *C*?
(iv) Average stock level of *A*?

Solution:

(i) *Minimum stock of A*
Re-order level – (Average rate of consumption × Average time required to obtain fresh delivery)
= 8,000 – (2,000 × 2) = 4,000 kg

(ii) *Maximum stock of B*
Re-order level – (Minimum consumption × Minimum re-order period + Re-order quantity)
= 4,750 – (4 × 175 × 3) + 5,000
= 9,750 – 2,100 = 7,650 kg

(iii) *Re-order level of C*
Maximum re-order period × Maximum usage = 4 × 1,350 = 5,400 kg

or

Re-order level of *C* = Minimum stock of *C* + (Average rate of consumption × Average time required to obtain fresh delivery)
= 2,000 + [200 × 6 × 3] kg = 5,600 kg

(iv) *Average stock level of A*

$$= \frac{\text{Minimum stock} + \text{Maximum stock}}{2} = \frac{4,000 + 16,250}{2}$$

= 10,125 kg

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Working Note:

Maximum stock of A = $ROL + ROQ$ – (Min. consumption × Min. re-order period)
= 8000 kg + 10000 – [(175 × 10) × 1]
= 16250 kg

Example 3.18

A Ltd. is committed to supply 24,000 bearings per annum to *B* Ltd. on a steady basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is Rs. 324.

(i) What should be the optimum run size for bearing manufacture?
(ii) What would be the interval between two consecutive optimum runs?
(iii) Find out the minimum inventory cost per annum. *(CA Inter, Nov. 2000)*

Solution:

(i) *Optimum run size for bearing manufacture*

$$= \sqrt{\frac{2 \times \text{Annual supply of bearings} \times \text{Set-up cost per production run}}{\text{Annual holding cost per bearing}}}$$

$$= \sqrt{\frac{2 \times 24,000 \text{ bearings} \times \text{Rs. } 324}{12 \text{ months} \times 0.10\text{P.}}} = \sqrt{12960000}$$

= 3600 bearings

(ii) *Interval between two consecutive optimum runs*

$$= \frac{12 \text{ months}}{\text{Number of production runs per annum}} = \frac{12 \text{ months}}{\left(\frac{\text{Annual production}}{\text{Optimum run size}}\right)}$$

$$= \frac{12 \text{ months}}{\left(\frac{24,000 \text{ bearings}}{3,600 \text{ bearings}}\right)} = \frac{12 \text{ months}}{6.66}$$

= 1.8 months or 55 days approximately

(iii) *Minimum inventory cost per annum*

= Total production run cost + Total carrying cost per annum

$$= \frac{24,000 \text{ bearings}}{3,600 \text{ bearings}} \times \text{Rs. } 324 + (1/2)\ 3,600 \text{ bearings} \times 0.10 \text{ P} \times 12 \text{ months}$$

= Rs. 2,160 + Rs. 2,160
= Rs. 4,320

Example 3.19

A manufacturer requires 9,600 units of a certain component annually. This is currently purchased from a regular supplier at Rs. 50 per unit. The cost of placing an order is Rs. 60 per order and the annual carrying cost is Rs. 5 per piece. What is the economic order quantity (EOQ) for placing order?

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Recently the supplier has expressed his willingness to reduce the price to Rs. 48, if the total requirements are obtained from him in two equal orders and to Rs. 47, if the entire quantity required is purchased in one lot. Analyse the cost of the three options and recommend the best course.

What other factors should also be considered before the decision is taken?

(I.C.W.A., Inter Stage 1, Dec. 2003)

Solution:

Economic Order Quantity (*EOQ*)

$$= \sqrt{\frac{2 \times \text{Annual Consumption} \times \text{Cost of placing an order}}{\text{Cost of carrying one unit inventory for one year}}}$$

$$= \sqrt{\frac{2 \times 9600 \times 60}{5}} = \sqrt{230400} = 480 \text{ units}$$

Analysis of Costs of three options

No. of order (options)	20	2	1
Size of order (units)	480	4800	9600
Price per unit of components (Rs.)	50	48	47
Average stock (units)	240	2400	4800
Total ordering Cost (Rs.) @ Rs. 60	1200	120	60
Total carrying cost (Rs.) @ Rs. 5	1200	12000	24000
Total cost of components (Rs.)	480000	460800	451200
Grand total cost (annual)	482400	472920	475260

Recommendation: From the above analysis it reveals that the most economical order quantity is 4800 units of components. Therefore placing 2 orders is marginally best.
Other factors to be considered are as follows:

- availability of sufficient storage space
- possible deterioration in quality due to long storage
- opportunity cost of funds required for investment in the inventory.

Total cost of components = No. of orders × Size of order (units) × Price per unit of component (Rs.)

Example 3.20

RST Limited has received an offer of quantity discount on its order of materials as under:

Price per tonne	*Tonnes number*
Rs. 9,600	Less than 50
Rs. 9,360	50 and less than 100
Rs. 9,120	100 and less than 200
Rs. 8,880	200 and less than 300
Rs. 8,640	300 and above

The annual requirement for the material is 500 tonnes. The ordering cost per order is Rs. 12,500 and the stock holding cost is estimated at 25% of the material cost per annum.

Required:

(i) Compute the most economical purchase level.
(ii) Computer EOQ if there are no quantity discounts and the price per tonne is Rs. 10,500.

(CA, PE, Exam II, Group II, Nov. 2004)

Solution:

(i)

Order size (Q units)	*No. of orders*	*Cost of purchase (AQ × per unit cost)*	*Ordering cost No. of orders × Rs. 12500*	*Carrying cost 2 × C × 25%*	*Total cost (3+4+5)*
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
40	12.5	48,00,000	1,56,250	48,000	50,04,250
		(500 × 9600)		$\left(\frac{40}{2} \times 9600 \times 0.25\right)$	
50	10	46,80,000	1,25,000	58,500	48,63,500
		(500 × 9360)		$\left(\frac{50}{2} \times 9360 \times 0.25\right)$	
100	5	45,60,000	62,500	1,14,000	47,36,500
		(500 × 9120)		$\left(\frac{100}{2} \times 9120 \times 0.25\right)$	
200	2.5	44,40,000	31,250	2,22,000	46,93,250
		(500 × 8880)	(2.5 ×12500)	$\left(\frac{200}{2} \times 8880 \times 0.25\right)$	
300	1.67	43,20,000	20,875	3,24,000	46,64,875
		(500 × 8640)	(1.67 × 12500)	$\left(\frac{300}{2} \times 8640 \times 0.25\right)$	

The above table shows that the total cost of 500 units including ordering and carrying cost is minimum (Rs. 46,64,875) where the order size is 300 units. Hence the most economical purchase level is 300 units.

(ii) $EOQ = \sqrt{\frac{2AO}{c \times i}} = \sqrt{\frac{2 \times 500 \times 12500}{10500 \times 25\%}}$ = 69 tonnes.

Example 3.21

IPL Limited uses a small casting in one of its finished products. The castings are purchased from a foundry. IPL Limited purchases 54,000 castings per year at a cost of Rs. 800 per casting.

The castings are used evenly throughout the year in the production process on a 360-day-per-year basis. The company estimates that it costs Rs. 9,000 to place a single purchase order and about Rs. 300 to carry one casting in inventory for a year. The high carrying costs result from the need to keep the castings in carefully controlled temperature and humidity conditions, and from the high cost of insurance.

Delivery from the foundry generally takes 6 days, but it can take as much as 10 days. The days of delivery time and percentage of their occurrence are shown in the following tabulation:

Delivery time (days)	:	6	7	8	9	10
Percentage of occurrence	:	75	10	5	5	5

Required:

(i) Compute the economic order quantity (*EOQ*).

(ii) Assume the company is willing to assume a 15% risk of being out of stock. What would be the safety stock? The re-order point?

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(iii) Assume the company is willing to assume a 5% risk of being out of stock. What would be the safety stock? The re-order point?

(iv) Assume 5% stock-out risk. What would be the total cost of ordering and carrying inventory for one year?

(v) Refer to the original data. Assume that using process re-engineering the company reduces its cost of placing a purchase order to only Rs. 600. In addition company estimates that when the waste and inefficiency caused by inventories are considered, the true cost of carrying a unit in stock is Rs. 720 per year.

(a) Compute the new *EOQ*.

(b) How frequently would the company be placing an order, as compared to the old purchasing policy?

(CA, PE, Exam II, Group II, May 2004)

Solution:

(i) *Computation of economic order quantity (EOQ)*

(A) Annual requirement = 54,000 castings

(B) Cost per casting = Rs. 800

(O) Ordering cost = Rs. 9,000/order

($c \times i$) Carrying cost per casting p.a = Rs. 300

$$EOQ = \sqrt{\frac{2AO}{c \times i}} = \sqrt{\frac{2 \times 54000 \times 9000}{300}} = 1800 \text{ casting}$$

(ii) *Safety stock*

(Assuming a 15% risk of being out of stock)

Safety stock for one day = 54,000/360 days = 150 castings

Re-order point = Minimum stock level + Average lead time × Average consumption

= 150 + 6 × 150 = 1,050 castings.

(iii) *Safety stock*

(Assuming a 5% risk of being out of stock)

Safety stock for three days = 150 × 3 days = 450 castings

Re-order point = 450 casting + 900 castings = 1,350 castings

(iv) Total cost of ordering = (54,000/1,800) × Rs. 9,000 = Rs. 2,27,000

Total cost of carrying = (450 + 1/2 × 1,800) Rs. 300 = Rs. 4,05,000

(v) (a) Computation of new *EOQ:*

$$EOQ = \sqrt{\frac{2 \times 54,000 \times 600}{720}} = 300 \text{ castings}$$

(b) Total number of orders to be placed in a year are 180. Each other is to be placed after 2 days (1 year = 360 days). Under old purchasing policy each order is placed after 12 days.

Example 3.22

The Complete Gardener is deciding on the economic order quantity for two brands of lawn fertilizer: Super Grow and Nature's Own. The following information is collected.

	Fertilizer	
	Super Grow	Nature's Own
Annual Demand	2,000 Bags	1,280 Bags
Relevant ordering cost per purchase order	Rs. 1,200	Rs. 1,400
Annual relevant carrying cost per bag	Rs. 480	Rs. 650

Required:

(i) Computer *EOQ* for Super Grow and Nature's Own.

(ii) For the *EOQ*, what is the sum of the total annual relevant ordering costs and total annual relevant costs for Super Grow and Nature's Own?

(iii) For the *EOQ*, compute the number of deliveries per year for Super Grow and Nature's Own.

(CA, PE, Exam II, Group II, Nov. 1999)

Solution:

(i) $EOQ = \sqrt{\frac{2SC_0^*}{iC_1}}$

*Here S = Annual demand of fertilizer bags.

C_1 = Cost per bag.

C = Relevant ordering cost per purchase order

iC_1 = Annual relevant carrying cost per bag

EOQ for Super Grow Fertilizer

$$\sqrt{\frac{2 \times 2,000 \text{ bags} \times \text{Rs. } 1,200}{\text{Rs. } 480}} = 100 \text{ bags.}$$

EOQ for Nature's Own Fertilizer

$$\sqrt{\frac{2 \times 12,80 \text{ bags} \times \text{Rs. } 1,400}{\text{Rs. } 560}} = 80 \text{ bags.}$$

(ii) *Total annual relevant costs for Super Grow Fertilizer*

= Total annual relevant ordering costs + Total annual relevant carrying costs

$$= \frac{S}{EOQ} C_0 + \frac{1}{2} EOQ \times iC_1$$

$$= \frac{2,000 \text{ bags}}{100 \text{ bags}} \text{ Rs. } 1,200 + \frac{1}{2} 100 \text{ bags} \times \text{Rs. } 480$$

= Rs. 24,000 + Rs. 24,000 = Rs. 48,000

Total annual relevant costs for Nature's Own Fertilizer

$$= \frac{1,280 \text{ bags}}{80 \text{ bags}} \times \text{Rs. } 1,400 + \frac{1}{2} 80 \text{ bags} \times \text{Rs. } 560$$

= Rs. 22,400 + Rs. 22,400 = Rs. 44,800

(iii) *Number of deliveries for Super Grow Fertilizer per year.*

$$= \frac{S}{EOQ} \text{ (annual demand of fertilizer bags)}$$

$$= \frac{2,000 \text{ bags}}{100 \text{ bags}} = 20 \text{ orders}$$

Numbers of deliveries for Nature's Own fertilizers per year.

$$= \frac{1,280 \text{ bags}}{80 \text{ bags}} = 16 \text{ orders}$$

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Example 3.23

A company manufactures 5,000 units of a product per month. The cost of placing an order is Rs. 100. The purchase price of the raw material is Rs. 10 per kg. The reorder period is 4 to 8 weeks. The consumption of raw materials varies from 100 kg to 450 kg per week; the average consumption being 275 kg. The carrying cost of inventory is 20% per annum. You are required to calculate reorder quantity, maximum level, minimum level and average level.

[B.Com. (Hons), Delhi, 2006, CA, PE Exam. II, Nov. 2002]

Solution:

$$\text{Re-order Quantity} = \sqrt{\frac{2 \times U \times P}{S}}$$

where U = Annual usage

P = Cost of placing an order

S = Cost of storage one unit per annum

$U = 5{,}000 \times 12 = 60{,}000$; $P = 100$; $S = 20\%$ of $10 = 2$

$$\therefore \quad \text{Re-order Quantity} = \sqrt{\frac{2 \times 60{,}000 \times 100}{2}}$$

$$= 2449.48 \text{ or } 2450 \text{ (approx)}$$

Re-order level: Maximum usage × Maximum Re-order period

$$= 450 \times 8 = 3600$$

Maximum level = Re-order level + Re-order quantity – (Minimum usage × Mimimum Re-order period)

$$= 3600 + 2450 - (100 \times 4) = 5650$$

Minimum level = Re order level – (Average usage × Average Re-order Period)

$$= 3600 - (275 \times 6) = 1950$$

$$\text{Average level} = \frac{\text{Maximum level} + \text{Minimum level}}{2}$$

$$= \frac{5650 + 1950}{2} = 3800$$

or

Average level = Minimum level + 1/2 Re-order quantity

$$= 1950 + 1/2 \times 2450 = 3175$$

Example 3.24

For the manufacture of a certain product two components A and B are used. The following particulars about these components are available:

	A	*B*
Normal usage (per week)	60 nos.	60 nos.
Maximum usage (per week)	80 nos.	80 nos.
Minimum usage (per week)	30 nos.	30 nos.
Reorder quantity	400 nos.	600 nos.
Reorder period	4 to 6 weeks	2 to 4 weeks

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You are required to calculate for each component:

(i) Reordering level;
(ii) Minimum level;
(iii) Maximum level;
(iv) Average stock level.

(I.C.W.A, Inter, Stage 1, June 2004)

Solution:

(i) *Reordering level*
(Maximum usage × Maximum Reorder period)

$A = 80 \times 6 = 480$

$B = 80 \times 4 = 320$

(ii) *Minimum level*
Re-order level-(Normal usage × Normal re-order period)

$A = 480 - (60 \times 5) = 180$

$B = 320 - (60 \times 3) = 140$

(iii) *Maximum level*

(Re-order level + Re-order qty.) – (Min. usage × Min. re-order period)

$A = 480 + 400 - 30 \times 4 = 760$

$B = 320 + 600 - 30 \times 2 = 860$

(iv) *Average Stock Level*

(Minimum level + Maximum level)/2

$A = (180 + 760)/2 = 470$

$B = (140 + 860)/2 = 500$

Alternative:

Average stock level:
Minimum level + (Re-order quantity)/2

$A = 180 + (400/2) = 380$ units.

$B = 140 + (600/2) = 440$ units.

Example 3.25

The quartely production of a company's product which has a steady market is 20,000 units. Each unit of a product requires 0.5 kg of raw material. The cost of placing one order for raw material is Rs. 100 and the inventory carrying cost is Rs. 2 per annum. The lead time for procurement of raw material is 36 days and a safety stock of 1,000 kg of raw materials is maintained by the company. The company has been able to negotiate the following discount structure with the raw material supplier.

Order quantity kg.	*Discount* Rs.
Upto 6,000	Nil
6,000 – 8,000	400

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8,000 – 16,000	2,000
16,000 – 30,000	3,200
30,000 – 45,000	4,000

You are required to

(i) Calculate the re-order point taking 30 days in a month.

(ii) Prepare a statement showing the total cost of procurement and storage of raw material after considering the discount of the company elects to place one, two, four or six orders in the year.

(iii) State the number of orders which the company should place to minimize the costs after taking *EOQ* also into consideration.

(CA, PE, Exam II, Group II, May 2002)

Solution:

1. Annul production (units) 80,000
   (20,000 units per quarter × 4 quarters)
2. Raw material required for 80,000 units in kg 40,000
   (80,000 units × 0.5 kg)
3. $EOQ = \sqrt{\frac{2 \times 40,000 \text{ kg} \times \text{Rs. } 100}{\text{Rs. } 2}} = 2,000 \text{ kg}$
4. Total cost of procurement and storage when the order size is equal to *EOQ* or 2,000 kg

No. of orders (40,000 kg/2,000 kg)	20
Ordering cost (Rs.) (20 orders × Rs. 100)	2,000
Carrying cost (Rs.) (1/2 × 2,000 kg × Rs. 2)	2,000
Total cost	4,000

(i) *Re-order point* = Lead time consumption + Safety stock
= 4,000 kg + 1,000 kg = 5,000 kg
(40,000 kg/360 days) × 36 days.

(ii) **Statement showing the total cost of procurement and storage of raw materials**
(after considering the discount)

Order size	*No. of orders*	*Total cost of procurement*	*Average stock*	*Total cost of storage of raw materials*	*Discount*	*Total cost*
kg		Rs.	kg	Rs.	Rs.	Rs.
(1)	(2)	(3) = (2) × Rs. 100	(4) = 1/2 (1)	(5) = (4) × Rs. 2	(6)	(7) = [(3) + (5) – (6)
40,000	1	100	20,000	40,000	4,000	36,100
20,000	2	200	10,000	20,000	3,200	17,000
10,000	4	400	5,000	10,000	2,000	8,400
6666.66	6	600	3,333	6,666	400	6,866

(iii) Number of orders which the company should place to minimize the costs after taking *EOQ* also into consideration is 20 orders, each of size 2,000 kg. The total cost of procurement and storage in this case comes to Rs. 4,000, which is minimum.

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STORES ORGANISATION

Efficient storing—after efficient purchasing—is another important step in materials control system.

The storekeeper and persons working in stores are primarily responsible for safeguarding the materials and keeping materials and supplies in proper places until required in production. It is difficult to list out all the functions performed by stores in different organisations. But usually they perform the following functions:

1. Acting as a buffer or protection against the consequences of non-availability.
2. Acting as a link between bulk purchases and the breaking down into units of need.
3. Providing security.
4. Avoiding damage and deterioration.
5. Establishing a proper system for ensuring control over usage, through a discipline of authority for withdrawals, formalised rationing of materials issued, recording of data for control, etc.
6. Marshalling during the course of manufacture.
7. Performing checking function on work done.
8. Serving as a means of reducing cost in movement of materials through systematic location, economy of handling, etc.
9. Forming a basis for good housekeeping, discipline and control.
   Storage brings a sense of tidiness and good arrangements and help to emphasise the importance of responsibility and accountability.

Storage Layout

Storage layout, i.e. careful design and arrangement of storerooms is desirable for savings in cost. Materials can be stored according to: (i) account number specially given for different types of materials; (ii) the frequency of use of the item; (iii) the production area where the item is used; or (iv) the nature, size and shape of the item. Practically, no single one of these factors could be the sole basis for deciding the storing arrangement, but shape and size of the materials significantly influence storeroom arrangement.

The basic accounting records of any inventory system are the documents required to authorise and record materials movement into or out of the stores. These are the goods received note, materials requisition and materials return note. Stores ledger cards—stock ledger cards or materials ledger cards—may show quantities on order, expected delivery dates and quantities reserved or required for work due to be processed (Fig. 3.6).

ABC Company Limited
Stores Ledger Card

Description _____ Code _____
Unit _____ Location _____
Maximum _____ Minimum _____
Re-order level _____ Re-order Quantity _____

Receipt			*Issues*			*Phsical Balance*	*Reserved*			*Ordered*			*Free Balance*
Date	*Ref.*	*Qty.*	*Date*	*Ref.*	*Qty.*		*Date*	*Ref.*	*Cum Qty.*	*Date*	*Ref.*	*Cum Qty.*	

Fig. 3.6 Stores Ledger Card

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Bin card Bin cards usually show quantities of each type of material received, issued and on hand. The bin card is placed in the bin or shelf or is hung over the almirah or the rack otherwise known as bin. Separate bin cards are prepared for each item of stores and if two different materials are kept in one almirah, two bin cards, one of each, are prepared, treating the almirah as two bins. A physical bin cards is presented in Fig. 3.7.

ABC Company Limited
Bin Card

Description _____ Bin No. _____
Store ledger No. _____ Code No. _____
Minimum level _____ Unit No. _____

	Received		*Issue*		*Balance*	
Date	*Ref.*	*Qty.*	*Ref.*	*Qty.*	*Quantity*	*Check*
May 1, 2008					500	
May 15, 2008		200			700	
May 30, 2008				300	400	
June 7, 2008		150			550	
June 25, 2008				400	150	

Fig. 3.7 Bin Card with Sample Data

Classification and Codification of Materials

Classification and codification of materials facilitates prompt identification of the materials in storage or when they are being issued to production departments. All items in the stores department should be properly classified and codified. Codification implies giving some symbols through letters or figures under a proper codification system. Codification provides certain benefits: (i) Simplicity in identifying and tracing the stores. (ii) Full particulars need not be given and thus clerical labour and time are saved. (iii) Secrecy is maintained about the details of the stores and all employees may not know them. (iv) Codification is necessary to adopt a mechanical system of accounting.

Issue of Materials

It is the quality of every good system of materials control that no materials can be issued from storerooms except on properly prepared and approved materials requisitions or stores requisitions. The materials requisition is a written order to the storekeeper to deliver materials or supplies to the place and the department designated or to give the materials to the person presenting a properly executed requisition. The materials requisition note (see Fig. 3.8) includes date, requisition number, department charged, name of stock ledger account to be credited, description of materials, quantity, unit price, total value, delivery point, signature of the person requisitioning the material and signature of the department executive approving the request for material. The requisitions are prepared in triplicate, one copy is retained by the preparer and two are sent to the storekeeper.

Department having standard materials requirements or a comparatively fixed list of materials or supplies generally use a special form of materials requisition called the "bill of materials". The bill of materials is a printed or duplicated form listing all the materials and part necessary for a typical job or production (see Fig. 3.9). In preparing such a requisition, it is necessary only to indicate the quantity in the blank space in front of the name or symbol of the material required.

ABC Company Limited
Materials Requisition Note

Job No. _____ Serial No. _____
Date _____

Code No.	*Description*	*Qty or Weight*	*Cost office*			
			Rate	*Unit*	*Amount*	*Stores ledger*

Authorised by _____ Storekeeper _____
Prices entered by _____ Received by _____
Bin Card entered _____ Calculation checked _____

Fig. 3.8 Materials Requisition Note

ABC Company Limited
Bill of Material

Job/work order No. _____ No. _____
Description of job _____ Date _____

S. No.	*Description*	*Code No.*	*Details of Issues*			
			Date	*Rate (Rs)*	*Amount (Rs)*	*Remarks*

Prepared by_____ Stores Department Cost Department
Checked by_____

Fig. 3.9 Bill of Material

Materials Returned to the Storeroom

Materials requisitioned from a storeroom and not needed or found to be defective are returned to the storeroom, where a returned material report is prepared either by the person returning the materials or by the storekeeper upon receipt of the materials. Two copies of the report are usually prepared; the original is used as a basis for crediting the accounts charged while the duplicate is retained in the files of the department returning the materials to the storeroom (Fig. 3.10).

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Some departments may prefer to use the excess materials on the next job instead of returning them to the storeroom. But it is always advisable to prepare a returned materials report, otherwise one job will be charged unnecessarily with too much materials cost and the other job with too little. A materials transfer note (see Fig. 3.11) is prepared to transfer costs from one original job to the new job and also the transfer is noted in the stock records.

ABC Company Limited
Material Return Note

Issuing Department _____ No. _____
Job No. _____ Date _____

S.No.	*Description*	*Code No.*	*Quantity*	*Rate (Rs)*	*Amount (Rs)*

Signature of
Works Manager/Foreman

Fig. 3.10 **Material Return Note**

ABC Company Limited
Materials Transfer Note

Serial No. _____
Date _____

The following materials have been transferred:
from Job No. _____ to Job No. _____

Code	*Description*	*Quantity*	*Cost Office*		
			Rate	*Unit*	*Amount*

Authorised Delivered Received Priced

Fig. 3.11 **Materials Transfer Note**

Materials Returned to Supplier

It may be necessary to return any rejected, specified excess, damaged or unsatisfactory materials to the supplier. Since goods are returned after having been received in storerooms and entered in the stock ledger

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accounts, some correcting entries are required. From the reject/despatch note issued by the purchasing department, information regarding the quantity and value may be entered in the Received Section of the stock ledger accounts in red ink. Alternatively, an entry can be made in the Issued Section with a special notation or symbol to indicate that the goods were returned to the supplier and not issued to departments or jobs or processes.

INVENTORY SYSTEMS

There are two principal ways of accounting for inventories:

Perpetual Inventory System

The perpetual inventory method requires a continuous record of additions to or reductions in materials, work-in-progress, and cost of goods sold on a day-to-day basis. Physical inventory counts are usually taken atleast once a year in order to check on the validity of the accounting records. The Institute of Cost and Management Accountant (U.K.) has defined perpetual inventory as:

A system of records maintained by the controlling department which reflects the physical movement of stocks and their current balance... A perpetual inventory is usually checked by a programme of continuous stocktaking, and the two terms are sometimes loosely considered synonymous. Perpetual inventory means the system of records, whereas continuous stocktaking means the physical checking of those records with actual stocks.

The perpetual inventory method has the following advantages:

1. The stock-taking task which is long and costly is avoided under this method.
2. The inventory of different items of materials in accordance with the stores ledger can be promptly prepared for the preparation of the income statement and balance sheet at interim periods if required without a physical inventory being taken.
3. Management may be informed daily of the number of units and the value of each kind of material on hand—information which tends to eliminate delays and stoppage in production.
4. The investment in materials and supplies may be kept at the lowest point in conformity with operating requirements.
5. A system of internal check is always in operation and the activities of different departments, such as purchasing, stores and production are continuously checked against each other.
6. It is not necessary to stop production so as to carry out a complete physical stock-taking.
7. Discrepancies and errors are promptly discovered and localised and remedial action can be taken to avoid their occurrence in the future.
8. This method has a moral effect on the staff, makes them disciplined and careful and acts as a check against dishonest actions.
9. The disadvantages of excessive stock are avoided, such as loss of interest on capital invested in stock, loss through deterioration, risk of obsolescence.

Periodic Inventory System

Under the periodic method, the entire book inventory is verified at a given date by an actual count of materials on hand. This physical inventory is usually taken near the end of the accounting period. This method provides for the recording of purchases, purchase returns and purchase allowances on a daily basis but does not provide for a continuous inventory or for a daily computation of the cost of goods sold. At the end of each accounting period, a physical count is made of the quantity of goods on hand and the value of the inventory is determined by using an inventory pricing method (FIFO, LIFO or Average Cost) and attaching cost to

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units counted. The cost of goods sold is computed by deducting closing inventory from the sum of opening inventory and purchases made during the current period. It is assumed that goods not on hand at the end of accounting period have been sold. There is no system and accounting for shrinkage, losses, theft and waste throughout the accounting period and they can be discovered only after the end of the period.

It can be concluded that perpetual inventory assists management in planning future purchases, reduces possibilities of stock shortages and aids in the reduction of waste, spoilage, etc., associated with the storage of inventory. But it is also more costly of the two procedures. The periodic inventory procedure is simple in concept and application. Yet it normally requires the shutdown of operation while it is carried out; it is error-prone due to inexperience of inventory takers; it cannot pinpoint shortages resulting from theft or waste.

INVENTORY SHORTAGES (LOSSES) AND OVERAGES

Under the perpetual inventory system, inventory accounts are maintained up-to-date in a stores ledger. It is, however, necessary to make physical counts of the materials at regular intervals to compare with the stores ledger records. It is possible that physical counting of materials may not agree with the stores ledger. The difference may be because of the following reasons:

A. Unavoidable

1. Evaporation
2. Absorption, moisture
3. Temperature changes affecting the volume of stock
4. Shrinkage
5. Deterioration of quality in stores, for example, through rust
6. Loss due to breaking bulk or cutting up.

B. Avoidable

1. Pilferage
2. Unsuitable storage
3. Careless handling
4. Under and over issues
5. Materials unused but not returned to stores

INVENTORY CONTROL

Nature of Inventory

Inventory is stores of goods and stocks. The Institute of Chartered Accountants of India (Accounting Standards 2) defines inventories as:

"Tangible property held (i) for the sale in the ordinary course of business, or (ii) in the process of production for such sale, or (iii) for consumption in the production of goods or service for sale, including maintenance supplies and consumables other than machinery spares."

In other words, in manufacturing organisations, inventories include (a) raw-materials, (b) work-in-progress, (c) finished produced goods, and (d) manufacturing supplies. In trading concerns, inventories consists of (a) merchandise held for sale, and (b) office, packing and other supplies.

Meaning of Inventory Control

Inventory control is the technique of maintaining inventory items (raw materials, work-in-progress, finished products, factory supplies) at desired levels. Manufacturing firms face several inventory control problems as

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compared to service-oriented organisations. In manufacturing organisations, production is of some tangible physical product. Therefore, emphasis is given to control of all inventory items. In service organisations, the focus is on service, and therefore there is very little emphasis on inventory control. In such service firms, services are used (consumed) as they are generated and not stocked for future consumption. However, there are some service organisations, such as hospitals, military organisations, educational institutions which have to maintain inventories of items related to their nature of work.

Importance of Inventory Control

Inventory control is of great significance in almost all types of business enterprises. If inventories pile up due to over-production or slow demand, capital is tied up which cannot be used for other productive purposes. Alternatively, production is likely to suffer because of inadequate inventory on hand. As stated earlier in this chapter, the basic objective of inventory control is identical to materials control, that is, maintaining inventory of adequate size for uninterrupted production and lowest investment on the inventory in conformity with production requirements.

Inventory control is also necessary because of the following significant factors:

1. *Demand fluctuations* There are likely to be fluctuations in demand pattern. To cope with the changing consumers' demand, it is necessary that adequate inventory should be maintained.
2. *Uncertainty about lead time* Sometimes the supplier may take more time in supplying the raw materials than expected. During this additional time, inventory has to be maintained so that the production does not suffer.
3. *Avoiding over-stocking and under-stocking* Over-stocking and under-stocking both are undesirable and should be avoided.

Inventory Control Techniques

Different business concerns may apply different inventory control techniques to meet specific requirements and circumstances. However, the following techniques are commonly used by firms for inventory control:

1. Two-bin system—bag and tag system.
2. Order cycling system.
3. Determination of inventory levels.
4. Statistical control system.
5. Control ratios.
6. Reservation system.
7. Budgetory control system.
8. ABC classification and control method (Pareto Analysis)
9. Perpetual inventory system.
10. Just-In-Time-Method

Pareto or ABC Analysis

In a large manufacturing company where stocks of direct materials and component parts consist of many thousands of different items, companies find it useful to divide materials, parts, supplies and finished goods into sub-classifications for purposes of inventory control. Many business firms introduce a system of analysing stocks by value categories known as "ABC or Pareto Analysis". Under this method, inventory items are ranked according to investments in each item in the inventory. The large value items are grouped together into one class for inventory control purposes. The lowest value items are grouped into another class and those items which are of intermediate value are grouped into a "middle" classification. High value items are labelled "Class A", middle value items, "Class B", and low value items, "Class C". All items in stock are listed in order of descending values showing quantity held and the corresponding value of the materials (see Table 3.3).

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The percentage given in Table 3.3 are only guidelines and are subject to change according to prevailing circumstances and choice of management. Table 3.3 shows that only 20% of the items represent 72% of the total costs.

Table 3–3 STOCK ANALYSIS UNDER ABC

Class	Items		Investment	
	No. of items	*Per cent of total items*	*Total cost*	*Per cent of total*
A	20,000	20%	2,88,000	72%
B	30,000	30%	76,000	19%
C	50,000	50%	36,000	9%
	100,000	100%	4,00,000	100%

The items under Class *A* are subject to greater continuous control and planning than are the items under other categories. The Class *A* items account for high annual consumption costs and correspondingly high investment in inventories. Because of high investments in Class *A* items, there would be frequent ordering and low safety stocks. This also assumes that the cost of placing and following up orders is relatively low in comparison with the costs of carrying excess inventories. A number of things can be done to reduce inventory of '*A*' items. For example, *A* items can generally be ordered for specific runs, the economic order quantity could be applied; local suppliers could be asked to stock supplies so that delivery time can be shortened. On the other hand, where the total annual purchase cost is relatively low as in the case of Class *C* items, there will be less frequent ordering and higher safety stocks. Items in Class *C* receive the least amount of control and should be under simple physical controls such as the two-bin system with safety stocks.

A graph can be prepared to show quantity and amount of items in different categories in descending order of value (Fig. 3.12).

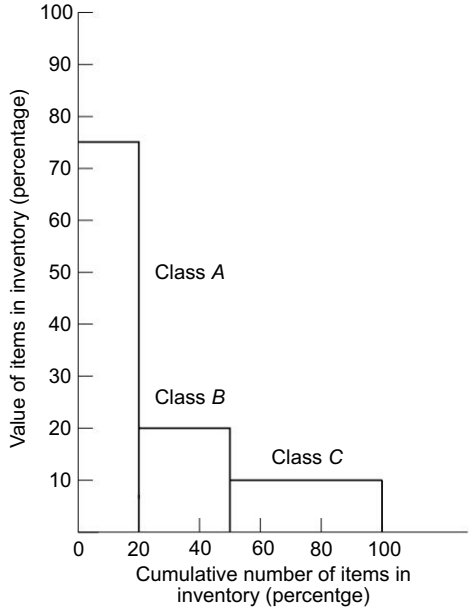


Fig. 3.12 ABC (Pareto) Method of Inventory Classifications

Example 3.26

A factory uses 4,000 varieties of inventory. In terms of inventory holding and inventory usage, the following information is compiled:

No. of varieties of inventory	*%*	*% value of inventory holding (average)*	*% of inventory usage (in end product)*
3875	96.875	20	5
110	2.75	30	10
15	0.375	50	85
	100.00	100	100

Classify the items of inventory as per ABC analysis with reasons.

(B.Com. (Hons), Delhi, 2003, CA, Inter Nov. 1998)

Solution:

Assume Rs. 10,00,000 as value of inventory of 4000 varieties in this factory.

No. of varieties of inventory (items)	*% of varieties*	*% value of inventory holding (average)*	*value of inventory holding (average)*	*% of inventory usage (in end product)*	*Value of inventory usage (in end product)*
3875	96.875	20	$\frac{10,00,000 \times 20}{100}$ = Rs. 2,00,000	5	$\frac{20,00,000 \times 5}{100}$ = Rs. 10,000
110	2.750	30	$\frac{10,00,000 \times 30}{100}$ = Rs. 3,00,000	10	$\frac{3,00,000 \times 10}{100}$ = Rs. 30,000
15	0.375	50	$\frac{10,00,000 \times 50}{100}$ = Rs. 5,00,000	85	$\frac{5,00,000 \times 85}{100}$ Rs. 4,75,000

Value of inventory items with 15% is Rs. 4,75,000 which is highest among the three varieties of inventory items.

Classification of the Items of Inventory as per ABC Analysis

Category A: 15 number of varieties of inventory items, should be classified as those of *A* category because of the following reasons:

(i) They constitute 0.375% of total number of varieties of inventory items handled by stores of factory. This is the minimum as per the given classification in the table.

(ii) The total usage of these items is 50% of total use value of inventory holding (average) which is maximum according to the given table.

(iii) The consumption of these items is about 85% of usage in end product.

Category B: 110 number of inventory items, should be classified as those of *B* category because of the following reasons:

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(i) They constitute 2.750% of total number of varieties of inventory items handled by the stores of the factory.
(ii) They require moderate investment of about 30% of total use value of inventory holding (average).
(iii) Their consumption is moderate about 10% of inventory usage in the end-product.

Category C: 3,875 number of varieties of inventory items, should be classified as those of category *C* because of the following reasons:

(i) They constitute 96.875% of total varieties of inventory items handled by stores of factory.
(ii) They require investment of 20% of total use value of average inventory holding.
(iii) Their consumption is minimum that is, just 5% of inventory usage in end product.

Kanban

Kanban is a Japanese term which means display on instruction card. In a manufacturing or factory organisation, Kanban contains many information such as reorder point, lead time, delivery location, source of supply, part number, quantity of parts that should be possessed etc. It is a system of markers which authorises production and movement to the process which requires the parts.

Business firms can use Kanban or any other similar technique as a production control tool. The employees in the production department manufacture parts as per the details mentioned on the Kanban which is used like production card. If in a factory, there is no Kanban card, production may not be done and transfer of materials may not take place.

Kanban is highly useful if used with JIT. The JIT pull system means that components are not made until requested by the next process. This is normally done by monitoring parts consumption at each stage and using a system of Kanban. Kanban, therefore, will reduce inventory, decrease lead or supply time and finally will increase productivity through integrating different processes.

Just-In-Time (JIT) Method

Just-In-Time (JIT) is a purchasing and inventory control method in which materials are obtained just in time for production to provide finished goods just in time for sale. There are two aspects of JIT: (i) Just-In-Time (JIT) Production, and (ii) Just-In-Time (JIT) purchasing. JIT with regard to production means producing only what is needed, when it is needed, in the quantity just needed. A JIT manufacturing system requires making goods or services only when the customer, internal or external, requires it. According to CIMA Official Terminology:

> "JIT is a technique for the organisation of work flows, to allow rapid, high quality, flexible production whilst minimising manufacturing waste and stock level". Further, CIMA defines JIT production as "a system which is driven by demand for finished products, whereby each component on a production line is produced only when needed for the next stage."

JIT purchasing requires better coordination with suppliers so that materials arrive immediately prior to their use. Firms using JIT purchasing enter into long term contracts with them to enable vendors to plan their annual production. Under JIT purchasing, *EOQ* is much lower as compared to *EOQ* under conventional purchasing. JIT purchasing provides significant savings in cost.

JIT aims to achieve the following objectives:

(i) Zero inventory
(ii) Zero breakdown
(iii) 100% on time delivery service
(iv) elimination of non-value added activities
(v) Zero defects.

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JIT is a demand-pull system. Demand for customer output (not plans for using input resources) triggers production. Production activities are "pulled" not "pushed" into action. The major differences between JIT manufacturing and traditional manufacturing are as follows:

JIT	*Traditional*
1. Pull system	1. Push system
2. Insignificant or Zero inventories	2. Significant inventories
3. Manufacturing cells (work centres)	3. Process structure
4. Multifunction labour	4. Specialised labour
5. Total quality management (TQM)	5. Acceptable quality level (AQL)
6. Simple cost accounting	6. Complex cost accounting

JIT production and JIT purchasing reduces or eliminates inventory and the costs associated with carrying the inventory. JIT emphasises that workers immediately correct the system making defective units because they have no inventory. With no inventory to draw from for delivery to customers, just-in-time relies on high quality materials and production. It is required that the companies that use just-in-time manufacturing must eliminate all the sources of failure in the system. Production people must be better trained so that they can carry out their works without errors. Suppliers must be able to produce and deliver defect free materials or components just when they are required, and equipment must be maintained so that machine failures are eliminated.

JIT applies to raw materials inventory as well as to work-in-process inventory. The goals are that both raw materials and work in progress inventory are held to absolute minimums. JIT is used to complement other materials planning and control tools, such as *EOQ* and safety stock levels. In JIT system, production of an item does not commence until the organisation receives an order. When an order is received for a finished product, productions people give orders for raw materials. As soon as production is complete to fill the order, production ends. In theory, in JIT, there is no need for inventories because no production takes place until the organisation knows that it will sell them. In practice, however, companies using just in time inventory generally have a backlog of orders or stable demand for their products to assure continued production.

The fundamental objective of JIT is to produce and deliver what is needed, when it is needed, at all stages of the production process—just in time to be fabricated, sub-assembled, assembled, and despatched to the customer. Although in practice there are no such perfect plans, JIT is an ideal and therefore a worthy goal. The benefits are low inventory, high manufacturing cycle rates, high output per employee, minimum floor space requirements, minimum indirect labour, and perfect in-process control. An associated requirement of a successful JIT operation is the pursuit of perfect quality in order to reduce, to an absolute minimum, delays caused by defective product units.[1]

INVENTORY TURNOVER

Business enterprises can analyse the turnover of different items of stock to find out which stocks are slow moving. Inventory turnover ratio enables the management to avoid capital being locked up in undesirable stocks. This ratio indicates the efficiency or inefficiency with which inventories are maintained. Inventory turnover ratio is calculated as follows:

1. Milton F. Usry and Lawrence H. Hammer, Cost Accounting, Planning and Control, Cincinnati: South Western Publishing Co., 1999, p. 257.

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$$\frac{\text{Cost of materials consumed}}{\text{Cost of average stock held during the period}}$$

The cost of average stock here is taken as the average of opening and closing stock.
The stock turnover can also be calculated in days as below:

$$\frac{\text{Days during the period}}{\text{Inventory turnover ratio}}$$

Detection of Slow-moving and Non-moving or Obsolete Materials

It is essential for a business firm to detect slow-moving and non-moving or obsolete materials. Obsolete materials become useless or obsolete due to change in product, process, design or method of production. Obsolete materials are different from slow-moving materials. Slow-moving stocks move at a slow rate. In case of slow and non-moving materials, capital remains locked unnecessarily and also cost of storing continue to be incurred if these materials are stored in excess of the requirements. Management should make proper investigation into slow-moving and obsolete materials and take steps to minimise losses arising therefrom. Management should prepare regular reports to examine the situations relating to these stocks so that useless stocks could be disposed off or used in some profitable work and effective steps could be taken to increase the movement of slow moving stocks.

Example 3.27

Compute the materials turnover ratio for materials *A* and *B* and comment upon the results.

	Materials A (Rs.)	*Materials B (Rs.)*
Opening stock	10,000	35,000
Purchase during the year	76,000	50,000
Closing stock	6,000	25,000

Solution:

Cost of materials consumed:	*Materials A*	*Materials B*
Opening stock	10,000	35,000
Add: Purchases	76,000	50,000
	86,000	85,000
Less: Closing stock	6,000	25,000
Cost of materials consumed	80,000	60,000

Average stock held:	*Materials A*	*Materials B*
Opening stock	10,000	35,000
Closing stock	6,000	25,000
	16,000	60,000
	16,000÷2	60,000÷2
Average stock	8,000	30,000

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Material turnover ratio

$$= \frac{\text{Cost of materials consumed}}{\text{Cost of stock held}}$$

$$\text{Materials } A = \frac{80{,}000}{8{,}000} = 10 : 1 \text{ or } 10$$

$$\text{Materials } B = \frac{60{,}000}{30{,}000} = 2 : 1 \text{ or } 2$$

Materials turnover in days

$$= \frac{\text{Days during the year}}{\text{Materials turnover ratio}}$$

$$\text{Materials } A = \frac{365}{10} = 36.5 \text{ days}$$

$$\text{Materials } B = \frac{365}{2} = 182.2 \text{ days}$$

From the above results, it can be said that materials *A* are very fast moving materials, while materials *B* are very slow moving when compared with materials *A*. Since, the normal standard inventory turnover ratio should be 2 : 1, the materials *B* turnover ratio can be said to be normal. Materials *A* turnover ratio is 36.5 days which shows that an average stock is being kept for 36.5 days. In contrast, materials *B* average stock is being kept for 182.5 days. Therefore, materials *B* are slow-moving materials.

ACCOUNTING FOR MATERIAL LOSSES

Some materials losses are bound to occur during manufacturing operations because of the nature of the raw materials or other factors which reduce the expected production. These losses may be waste, scrap, spoilage, defective.

Scrap

Scrap is residue from manufacturing operations that has measurable but relatively minor recovery value. Scrap is saleable material resulting from the primary manufacturing operations. Scrap results from: (i) the processing of materials, (ii) defective and broken parts, (iii) obsolete stock, revisions or abandonment of experimental projects, and scrapping of worn out or obsolete machinery. In some cases scrap can be sold and should therefore be collected and placed in storage so that it can be sold to scrap dealers. Scrap should be accounted for in some manner not only from the point of view of efficiency, but because scrap is often a tempting source of theft.

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Treatment of Scrap

Scrap may be treated in the cost accounts in the following ways:

1. Where the value of scrap is very insignificant, it is not considered in the cost accounts. That is, the cost of scrap is charged to good units and income from the sale of scrap is treated as other income.
2. If the value of scrap is significant, the net sale proceeds of scrap (sales value of scrap—cost of selling the scrap) is deducted from the material cost. That is, the amount (net) realised from the sale is treated as a reduction in the materials cost that has been charged to the individual job or product.
3. The scrap may be sold in a period different from that in which it was created and if the scrap has a low sales value, only a quantity record of the scrap should be maintained. It is not valued and does not appear on the balance sheet.

Scrap Report

It is advisable to prepare a daily, weekly, scrap report to account for scrap and to compare it with predetermined norms or standards which, in turn, can reveal unexpected items and unusual amounts. A specimen of scrap report is given in Fig. 3.13.

Production Department *Scrap Report*

For the week ending April 10, 2008

No.	*Description used*	*Units scrapped*	*Units*	*% Scrap*	*Cost*	*Reasons*
Total for week						

Fig. 3.13 A Specimen of Scrap Report

Spoilage

Spoilage can be defined as the materials which in the process of manufacture are badly damaged or have developed some imperfection which cannot economically be corrected, and thus the goods ought to be sold as seconds. Spoiled units fail to reach the required standard of quality specifications. The cost of spoiled goods may be treated by either of the following methods:

1. The loss due to spoilage may be charged to a specific product or job on which the spoilage occurred, if it is clearly traceable to the work done on that order.
2. The normal spoilage loss may be charged to factory overhead and thus spread over the cost of all jobs/products.
3. The cost of abnormal spoilage (that is, due to causes not inherent in the manufacturing process) is transferred to the Costing Profit and Loss Account. Abnormal loss is unexpected and should have been avoided by management. It is considered controllable by management.

Spoilage Report

A spoilage report should be prepared detailing the spoiled units and cost of spoiled units and other relevant information (Fig. 3.14). To control spoilage, allowance for a normal spoilage should be determined in advance and actual spoilage should be compared with the standard (allowed) spoilage. A spoilage report

may enable managements to provide overall control over the spoilage costs. If all or many departments are involved, spoilage costs are then treated as a factory overhead. Sometimes, spoilage can be controlled by the individual machine operators. This requires daily or weekly spoilage reports which can reveal the spoiled work occurred, the reason for its occurrence and the cost of correcting the defects.

Spoilage Report

Units/Deptt No._____ Date_____

Production Order No._____

Units produced	*Units spoiled*	*Normal spoilage*		*Abnormal spoilage*		*Cost of abnormal spoilage (Rs.)*	*Reason for spoilage*	*Action taken*
		Qty	*%*	*Qty*	*%*			

Fig. 3.14 **A Spoilage Report**

Defectives

Defective products are such semi-finished or finished products which in the process of manufacturing have developed some imperfection, but which, unlike spoiled materials, can by the expenditure of additional labour and possibly materials, be made into perfect finished articles. In the manufacturing process, imperfections may arise because of sub-standard materials, bad workmanship, careless planning, laxity in inspection, etc. If the unit can be reprocessed in one or more stages and made into a standard saleable product, it is often profitable to rework the defective unit. Defective work is to be distinguished from spoiled work. Defective work is work in which there is some imperfection which can be reworked or reconditioned by the application of additional materials, labour and/or processing and brought to the point of standard. However, the spoiled units cannot be reconditioned and the units must be sold either as scrap or as second or third-grade products.

The accounting treatment for defective work is similar to that relating to spoiled goods. The cost of defectives can be treated in the following manner:

1. Normal defectives, that is, those defectives which are inherent in the manufacturing process and are identified as normal, can be treated in the following manner:
   (a) Charged to good products—The loss (the additional cost of defectives) is absorbed by good units produced.
   (b) Charged to general factory overheads—If defective units occur irregularly, the added cost of reworking and perfecting the defective goods is properly charged to factory overheads and apportioned as a part of that factory overhead.
   (c) Charged to the department overhead—If the department responsible for defective goods can be identified, the additional cost of perfection is charged to that department.
2. If the defective units are clearly identifiable with a specific job or production order and the defects are peculiar to the job, the cost to complete the defective units can be charged to that job.

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3. If defectives are abnormal and as due to reasons beyond the control of the business firm, the rework cost is charged to the Costing Profit and Loss Account.

Defectives Report

Inspectors scrutinise work-in-process at the completion of each stage of production in order to separate defective and spoiled products from those which equal the standard of perfection required of all finished production.

After inspection if it is found that it is necessary to recondition work found defective, a defective work report (see Fig. 3.15) is prepared and attached to the production order representing the defective work. The defective work report contains the number of the production order, a description of the nature of the defective work, the number of units involved, and additional cost of material, labour and applied factory overheads necessary to bring the products upto standard.

Waste (or Wastage)

The terms "spoilage" and "waste" are sometimes used synonymously. However, wastage generally refers to that portion of raw material which is lost in storing, handling and in manufacturing processes. It does not possess any recovery or realisable value. Waste for the purpose of accounting treatment is classified in two categories: Normal waste and Abnormal waste, (i) Normal waste is expected (unavoidable) and uncontrollable. It is treated as a part of the cost of the product, that is, the cost of normal waste unit is borne by the good remaining units. (ii) Abnormal waste is unexpected (avoidable) and controllable. It is valued like good output. Its cost is transferred to the Costing Profit and Loss Account. In case of normal waste, cost per unit of the finished output is relatively inflated, but in abnormal waste, cost per unit remains the same for abnormal units as well as good finished units.

Defective Work Report

Production order no._____ No._____
No. of units_____ Date_____
Department responsible for spoilage_____
Nature of defects_____

Department (Job No.)	*Description of additional work required*	*Rework costs*			*Total costs*
		Materials cost	*Labour cost*	*Applied factory overhead*	

Fig. 3.15 **Defective Work Report**

THEORY QUESTIONS

1. Describe the meaning objectives, and basic principles of materials control system. *(B. Com. (Hons), Delhi)*
2. What are the important requirements of a materials control system. *(B. Com. (Hons), Delhi 2004)*
3. Distinguish between Bill of Material and stores requisition. *(B. Com. (Hons), Delhi 1997)*
4. Explain ABC system of inventory control. *(B. Com. (Hons), Delhi 1999)*
5. Explain Just-In-Time purchases. *(B. Com. (Hons), Delhi 2001)*
6. What do you understand by 'inventory control'. State its objects.
7. What are the objectives of inventory control? How is inventory control effected through ABC analysis of stores? *(ICWA, Inter)*
8. Define waste, scrap, defectives and spoilage with examples. Discuss the respective treatment in cost accounts and set out a procedure for their control. *(ICWA)*
9. "The Perpetual Inventory System is an integral part of materials control." Discuss this statement by bringing out briefly the salient features and advantages of the system. *(ICWA Inter)*
10. In ABC Company Ltd. waste, scrap, spoilage and defectives are very high. Suggest and explain various methods for accounting of wastage and scrap and also treatment of costs incurred on spoilage and defective work. *(ICWA Inter)*
11. Distinguish between spoilage and defectives in a manufacturing company. Discuss their treatment in cost accounts and suggest a procedure for their control. *(CA Inter)*
12. In a meeting of the department heads of a company, the purchase procedure and materials accounting were strongly criticised and blamed for high cost of materials. The Managing Director of the company authorises you to investigate and suggest improvements. Give your suggestions indicating the assumptions on which they are based.
13. Distinguish between Bin Card and Stores Ledger. *(B.Com. (Hons), Delhi, 2003, CA, PE, Exam II, Group II, May 2003, Nov. 2004)*
14. Enumerate the various factors to be considered in fixing the reorder level of raw material item. *(B.Com. (Hons) Delhi, 2004)*
15. Explain the concept of ABC analysis as a technique of material control. *(B.Com. (Hons), Delhi, 2004, 2006)*
16. What do you mean by inventory control? What are its techniques? Discuss briefly ABC system of inventory control. *(B.Com. Delhi, 2005)*
17. Describe the procedure for the efficient system of physical control of materials till it reaches the stores. *(B.Com. (Hons), Delhi, 2007)*
18. Distinguish between periodic and perpetual inventory system. Explain their comparative advantages and disadvantages. *(B.Com. (Hons), Delhi, 2007, B.Com. Delhi, 2004, 2006, 2007)*
19. What are the causes of discrepancies in stock records? How would you treat these discrepancies? *(B.Com. (Hons), Delhi, 2007)*
20. Under what circumstances is it essential to use continuous stock taking for control over materials? State its advantages. *(B.Com.(Hons), Delhi, 2002)*
21. Write short notes on the following:
    (i) Re-order quantity
    (ii) Re-order level
    (iii) Maximum stock level
    (iv) Minimum stock level *(CA, PE, Exam II, Group II, Nov. 2003)*
22. Discuss ABC analysis as a system of inventory control. *(CA, PE, Exam II, Group II, Nov. 2004)*
23. Discuss the accounting treatment of spoilage and defectives in cost accounting. *(CA, PE, Exam II, Group II, Nov. 2003)*
24. Write detailed explanatory notes on the following:
    (i) JIT manufacturing
    (ii) Kanban

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25. Distinguish between JIT and traditional manufacturing.
26. What is JIT? Discuss the advantages of JIT manufacturing system.

SELF-EVALUATION QUESTIONS

Select the correct answer for the following multiple-choice questions:

1. Which one of the following items is not included in the annual carrying costs of inventory?

(a) Cost of capital
(b) Insurance on inventory
(c) Annual warehouse depreciation
(d) Taxes on inventory
(d) Inventory breakage on stored inventory

2. Economic order quantity (*EOQ*) model is used by a business to

(a) Minimise the cost of placing orders
(b) Minimise the unit purchase price of inventory
(c) Minimise the number of orders placed during a year
(d) Minimise the required amount of safety stock
(e) Minimise the combined costs of placing orders and carrying inventory

3. The calculation of inventory re-order point in units requires the

(a) Purchase price per month
(b) Annual demand for units
(c) Daily demand for units
(d) Storage cost per unit
(e) Warehouse capacity

4. Materials control system would be most useful to a

(a) Manufacturer
(b) Wholesaler
(c) Hospital
(d) Retailer

5. Which of the following items would most likely be included in the calculation of economic order quality?

(a) Price
(b) Cost
(c) Demand
(d) Supply

6. Given the following information, identify the correct calculation for the economic order quantity (*EOQ*)

Cost per purchase order	Rs.	40
Annual cost of carrying one unit in stock for one Year	Rs.	1.20
Annual consumption units		20,000

(a) $\sqrt{\frac{2(20000 \times \text{Rs. } 40)}{\text{Rs. } 1.20}}$

(b) $\sqrt{\frac{20000 \times \text{Rs. } 40}{\text{Rs. } 1.20}}$

(c) $\sqrt{\frac{2 \times 20{,}000 \times \text{Rs. } 1.20}{\text{Rs. } 20}}$

(d) $\sqrt{\frac{20{,}000 \times \text{Rs. } 1.20}{\text{Rs. } 20}}$

PROBLEMS

1. A manufacturer buys certain equipment from an outside supplier at Rs. 30 per unit. Total annual needs are 800 units. Further the following data are available.

Annual return on investment 10%
Rent, taxes, insurance per unit per year Re. 1
Cost of placing an order Rs. 100
Determine the economic order quantity.

Ans: 200 units

2. In a factory component *A* is used as follows:

Normal usage 50 kg per week — Minimum usage 25 kg per week
Maximum usage 75 kg per week — Re-order quantity 300 kg
Re-order period 4 to 6 weeks

Calculate the following for component *A*:
(a) Re-order level
(b) Maximum level
(c) Minimum level
(d) Average stock level

Ans: Re-order level 450 kg
Maximum level 650 kg
Minimum level 200 kg
Average stock level 425 kg

3. A company manufactures a product from a raw material, which is purchased at Rs. 60 per kg. The company incurs a handling cost of Rs. 360 plus freight of Rs. 390 per order. The incremental carrying cost of inventory of raw material is Re 0.50 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw materials is Rs. 9 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg of raw material.

Required:

(i) Calculate the economic order quantity of raw materials.
(ii) Advise, how frequently should orders for procurement be placed.
(iii) If the company proposes to rationalise placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated. *(C.A. Inter, Nov. 2001)*

4. In a company weekly minimum and maximum consumption of material *A* are 25 and 75 units respectively. The re-order quantity as fixed by the company is 300 units. The material is received within 4 to 6 weeks from issues of supply order. Calculate minimum level and maximum level of material *A*. *(CA Inter)*

Ans: Minimum level 200 units
Maximum level 650 units

5. About 50 items are required every day for a machine. A fixed cost of Rs. 50 per order is incurred for placing an order. The inventory carrying cost per item amount to Re. 0.02 per day. The lead period is 32 days. Compute:

(i) Economic Order Quantity
(ii) Re-order level *(CA Inter, Nov. 1996)*

Ans: EOQ 500 units
Re-order level 1600 items

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6. From the following information calculate Economic Order Quantity, and the number of orders to be placed in one quarter of the year:

(i) Quarterly consumption of materials	2,000 kg.
(ii) Cost of placing one order	Rs. 50
(iii) Cost Per unit	Rs. 40
(iv) Storage and carrying Cost	8% on average inventory

(B. Com. (Hons), Delhi 1997)

Ans: *EOQ* 500 kg

No. of order to be placed is 4.

7. ZEE is product manufactured out of three raw materials *M*, *N* and *Q*. Each unit of ZEE requires 10 kg, 8 kg, and 6 kg. of *M*, *N* and *Q* respectively. The re-order levels of *M* and *N* are 15,000 kgs and 10,000 kg. respectively while the minimum-level of *Q* is 2,500 kg. The weekly production of ZEE varies from 300 to 500 units, while the weekly average production is 400 units. You are required to compute

(i) the minimum stock level of *M*.
(ii) the maximum stock level of *N*, and
(iii) the re-order level of *Q*.

The following additional data are given:

Re-order Quantity (in kgs.) / *Delivery (in weeks)*	*M* 20,000	*N* 15,000	*Q* 20,000
Minimum	2	4	3
Average	3	5	4
Maximum	4	6	5

(ICWA Inter, Dec. 1995)

Ans: Minimum stock level of *M* 3,000 kg

Maximum stock level of *N*, 15,400 kg

Re-order level of *Q*, 15,000 kg

8. Materials *X* and *Y* are used as follows:

Minimum usage – 50 units each per week
Maximum usage – 150 units each per week
Normal usage – 100 units each per week

Ordering quantities: *X* = 600 units; *Y* = 1000 units

Delivery period: *X* = 4 to 6 weeks; *Y* = 2 to 4 weeks

Calculate for each material : (a) Minimum level; (b) Maximum level; and (c) Order level.

Ans.

	Material X	*Material Y*
Minimum level	400 units	300 units
Maximum level	1300 units	1500 units
Order level	900 units	600 units

9. XYZ Company buys in lots of 500 boxes which is a 3 months supply. The cost per box is Rs 125 and the ordering cost is Rs 150. The inventory carrying cost is estimated at 20% of unit value. What is the total annual cost of the existing inventory policy? How much could be saved by employing the economic order quantity?

Ans: Total annual cost of existing inventory Rs. 6850

EOQ 155 units

Saving in annual cost if EOQ is adopted Rs. 2962.50

10. The following information in an inventory problem is available:

Annual demand	2400 units
Unit price (Rs.)	2.40
Ordering cost (Rs.)	4.00
Storage cost (Rs.)	2% per year
Interest rate	10% p.a.
Lead time	1/2 month

Calculate *EOQ*, Re-order level and total annual inventory cost. How much does the total inventory cost vary if the unit price is changed to Rs. 5? *(ICWA Inter)*

Ans: EOQ 258 units, Reorder level 100 units, Total annual inventory cost Rs. 5837.15.
Difference in total inventory cost Rs. 6272.55

11. A large local government authority places orders for various stationery items at quarterly intervals. In respect of an item of stock, data are as follows:
Annual usage 5000 boxes
Minimum order quantity 500 boxes
Cost per box Rs. 2
Usage of material is on a regular basis and on average, half of the amount purchased is held in inventory. The cost of storage is considered to be 25% of the inventory value. The average cost of placing an order is estimated at Rs. 1.25.
The chief executive of the authority has asked you to review the present situation and to consider possible way of effective cost savings. You are required to:

(a) Tabulate the cost of storage and ordering for each level of orders from four to twelve placed per year.
(b) Ascertain from the tabulation the number of orders which should be placed in year to minimise these costs.
(c) Calculate the percentage savings on the annual cost which could be made by using the economic order quantity system. *(CIMA, UK)*

12. Calculate the material turnover ratio for the year 2008 from the following information:

	Material X (Rs.)	*Material Y* (Rs.)
Opening Stock	25,000	87,500
Closing Stock	15,000	62,500
Purchases	1,90,000	1,25,000

Determine the fast moving material

Ans: Turnover ratio
Material *X*-10
Material *Y*-2
Material *X* is the fast moving material.

13. The following information is available about a company for the year 2008.

	Opening stock	*Purchases*	*Closing stock*
Material *A*	700 kg	11,500 kg	200 kg
Material *B*	200 litres	11,000 litres	1200 litres
Material *C*	1000 kg	1800 kg	1200 kg

The inventory is value @ Rs. 1 per kg or litre.
Calculate the material turnover ratio for each of the above materials and express in number of days the average inventory held. What conclusions can be drawn?

Ans:

	Turnover ratio	No. of days inventory held
Material A	26.67	14 days approx.
Material B	14.29	26 days approx.
Material C	1.46	250 days

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Material *A* has the highest inventory turnover ratio, while material *C* has the lower turnover ratio. Therefore, purchase of material *C* should be controlled.

14. After inviting tenders, two quotations are received as follows:

(a) Rs. 1.20 per unit.

(b) Rs. 1.10 per unit plus Rs. 3,000 fixed charges to be added irrespective of units ordered.

Advise with your arguments on whom orders should be placed and what quantity is to be ordered.

The following additional information is available:

Present stock	35,000 units
Average monthly requirement	10,000 units
Maximum level	80,000 units
Minimum level	30,000 units

Ans: Order should be placed for 45,000 units with the second party.

15. A company's monthly requirement of an inventory item is 1,800 units. The cost of processing an order is Rs. 5 and the carrying cost per unit is 20 paise. The company supplier agrees to offer the following quantity discounts:

	Upto				Above
Lot size (in units)	400	401–600	601–800	801–1,000	1,000
Discount (in Rs.)	Nil	6	10	15	20

Lead time is 2 days and the company wishes to keep a safety equal to 50% of the usage in the lead time.

(a) Find the economic ordering quantity (*EOQ*) without considering the offer of discount.

(b) Calculate the re-order point taking 30 working days in a month.

(c) Tabulate different types of cost as also effect of discount on different order sizes taking 1, 2, 3..., 7 orders a month and indicate the *EOQ*. *(CA, Final)*

Ans: (a) 1039 units

(b) 180 units

(c) 450 units

16. JP Limited, manufacturers of a special product, follows the policy of *EOQ* (Economic Order Quantity) for one of its components. The component's details are as follows:

Purchase price for component	Rs. 200
Cost of an order	Rs. 100

Annual cost of carrying one unit in inventory: 10% of purchase price.

Total cost of inventory and ordering per annum: Rs. 4,000.

The company has been offered a discount of 2% on the price of the component, provided the lot size is 2,000 component at a time.

You are required to:

(a) Compute the *EOQ*

(b) Advise whether the quantity discount offer can be accepted.

(Assume that the inventory carrying cost does not vary according to discount policy.)

(c) Would your advise differ if the company is offered 5% discount on a single order? *(CA, Inter)*

Ans: (a) *EOQ* 200 units

(b) Discount should be accepted because the total inventory cost will be lower by Rs. 3900 as compared to the total cost under *EOQ* policy.

MATERIALS COSTING

4

Learning Objectives

After reading this chapter, you should be able to:

1. explain meaning and treatment of different items in determining the cost of materials received;
2. discuss different methods of costing materials issued;
3. explain pricing of materials returned to vendor and storerooms, and
4. identify the factors to be considered in selecting a material pricing method.

COSTING MATERIALS RECEIVED

The invoice received from the supplier is the basic document providing a base figure for determining the cost of materials to be entered in the accounting books. This figure, however, is subject to adjustment and some other items may affect the cost of materials received. These items are:

Discounts

Discounts may be trade discount, cash discount and quantity discount.

Trade discount is allowed when a supplier sells the materials to a retailer who, in turn, resells the materials. Trade discount is deducted from the purchase price to determine the cost of materials purchased.

Cash discount is also known as purchase discount. Cash discount arises after the materials have been purchased and is offered by the supplier to his customer, provided payment is made at once or within an agreed stipulated time. There are two methods of treating such purchase or cash discounts.

1. The cash discount received while purchasing materials should be deducted from the invoice price of the materials. Thus, the materials cost price will be relatively reduced.
2. Alternatively, it may be treated as an item of financial nature (as additional income) and therefore be kept outside the purview of cost accounting. The full invoice price should be charged to the materials account crediting the suppliers with the net invoice price, and the discount earned account with the amount of cash discount received. It can be argued, however, that there is little justification for recording income on purchase; one can only earn income by selling or holding assets. Income is not produced by buying.

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Quantity discount is a reduction in price given by a supplier to all large users of his product. This discount is deducted from the purchase price in arriving at the materials cost price. Also, this discount varies according to the size of the order for the purchase of materials.

Carriage Inwards on Raw Materials

It represents the expenditure incurred in bringing raw materials to the factory from outside and include sea, land and air freight, insurance, duties, dock charges, etc.

There is a difference of opinion as to treatment of carriage inwards. Accounting theory suggests that such charges are proper additions to the costs of materials purchased, since these costs are incurred in bringing the materials to the factory. But what is sound in theory is not always practicable, and deviations from theory are common. Where such costs are immaterial (small), or it is difficult to trace or even allocate such charges to specific items of materials (the cost to allocate such expenses to individual products outweighs the benefits to be obtained from such allocation), then these charges should be treated as an indirect manufacturing cost (factory overhead) which should be apportioned to product indirectly.

Material Handling Charges

The term "material handling costs" refers to the expense involved in receiving, storing, issuing and handling materials. Generally, such costs are part of the cost of materials and should be treated as a direct cost. But, in practice, such costs are most often treated as indirect costs. There is a practical difficulty in apportioning this cost to various materials items. The costs of operating the service departments involved in materials handling become a part of indirect manufacturing cost which is apportioned among the producing departments and then they are charged to product on labour hours, labour cost, machine hours, weight or any other appropriate basis.

Example 4.1

At what price per unit would Part No. A 32 be entered in the store's ledger, if the following invoice was received from a supplier?

Invoice	Rs.
200 units Part No. A 32 @ Rs. 5	1,000.00
Less 20% discount	200.00
	800.00
Add excise duty @ 15%	120.00
	920.00
Add packing charges (5 non-returnable boxes)	50.00
	970.00

Notes:

(i) A 2% discount will be given for payment within 30 days.

(ii) Documents substantiating payment of excise duty is enclosed for claiming MODVAT credit.

(CA, Inter)

Solution:

Computation of Purchase Price per Unit

	Rs.
(a) Net cost of 200 units after trade discount	800
Add Packing Charges	50
Total Cost for 200 units	850

$$\text{Cost per unit} = \frac{\text{Rs. } 850}{200} = \text{Rs. } 4.25$$

Example 4.2

A manufacturer in Surat purchased three chemicals *A*, *B* and *C* from Mumbai. The invoice gave the following information:

	Rs.
Chemical *A*: 3,000 kg @ Rs. 4.20 per kg	12,600
Chemical *B*: 5,000 kg @ Rs. 3.80 per kg	19,000
Chemical *C*: 2,000 kg @ Rs. 4.75 per kg	9,500
Sales tax @ 5%	2,055
Railway freight	1,000
	44,155

A shortage of 200 kg in Chemical *A*, of 280 kg in Chemical *B* and of 100 kg in Ch

emical *C* was noticed due to breakages. At Surat, the manufacturer paid octroi duty @ 0.10 per kg. He also paid cartage Rs. 20 for Chemical *A*, Rs. 63.12 for Chemical *B* and Rs. 31.80 for Chemical *C*. Calculate the stock rate that you would suggest for issue price of chemicals assuming a provision of 5 per cent towards further deterioration.

(CA, Inter)

Solution:

Statement Showing Total Material Purchase Cost

Particulars	*Chemical A (Rs.)*	*Chemical B (Rs.)*	*Chemical C (Rs.)*
Invoice price	12,600	19,000	9,500
Sales tax @ 5%	630	950	475
Railway freight (*A* : *B* : *C* : 3 : 5 : 2)	300	500	200
Octroi @ 0.10 per kg	300	500	200
Cartage	20	63.12	31.80
Total cost	13,850	21,013.12	10,406.80

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Quantity Available for Issue

Particulars	*Chemical A (kg)*	*Chemical B (kg)*	*Chemical C (kg)*
Quality purchased	3,000	5,000	2,000
Loss due to breakage	(200)	(280)	(100)
	2,800	4,720	1,900
Provision for deterioration	(140)	(236)	(95)
Quantity available for issue	2,660	4,484	1,805

Pricing (Rate per kg) for Issue

Chemical *A*	Rs. 13,850 ÷ 2,660 or Rs. 5.20 (approx.)
Chemical *B*	Rs. 21,013.12 ÷ 4,484 or Rs. 4.68 (approx.)
Chemical *C*	Rs. 10,406.80 ÷ 1,805 or Rs. 5.76 (approx.)

Notes:

(i) Sales tax rate: $\frac{\text{Rs. } 2,025}{\text{Rs. } 41,000} \times 100$ or 5%

(ii) A better approach is to consider loss due to breakage as abnormal. Therefore, issue rates are calculated as follows:

	Chemical A	*Chemical B*	*Chemical C*
Quantity available for issue (kg)	2,660	4,484	1,805
Loss due to breakage (kg)	200	280	100
Total quantity to be priced (kg)	2,860	4,764	1,905
Total cost (Rs.)	13,850	21,013.12	10,406.80
Issue price (per kg)	4.84	4.41	5.46

Abnormal losses are debited directly to the costing profit and loss account as per details below:

Chemical *A*:	200 × Rs. 4.84	Rs. 968.00
Chemical *B*:	280 × Rs. 4.41	1,234.80
Chemical *C*:	100 × Rs. 5.46	546.00
		Rs. 2,748.80

Example 4.3

A foundary is melting pig iron for producing castings. Coke and limestone are used to melt the metal. 150 kg of coke and 50 kg of limestone are required to melt one ton of pig iron. The loss in melting is 5% and the rejection amounts to 10% of the casting made. Cost of pig iron is Rs. 895 per tonne. Cost of coke is Rs. 650 per tonne. Cost of limestone is Rs. 100 per tonne. Rejections fetch a return of 60 paise per kg. Find the cost of raw material per kg of saleable castings. *(ICWA, Inter)*

Solution:

Cost of material	*Amount (Rs.)*
Pig iron 1,000 kg	895.00
Coke 150 kg @ Re. 0.650	97.50
Limestone 50 kg @ Re. 0.100	5.00
	997.50
Normal rejections 95 kg @ Re. 0.60	(57.00)
Net total cost	940.50
Quantity of saleable cost iron: Input	1,000 kg
Loss in melting @ 5% of 1,000 kg	(50 kg)
Output	950 kg
Normal rejections @ 10% of 950 kg	(95 kg)
Saleable output	855 kg

Raw material cost per kg of saleable casting = $\frac{\text{Rs. } 940.50}{855 \text{ kg}}$ = Rs. 1.10

Notes:

1. Normal rejection: 10% of (input – melting loss), that is, 10% of (1000 – 50).
2. Cost of normal loss is borne by good units which are in good condition. This principle is used extensively in process costing method.

Example 4.4

From the following particulars workout the issue rate per 1000 each of first class and second class bricks.

(a) Paid for supply at the kiln site for 30 lakh first class bricks @ Rs. 30 per 1,000.
(b) Paid for supply at the kiln site for 60 lakh second class bricks @ Rs. 25 per 1,000.
(c) Paid carriage charges for carrying all bricks from kiln to store yard @ Rs. 1.50 per 1,000.
(d) Paid unloading charges Rs. 90 (lump sum).
(e) Paid for stacking in the store yard Rs. 180 (lump sum).
(f) Breakage in handling: 1% for first class bricks, 2% for second class bricks.

(ICWA, Inter)

Solution:

	Total	*Cost (Rs.)*	
	First class bricks	*Second class bricks*	
Amount paid towards the cost of bricks:	90,000	1,50,000	
Carriage charges @ Rs. 1.50 per 1,000	4,500	9,000	
Unloading charges (apportioned in the Ratio of quantity, that is, 30 : 60)	30	60	
Paid for stacking in the store yard (apportioned in the ratio of quantity, that is, 30 : 60)	60	120	
	94,590	1,59,180	

(*Contd.*)

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(*Contd.*)

	Total First class bricks	*Cost (Rs.) Second class bricks*
Cost per 1,000 = $\frac{\text{Total cost}}{\text{(Total number in '000 – Normal loss)}}$		
	First class brick	*Second class brick*
= $\frac{\text{Rs. 94,590}}{\text{(3,000 – 1\% of 3,000)}}$	$\frac{\text{Rs. 1,59,180}}{\text{(6,000 – 2\% of 6,000)}}$	
= Rs. 31.8485	Rs. 27.0714	
Thus, (a) Issue rate per 1,000 of first class bricks Rs. 31.8485		
(b) Issue rate per 1,000 of second class bricks Rs. 27.0714.		

Notes:

In this case, cost-unit has been taken as 1,000 bricks.

Example 4.5

The particulars relating to 1,200 kg of a certain raw material purchased by a company during June were as follows:

(a) Lot prices quoted by supplier and accepted by the company for placing the purchase order:
Lot up to 1,000 kg @ Rs. 22 per kg
Between 1,000 – 1,500 kg @ Rs. 20 per kg
Between 1,500 – 2,000 kg @ Rs. 18 per kg
Prices are F.O.R. supplier's factory
(b) Trade discount 20%
(c) Additional charge for container @ Rs. 10 per drum of 25 kg
(d) Credit allowed on return of containers @ Rs. 8 per drum
(e) Sales tax @ 10% on raw material and 5% on drum
(f) Total freight paid by the purchaser Rs. 240
(g) Insurance at 2.5% (on net invoice value) paid by the purchaser
(h) Stores overhead applied at 5% on total purchase cost of material

The entire quantity was received and issued to production. The containers were returned in due course. Draw up a suitable statement to show:

(i) Total cost of material purchased
(ii) Unit cost of material issued to production

(ICWA, Inter)

Solution:

	Amount Rs.	*Cost per unit Rs.*
Raw material 1,200 kg @ Rs. 20	24,000.00	20.00
Trade discount @ 20%	(4,800.00)	(4.00)
	19,200.00	16.00
Charge for containers 48 @ Rs. 10	480.00	0.40

(*Contd.*)

(*Contd.*)

	Amount *Rs.*	*Cost per unit* *Rs.*
	19,680.00	16.40
Sales tax: Raw material @ 10% on Rs. 19,200	19,20.00	1.60
Containers @ 5% on Rs. 480	24.00	0.02
Net invoice value	21,624.00	18.02
Freight paid	240.00	0.20
Insurance @ 2.5% on Rs. 21,624	540.60	0.45
	22,404.00	18.67
Credit for containers 48 @ Rs. 8	(384.00)	(0.32)
	22,020.60	18.35
Stores overhead applied 5% on Rs. 22,020.60	1,101.03	0.92
	23,121.03	19.27
(i) Total cost of material purchased	Rs. 23,121.63	
(ii) Unit cost of material issued to production	Rs. 19.27	

Notes:

1. Drums required = $\frac{\text{Total quantity}}{\text{Quantity per drum}} = \frac{1,200 \text{ kg}}{25 \text{ kg}} = 48$ numbers
2. If excise duty is to be charged separately, the amount is to be calculated on basic price, that is, on Rs. 24,000. The discount of 20% is to be calculated on basic price. Sales tax is to be calculated on (Basic price + Excise duty – Trade discount). Amount against other items is to be charged accordingly. Excise to be deducted if Modvat/Cenvat credit is available along with credit for container.
3. Sales tax refund is not available on Rs. 8 being the amount refunded on return of containers.
4. Usually, stores overheads are included in factory overheads and are not applied to materials as indicated in the given illustration.

Example 4.6

Modern Manufacturing Company purchased a material of 20 tonnes from a mining company. The following data is available for the lot of material purchased:

(a) Invoice price of material @ Rs. 2,000 per tonne
(b) Trade discount @ 20% on invoice price
(c) Excise duty @ 10% on invoice price
(d) Sales tax @ 10%
(e) Freight and insurance @ 2%
(f) Other charges for delivery @ Rs. 100 per tonne
(g) Cost of containers @ Rs. 20 per box of 1 quintal (100 kg)
(h) Cost of loading and unloading @ 1% of total cost

Compute total material purchase cost and cost per tonne to Modern Manufacturing Company.

(CA Inter)

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Solution:

Modern Manufacturing Company
Statement Showing Total Material Purchase Cost of 20 Tomes

Particulars	*Amount (Rs.)*
Invoice price of materials (Rs. 2,000 × 20 tonnes)	40,000
Trade discount (0.20 × Rs. 40,000)	(8,000)
	32,000
Excise duty (0.10 × Rs. 40,000)	4,000
	36,000
Sales tax (0.10 × Rs. 36,000)	3,600
	39,600
Freight and insurance (0.02 × Rs. 39,600)	792
	40,392
Other charges for delivery (Rs. 100 × 20 tonnes)	2,000
	42,392
Cost of containers (Rs. 20 × 10 quintal × 20 tonnes)	4,000
	46,392
Cost of loading and unloading (0.01 × Rs. 46392)	464
Total cost of material (20 tonnes)	46,856
Cost per tonne: Rs. 46,856 ÷ 20, or Rs. 2,342.80	

COSTING MATERIALS ISSUED

Where materials have been purchased for a specific product or specific job, the cost of materials received is wholly debited (charged) to that job. But most often, materials are purchased for several products or jobs. If all purchases were made at the same price, there would be no problem in costing materials issued and in inventory valuation. However, purchases made at different times usually carry different prices and the stores ledger card shows not one but several prices for the same kind of materials. Therefore, it becomes essential to consider the price at which it should be charged to production. Several methods are in use concerning the pricing of materials issued from the storeroom. They may be listed as follows:

A. Cost Price Methods
   1. First-in, First-out (FIFO)
   2. Last-in, First-out (LIFO)
   3. Highest-in, First-out (HIFO)
   4. Base Stock Price

B. Average Price Methods
   1. Simple average
   2. Weighted average
   3. Periodic simple average
   4. Periodic weighted average
   5. Moving simple average method
   6. Moving weighted average method

C. Normal Price Methods
   1. Standard price
   2. Inflated price
   3. Replacement or market price

First-in, First-out (FIFO)

The FIFO method follows the principle that materials received first are issued first. After the first lot or bach of materials purchased is exhausted, the next lot is taken up for supply. It does not suggest, however, that the same lot will be issued from stores. Sometimes, all materials are tagged with their arrival date and issued in date order especially with stocks that deteriorate. The inventory is priced at the latest costs.

Advantages

A good system of inventory management requires that oldest units should be sold or used first and inventory should consist of the latest purchases. This is found in the FIFO method of costing. Under the FIFO method, management has little or no control over the selection of units in order to influence recorded profits. Valuation of inventory and cost of goods manufactured are consistent and realistic. Besides, the FIFO method is easy to understand and operate.

Disadvantages

The objectives of matching current cost with current revenues is not achieved under the FIFO method. If the prices of materials are rising rapidly, the current production cost may be understated. If the sales price is fixed, then sales revenue may not produce enough income to cover the purchase of raw materials. The valuation of inventory in terms of current cost depends on the frequency of price changes and the stock turnover. In case stocks turnover rapidly, the inventory valuations will reflect current prices. There are other limitations under the FIFO method. FIFO costing is improper if many lots are purchased during the period at different prices. This method overstates profit especially with high inflation. It does not consider the cost of replacing used materials, a situation created by high inflation.

The FIFO method is suitable where (i) the size and cost of raw materials units are large, (ii) materials are easily identified as belonging to a particular purchased lot, and (iii) not more than two or three different receipts of the materials are on hand at one time.

Example 4.7 explains the FIFO method of costing.

Example 4.7

The following is a summary of the receipts and issue of materials in a factory during January.

January

1 Opening balance 500 units @ Rs. 25 per unit
3 Issue 70 units
4 Issue 100 units
8 Issue 80 units
13 Received from supplier 200 units @ Rs. 24.50 per unit
14 Returned to store 15 units @ Rs. 24 per unit
16 Issue 180 units
20 Received from supplier 240 units @ Rs. 24.75 per unit
24 Issue 304 units
25 Received from supplier 320 units @ Rs. 24.50 per unit
26 Issue 112 units
27 Returned to store 12 units @ Rs. 24.50 per unit
28 Received from supplier 100 units @ Rs. 25 per unit

Work out on the basis of First-in, First-out. This revealed that on the 15th there was a shortage of five units and another on the 27th of eight units.

(CA Inter)

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Solution:

Stores Ledger Account (FIFO)

	Receipts			Issue			Stock		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
Jan. 1	—	—	—	—	—	—	500	25.00	12,500
3	—	—	—	70	25	1,750	430	—	10,750
4	—	—	—	100	25	2,500	330	—	8,250
8	—	—	—	80	25	2,000	250	—	6,250
13	200	24.50	4,900	—	—	—	250	25.00	6,250
	Refund						200	24.50	4,900
14	15	24.00	360	—	—	—	250	25.00	6,250
							200	24.50	4,900
							15	24.00	360
15	—	—	Shortage	5	25	125	245	25.00	6,125
							200	24.50	4,900
							15	24.00	360
16	–	–	–	180	25	4,500	65	25.00	1,625
							200	24.50	4,900
							15	24.50	360
20	240	24.75	5,940	–	–	–	65	25.00	1,625
							200	24.50	4,900
							15	24.00	360
							240	24.75	5,940
24	–	–	–	65	25.00	1,625			
				200	24.50	4,900			
				15	24.00	360			
				24	24.75	594	216	24.75	5,346
25	320	24.50	7.680	–	–	–	216	24.75	5,346
							320	24.50	7,680
26	–	–	–	112	24.75	2,772	104	24.75	2,574
							320	24.00	7,680
27	12	24.50	294	–	–	–	104	24.75	2,574
							320	24.00	7,680
	–	–	–	–	–	–	12	24.50	294
27	–	–	Shortage	8	24.75	198	96	24.75	12,376
							320	24.00	7,680
							12	24.50	294
28	100	2,500	2,500	–	–	–	96	24.75	2,376
							320	24.00	7,680
							12	24.50	294
							100	25.00	2,500

Closing stock 528 units = Rs. 12,750

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Last-in, First-out (LIFO)

The LIFO method of costing and inventory valuation is based on the principle that materials entering production are the most recently purchased. The method assumes that the most recent cost, generally the replacement cost is the most significant in matching cost with revenue in the income determination. The cost of the last lot of materials received is used to price materials issued until the lot is exhuasted, then the next lot pricing is used, and so on through successive lots. The inventory is priced at the oldest costs.

Advantages

1. It provides a better matching of current costs with current revenues.
2. It results in real income in times of rising prices, by maintaining net income at a lower level than other costing methods.
3. In industries subject to sharp materials price fluctuations, the method minimises unrealised inventory gains and losses and tends to stabilise reported operating profits. Income is reported only when it is available for distribution as dividends or for other purposes.
4. Probably the most important arguments in favour of LIFO is its role in tax saving. It is generally considered a cheap form of tax avoidance by business firms. By valuing inventory at beginning-of-period prices and calculating cost of sales at the current prices, the firm creates secret reserves which are not taxed. As long as prices and inventory levels do not decline, this benefit remains and in this case the tax saving is permanent. However, if the tax rates go up in the meantime, the so-called tax saving will be eliminated by higher tax rates.
5. LIFO produces an income statement which shows correct profit or losses and financial position. It correlates current cost and sales, and income statements show the result of operation, excluding profits or losses due to changing price levels.

Disadvantages

The following are the limitations of the LIFO method of costing:

1. Inventory valuations do not reflect the current prices and therefore are useless in the context of current conditions.
2. The argument that LIFO should be used for matching current costs with current revenue, is not sound. The most recent purchase costs are matched against the revenues of the current period. However, unless both purchases and sales occur regularly in even quantities, the revenues will not be matched with the current costs at the time of sale. When purchases are irregular and unrelated to the timing of sales, the matching is illogical and unsystematic, particularly if prices and costs are changing rapidly.
3. The profit of a firm can be manipulated with the LIFO method in operation. By timing purchases, a company can cause higher or lower costs to flow into the income statement, thus increasing or decreasing reported net income at will.
4. Another limitation which also results from LIFO's lowering of the earnings figure is the effect it will have on existing bonus and profit sharing plans. Employees and managers who are interested in the growth of these plans may have difficulty in understanding a drop in the benefits which were created wholly or partially by an accounting change.

During a period of rising costs, LIFO produces the desirable effect of reducing taxable income and tax liability; thereby conserving cash. On the other hand, it also affects the profit reported in the financial statements.

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Example 4.8

Prepare a stores ledger account from the following transactions under the LIFO method.

Jan. 1	Received 1,000 units @	Re. 1.00 per unit
10	Received 260 units @	Rs. 1.05 per unit
20	Issued 700 units	
Feb. 4	Received 400 units @	Rs. 1.15 per unit
21	Received 300 units @	Rs. 1.25 per unit
March 16	Issued 620 units	
April 12	Issued 240 units	
May 10	Received 500 units @	Rs. 1.10 per unit
25	Issued 380 units	

Solution:

Stores Ledger Account (FIFO)

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt.*	*Qty*	*Rate*	*Amt.*	*Qty*	*Rate*	*Amt.*
1	2	3	4	5	6	7	8	9	10
January									
1	1,000	1.00	1,000	–	–	–	1,000	1.00	1,000
10	260	1.05	273	–	–	–	1,260		1,273
20	–	–	–	260	1.05	273	560		560
				440	1.00	440			
February									
4	400	1.15	460	–	–	–	960		1,020
21	300	1.25	375	–	–	–	1,260		1,395
March									
16	–	–	–	300	1.25	375	640		652
				320	1.15	368			
April									
12	–	–	–	80	1.15	92	400		400
				160	1.00	160			
May									
10	500	1.10	550	–	–		900		950
25	–	–	–	380	1.10	418	520		532

The Closing Stock consists of
120 units at Rs. 1.10 = 132
400 units at Re. 1.00 = 400
Rs 532

Highest-in, First-out (HIFO)

This method is based on the principle that materials received at the highest price in the stock are issued first. This will have the effect of pricing materials issued at the highest price and inventory valuation being made at the lowest possible prices. If the prices fluctuate widely, the highest cost will always be entering into the cost of goods sold. For instance, suppose on a particular date the stock ledger shows stock representing 500

units at the rate of Rs. 20,700 units at the rate of Rs. 12, and 300 units at the rate of Rs. 25. If materials are issued, then out of the above three lots, first of all 300 units would be issued. After this lot is over, then the second lot of 500 units, which becomes the highest priced stock after despatches of 300 units, would be taken up for transmission to production departments. Like other methods, this method also requires detailed records on the stores ledger.

Base Stock Price

Under this method it is assumed that the minimum stock of a commodity which must always be carried is in the nature of a fixed asset and is never realised while the business continues. This minimum stock is carried at original cost. The stock in excess of this figure would be treated in accordance with one of the other methods, that is, FIFO or LIFO. The limitation of this method is that while measuring the return on capital employed in the business, the stock value may be under-valued and therefore the resulting business results will not be reliable.

Example 4.9

From the following information prepare a stores ledger account assuming 100 units as base stock following the FIFO method:

Rate		*Rate per unit (Rs.)*
January 1, 2007	Received 500 units	20
January 10	Received 300 units	24
January 15	Issued 700 units	—
January 20	Received 400 units	28
January 25	Issued 300 units	—
January 27	Received 500 units	22
January 31	Issued 200 units	—

Solution:

Stores Ledger Account
Base Stock Price with FIFO (minimum stock 100 units)

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
2007									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200				500	20	10,000
							300	24	7,200
Jan. 15	–	–	–	400	20	8,000	100	20	2,000
				300	24	7,200			
Jan. 20	400	28	11,200	–	–	–	400	28	11,200
Jan. 25	–	–	–	300	28	8,400	100	20	2,000
							100	28	2,800
Jan. 27, 2007	500	22	1100				500	22	11,000
Jan. 31	–	–	–	100	28	2,800	100	20	2,000
				100	22	2,200	400	22	8,800

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Simple Average

This method is based on the principle that materials issued should be priced on an average price and not on exact cost price. The simple average is an average of prices without having regard to the quantities involved. It should be used when prices do not fluctuate very much and the stock value is small. The average under this method is calculated by dividing the total of rates of materials in the storeroom by the number of rates of prices. This method is easy to operate.

Example 4.10

Prepare a stores ledger account by following the simple average method on the basis of information given in Example 4.9.

Solution:

Stores Ledger Account
(Simple Average Price Method)

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
2007									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200	–	–	–	500	20	10,000
							300	24	7,200
Jan. 15	–	–	–	700	22	15,400	100		1,800
Jan. 20	400	28	11,200	–	–	–	500		13,000
Jan. 25	–	–	–	300	26	7,800	200		5,200
Jan. 27	500	22	11,000	–	–	–	700		16,200
Jan. 31	–	–	–	200	25	5,000	500		11,200

Average price for different issues has been calculated as follows:
Jan. 15 700 units = 20 + 24/2 = Rs. 22 per unit
Jan. 25 300 units = 24 + 28/2 = Rs. 26 per unit
Jan. 31 200 units = 28 + 22/2 = Rs. 25 per unit

Weighted Average

Under this method, issue of materials is priced at the average cost price of the materials in hand, a new average being computed whenever materials are received. In this method, total quantities and total costs are considered while computing the average price and not the total of rates divided by total number of rates as in simple average. The weighted average is calculated each time a purchase is made. The quantity bought is added to the stock in hand, and the revised balance is then divided into the new cash value of the stock. The effect of early price is thus eliminated. This method avoids fluctuations in price and reduces the number of calculations to be made, as each issue is charged at the same price until a fresh purchase necessitates the computation of a new average. It gives an acceptable figure for stock values.

Advantages

The following are the advantages of the weighted average method:

1. The method is logical and consistent as it absorbs cost while determining the average for pricing material issues.
2. The changes in the prices of materials do not much affect the materials issues and stock.

3. The method follows the concept of total stock and total valuation.
4. Both cost of materials issued and in stock tend to reflect actual costs.

Disadvantages

However, the weighted average method also has the following disadvantages:

1. Simplicity and convenience are lost when there is too much change in the prices of materials.
2. An average price is not based on actual price incurred, and therefore is not realistic. It follows only arithmetical convenience.

Example 4.11

Prepare a store ledger account on the basis of information given in Example 4.9 by following the weighted average method.

Solution:

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
2007									
Jan. 1	500	20	10,000	–	–	–	500	20	10,000
Jan. 10	300	24	7,200	–	–	–	800	21.50	17,200
Jan. 15	–	–	–	700	21.50	15,050	100		2,150
Jan. 20	400	28	11,200	–	–	–	500	26.70	13,350
Jan. 25	–	–	–	300	26.70	8,010	200		5,340
Jan. 27	500	22	11,000	–	–	–	700	23.34	16,340
Jan. 31	–	–	–	200	23.34	4,668	500		11,672

Periodic Simple Average

In cost accounting, where job costs may be prepared infrequently, say monthly, or bimonthly, it may be necessary to price materials issued by taking the average price ruling during that period. If it is calculated monthly, the average of the unit prices of all the receipts during the month is adopted as the rate for pricing issues during the month. Only a simple calculation has to be done at the end of the accounting period. The opening stock is not considered for computing periodic simple average because it has not been purchased during the current period and would have been included in the previous year's calculations. However, purchases made during the current year and closing stock are taken into account while computing this average. Basically, this method follows the principle of simple average price, but a period is set for which the average is calculated. Taking the above example, the total receipts and issue of the materials would be shown as follows:

Receipts			*Issues*		
Qty	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
1,700	94	39,400	1,200	23.50	28,200

$$\text{The periodic simple average} = \frac{\text{Total prices of the materials}}{\text{Total No. of prices}}$$

$$= \frac{94}{4} \text{ Rs. } 23.50$$

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Closing stock = Units 1700 – 1200 = 500

= Rs. 39,400 – 28,200 = Rs. 11,200.

The above rate, that is, Rs. 23.50 per unit will be used for pricing the materials issued during the period.

Periodic Weighted Average

This method is quite similar to the weighted average price method with only one difference that in this method average price is not calculated at the time of every new receipt of materials but only periodically. Periodic weighted average is calculated by dividing the total value of the materals purchased during a given period, by the total quantity purchased during the same period. Opening stock-its value and quantity both—are not considered while computing this average. In the above example, the periodic weighted average will be computed as follows:

	Receipts			*Issues*		
	Qty	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
Total	1,700	23.18	39,400	1200	23.18	27,816

Closing stock quantity = 500

Amount = Rs. 11,584

Periodic weighted average

$$= \frac{\text{Total cost of materials purchased}}{\text{Total quantity purchased}}$$

$$= \frac{39{,}400}{1{,}700}$$

= 23.18

Moving Simple Average

Under this method periodic simple average prices are further averaged. In this way moving average is obtained by dividing periodic average prices (of different periods by the number of periods taken. The periods chosen cover the period in which the material is issued. The following example explains this method.

Months	*Periodic average price (Rs.)*	*Moving average price (Rs.)*
January	2.55	
February	2.65	
March	2.72	
April	2.95	
May	3.15	
June	3.25	2.88
July	3.40	3.02
August	3.50	3.16
September	3.68	3.32
October	3.80	3.46
November	3.90	3.59
December	4.15	3.74

In the above example, moving average has been obtained for a six month period.

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The moving simple average method will give prices to be used for materials issues which are below the periodic average prices. This will be true when prices are showing an upward trend. In periods of falling prices, the resulting issue prices under the moving average method will be greater than the periodic average prices. This influences the value of closing stock which may be under-valued or over-valued.

Moving Weighted Average

This method finds the materials issues price by dividing the total of the periodic weighted average prices for a number of periods by the total number of such periods. This is similar to the moving simple average method.

Standard Price

This method charges materials issued into the factory at a predetermined budgeted, or estimated price reflecting a normal or an expected future price. A standard price is fixed for each class of materials in advance after making proper investigations. Receipts and issues of materials are recorded in quantities only on the materials ledgers, thereby simplifying the record-keeping. The difference between actual price and standard price is transferred to a purchase price variance which reveals to what extent actual costs are different from standard materials cost. Materials are charged into cost of goods sold at the standard price avoiding inconsistencies in different actual cost methods.

This method helps in knowing the purchase efficiency. If the total actual cost is less than the standard price, there will be favourable purchasing efficiency and vice-versa. This method is simple to operate and provides stability in costing system. However, standard price does not often reflect actual or expected cost, but only a generalised target. The stock value need not show actual cost incurrence and therefore does not necessarily conform to acceptable principles of stock valuation.

Inflated Price

This price includes carrying costs, cost of contingencies and also the losses arising out of evaporation, shrinkage, etc. This method aims to cover/recover the full cost of materials purchased.

Replacement Price or Market Price

Under this method materials issues are priced at replacement price on the date the issue is made. The replacement cost (market price) is the cost of securing the same type of material at the current moment in time. This method has the following advantages:

Advantages

1. The replacement cost approach matches current revenue against current cost and is therefore useful in measuring the operating results of a business firm correctly and accurately.
2. The use of replacement cost brings out clearly the difference between holding gains and operating gains and financial statement users will have a better understanding of the financial statement. If replacement cost is not used, the profit resulting due to holding of materials and inventory is taxed and therefore, impairs the capital of a business firm.
3. The replacement price if used, will disclose good or bad buying made by the purchase department of the firm.
4. The replacement cost approach helps in determining a selling price for the product which is competitive and realistic.
5. In case the prices of materials have decreased, the materials should be charged to the production at the current replacement price and the resulting loss should be taken into consideration in the accounts of the firm.

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Disadvantages

However, this method has certain disadvantages. Firstly, the objectivity is lost in accepting the replacement cost as the basis of materials pricing. The "replacement" concept is a relative one and in the absence of market for the materials, no equitable replacement price is determinable. This increases the subjectivity in selection of a current replacement price. Secondly, this is not based on actual cost, that is, cost incurred, and therefore may add confusion and complications in cost accounting. Thirdly, this method is workable only when market prices are available and reflect current cost of replacing the materials.

Example 4.12

The following are the transactions in respect of purchase and issue of components forming part of an assembly of a product manufactured by a firm which requires to update its cost of production, very often for bidding tenders and finalising cost plus contracts.

Date	*Quantity (in Nos)*		*Particulars*
2007 January	5	1,000	purchased at Rs 1.20 each
	11	2,000	issued
February	1	1,500	purchased Rs 1.30 each
	18	2,400	issued
	26	1,000	issued
March	8	1,000	purchased at Rs 1.40 each
	17	1,500	purchased at Rs 1.30 each
	28	2,000	issued

The stock on January 1, 2007 was 5,000 Nos valued at Rs. 1.10 each. State the method you would adopt in pricing the issue of components giving reasons. What value would be placed on stocks as on March 31 which happens to be the financial year-end and how would you treat the difference in value if any, on the stock account? *(ICWA Inter)*

Solution:

Stores Ledger

	Receipts			*Issue*			*Stock*		
Date	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*	*Qty*	*Rate*	*Amt*
Jan. 1							5,000	1.10	5,500
5	1,000	1.20	1,200				6,000		6,700
11				1,000	1.20	1,200			
				1,000	1.10	1,100	4,000		4400
Feb. 1	1,500	1.30	1,950				5,500		6,350
18				1,500	1.30	1,950			
				900	1.10	990	3100		3410
26				1,000	1.10	1,100	2,100		2.310
Mar. 8	1,000	1.40	1,400				3,100		3,710
17	1,500	1.30	1,950				4,600		5,660
28				1,500	1.30	1,950			
				500	1.40	700	2,600		3,010
31							2,600		3,010

Note:

The closing stock consists of 500 units @ Rs. 1.40	=	Rs.	700
2,100 units @ Rs. 1.10	=	Rs.	2,310
2,600		Rs.	3,010

The stores ledger shows that the value of closing stock based on actual cost is Rs. 3,010. The last purchase effected on March 17 @ Rs 1.30 per unit represents the current market price. On this basis, the value of stock as on March 31 works out to Rs. 3,380. This is higher than cost. Moreover in cost books stocks are shown at cost and not at market value. Hence, no adjustment is otherwise necessary.

Example 4.13

From the records of an oil distributing company, the following summarised information is available for the month of March 2005.

Sales of the month: Rs. 19,25,000

Opening Stock as on 1.3.2005: 1.25,000 litres @ Rs. 6.50 per litre

Purchases (including freight and insurance):

March 5	150,000 litres @ Rs. 7.10 per litre
March 27	100,000 litres @ Rs. 7.00 per litre

Closing stock as on 31.3.2005: 1,30,000 litres.

General administrative expenses for the month: Rs. 45,000

On the basis of the above information, work out the following using FIFO and LIFO methods of inventory valuation assuming that pricing of issues is being done at the end of the month after all receipts during the month:

(a) Value of closing stock as on 31.3.2005
(b) Cost of goods sold during March 2005
(c) Profit or loss for March 2005 *(ICWA Inter)*

Solution:

(A) FIFO Method of Pricing Issues

Stores Ledger

Date	*Particulars*	*Receipts*			*Issues*			*Balance*		
		Qty litre	*Rate Rs. per litre*	*Value Rs.*	*Qty litres*	*Rate Rs. per litre*	*Value Rs.*	*Qty litres*	*Rate Rs. per litre*	*Value Rs.*
1.3.2005	Balance b/d							1,25,000	6.50	8,12,500
5.3.2005	Purchases	1,50,000	7.10	10,65,000				2,75,000		18,77,500
27.3.2005	Purchases	1,00,000	7.00	7,00,000				3,75,000		25,77,500
	Issues (3,75,000 – 1,30,000 = 2,45,000 units)				1,25,000	6.50	8,12,500	2,50,000		17,65,000
					1,20,000	7.10	8,52,000	1,30,000		9,13,000
		2,50,000		17,65,000	2,45,000		16,64,500			

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(B) LIFO Method of Pricing Issues

Stores Ledger

Date	Particulars	Receipts			Issues			Balance		
		Qty litres	Rate per litre Rs.	Value Rs.	Qty litres	Rate per litre Rs.	Value Rs.	Qty litres	Rate per litre Rs.	Value Rs.
1.3.2005	Balance b/d							1,25,000	6.50	8,12,500
5.3.2005	Purchases	1,50,000	7.10	10,65,000				2,75,000		18,77,500
27.3.2005	Purchases	1,00,000	7.00	7,00,000				3,75,000		25,77,500
	Issues				1,00,000	7.00	7,00,000			
					1,45,000	7.10	10,29,500	1,30,000		8,48,000
		2,50,000		17,65,000	2,45,000		17,29,500			

Closing stock, cost of goods sold, profit under FIFO

(a) Value of closing stock		Rs. 9,13,000
(b) Cost of goods sold (8,12,500 + 8,52,000)		Rs. 16,64,500
(c) Profit		
Sales		Rs. 19,25,000
Less: Cost of goods sold		Rs. (16,64,500)
General administration expenses		Rs. (45,000)
Profit		Rs. 2,15,500

Closing stock, cost of goods sold, profit under LIFO

(a) Value of closing stock		Rs. 848,000
(b) Cost of goods sold (7,00,000 + 10,29,500)		Rs. 17,29,500
(c) Profit:		
Sales		Rs. 19,25,000
Less: Cost of goods sold	17,29,500	
General administration expenses	45,000	17,74,500
Profit		Rs. 1,50,500

Example 4.14

Show how the items given ahead relating to purchases and issue of raw material item will appear in the stores ledger card, using weighted average method for issue pricing:

		Units	Prices per units Rs.
Jan. 1	Opening balance	300	20
Jan. 5	Purchases	200	22
Jan. 11	Issue	150	?
Jan. 22	Purchases	200	23
Jan. 24	Issue	150	?
Jan. 28	Issue	200	?

(B.Com.(Hons), Delhi 2005)

Solution:

Store Ledger Account

Receipt				*Issue*			*Balance*	
Date	*Qty.*	*Rate*	*Amt.*	*Qty.*	*Rate*	*Amount*	*Qty.*	*Amt.*
Jan 1	—	—	—	—	—	—	300	6,000
Jan 5	200	22	4,400	—	—	—	500	10,400
Jan 11	—	—	—	150	20.80	3,120	350	7,280
Jan 22	200	23	4,600	—	—	—	550	11,880
Jan 24	—	—	—	150	21.60	3,240	400	8,640
Jan 28	—	—	—	200	21,60	4,320	200	4,320

Issue Prices:

$$\text{Jan 11} = \frac{10,400}{500}$$

$$= \text{Rs. } 20.80 \text{ per unit}$$

$$\text{Jan 24} = \frac{11,880}{550} = \text{Rs. } 21.60 \text{ per unit}$$

$$\text{Jan 28} = \frac{8,640}{400} = \text{Rs. } 21.60 \text{ per unit}$$

Example 4.15

The Stock Ledger Account for Material *X* in a manufacturing concern reveals the following data for the quarter ended Sept. 30, 2002.

	Receipts		*Issues*	
	Quantity Units	*Price Rs.*	*Quantity Units*	*Price Rs.*
July 1 Balance b/d	1,600	2.00	—	—
July 9	3,000	2.20	—	—
July 13	—	—	1,200	2,556
Aug. 5	—	—	900	1,917
Aug. 17	3,600	2.40	—	—
Aug. 24	—	—	1,800	4,122
Sept. 11	2,500	2.50	—	—
Sept. 27	—	—	2,100	4,971
Sept. 29	—	—	700	1,656

Physical verification on Sept. 30, 2002 revealed an actual stock of 3,800 units. You are required to:

(a) Indicate the method of pricing employed above.

(b) Complete the above account by making entries you would consider necessary including adjustments, if any, and giving explanations for such adjustments. *(ICWA Inter.)*

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Solution:

(a) The verification of the value of issues applied in the problem shows that Weighted Average Method of pricing has been followed. For example, the issue price of 1200 units of July 13 will be Rs. 2.13 $\left(\frac{\text{Rs. } 2556}{1200 \text{ units}}\right)$ which is the weighted average price of purchases made on July 9 and July 1 opening stock, calculated as follows:

$$\text{Weighted average price} = \frac{(1600 \text{ units} \times \text{Rs. } 2) + (3000 \text{ units} \times \text{Rs. } 2.20)}{1600 \text{ units} + 3000 \text{ units}}$$

$$= \frac{\text{Rs. } 9800}{4600 \text{ units}}$$

$$= \text{Rs. } 2.13$$

(b) The complete Stores Ledger account giving the transactions as stated in the problem together with the necessary adjustments is given below:

Stores Ledger Account (Weighted Average Method)

Date		Receipts			Issues			Balance		
		Qty Rs.	*Rate* Rs.	*Amount* Rs.	*Qty* Rs.	*Rate* Rs.	*Amount* Rs.	*Qty*	*Rate*	*Amount*
July	1	1600	2.00	3,200				1,600	2.00	3,200
	9	3,000	2.20	6.600				4,600	2.13	9,800
	13				1200	2.13	2,556	3,400	2.13	7,244
Aug.	5				900	2.13	1,917	2,500	2.13	5,327
	17	3,600	2.40	8,640				6,100	2.29	13,967
	24				1800	2.29	4,122	4,300	2.29	9,845
Sept.	11	2,500	2.50	6,250				6,800	2.37	16,095
	27				2100	2.37	4,971	4,700	2.37	11,124
	29				700	2.37	1,656	4,000	2.37	9,468
	30				200*	2.37	473	3,800	2.37	8,995

Closing Stock: 3,800 units, value of closing stock = Rs. 8,995

* Shortage of 200 units has been charged at the weighted average price of the goods in stock.

Closing stock 3800 units × Rs. 2.37 = Rs. = Rs. 9006. Since the figures of issue prices have been taken directly as given in the question, there is a minor difference in the value of closing stock.

Example 4.16

The following transactions in respect of material *Y* occurred during the six months ended 30th June, 2005.

Month	*Purchase (units)*	*Price per unit (Rs.)*	*Issued (units)*
January	200	25	Nil
February	300	24	250
March	425	26	300
April	475	23	550
May	500	25	800
June	600	20	400

Required:
The chief accountant argues that the value of closing stock remains the same, no matter which method of pricing of material issues is used. Do you agree? Why or why not? Detailed stores ledgers are not required.
(CA Inter)

Solution:

In the given problem the total number of units purchased from January to May 2005 is 1,900 and the same have also been issued during this period. Thus, there was no stock at the end of May, 2005 which could become opening stock for the next month. In June, 2005; only a single purchase and a single issue of material was made. The closing stock is of 200 units. In this situation, stock of 200 units at the end of June, 2005 will be valued at Rs. 20 per unit irrespective of the pricing method of material issues. Hence, one would agree with the argument of the Chief Accountant.

However, this will not be true with the value of closing stock at the end of each month. Moreover, the value of closing stock at the end of June, 2005 would have been different under different pricing methods if there were several purchases at different prices and several issues during the month.

Example 4.17

Oil India is a bulk distributor of oil. A periodic inventory of oil on hand is taken when the books are closed at the end of each month. The following summary of information is available for the month of December.

Sales Rs. 9,45,000
General Administrative Cost Rs. 25,000
Opening Stock 1,00,000 litres @ Rs. 3 per litre : Rs. 3,00,000
Purchases (including freight in)
Dec. 1 2,00,000 litres @ Rs. 2.85 per litre
Dec. 30 1,00,000 litres @ Rs. 3.03 per litre
Closing Stock Dec. 31, 1,30,000 litres

Compute the following by the first in-first out, weighted average and last in-first out method of inventory costing:

(a) Value of inventory on Dec. 31;
(b) Amount of cost of goods sold for Dec;
(c) Profit or loss for Dec. *(B.Com.(Hons), Delhi, 2007)*

Solution:

FIFO Method

(a)	**Closing Stock**		
	30,000 litre @ Rs. 2.85		85,500
	1,00,000 litre @ Rs. 3.03		3,03,000
	Value of closing stock		Rs.3,88,500
(b)	**Cost of Goods Sold**		
	Opening Stock 1,00,000 litre @ Rs. 3		3,00,000
	Add: Purchases		
	Dec. 1 2,00,000 litre @ 2.85	5,70,000	
	Dec.30 1,00,000 litre @ 3.03	3,03,000	8,73,000
			11,73,000

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			Rs.
Less: Closing Stock			3,88,500
Cost of Goods Sold			7,84,500

(c) Profit

SALES	9,45,000	
Less: Cost of Goods Sold	7,84,500	
Gross Profit	1,60,500	
Less: General Administrative Cost	25,000	
PROFIT	1,35,500	

LIFO METHOD

(a) Closing Stock

1,00,000 litre @ Rs. 3	3,00,000	
30,000 litre @ Rs. 2.85	85,500	
Value of Closing Stock	3,85,500	

(b) Cost of Goods Sold

		Rs.
Opening Stock 1,00,000 litre @ Rs. 3		3,00,000
Add: Purchases		
Dec. 1 2,00,000 litre @ Rs. 2.85	5,70,000	
Dec.30 1,00,000 litre @ Rs. 3.03	3,03,000	8,73,000
		11,73,000
Less: Closing Stock		3,85,500
Cost of Goods Sold		7,87,500

(c) Profit

SALES	9,45,000	
Less: Cost of Good Sold	7,87,500	
Gross Profit		1,57,500
Less: General Administrative Cost		25,000
Net Profit		1,32,500

Weighted Average Method

Unit	*Rs.*	*Amount*
1,00,000	3	3,00,000
2,00,000	2.85	5,70,000
10,000	3.03	3,03,000
4,00,000		11,73,000

$$\text{Weighted Avg Price} = \frac{11,73,000}{4,00,000} = 2.9325$$

Note:

We assume that all the units sold are sold on the last day of the month that is, on 31st Dec.

(a) Closing Stock

1,30,000 × 2.9325 = 3,81,225

Cost of Goods Sold			Rs.
Opening stock 1,00,000 Litre @ Rs. 3			3,00,000
Add: Purchases			
Dec. 1	2,00,000 Litre @ Rs. 2.85	5,70,000	
Dec.30	1,00,000 Litre @ Rs. 3.03	3,03,000	8,73,000
			11,73,000
Less: Closing Stock			381225
Cost of Goods Sold			7,91,775

(c) Profit

Sales	9,45,000
Less: Cost of Goods Sold	7,91,775
Gross Profit	1,53,225
Less: General Administrative Cost	25,000
Net Profit	1,28,225

Example 4.18

ABC Limited provides you the following information. Calculate the cost of goods sold and ending inventory, applying the LIFO method of pricing raw materials under the Perpetual and Periodical Inventory Control Systems.

Date		*Particulars*	*Units*	*Per unit cost (Rs.)*
January	1	Opening Stock	200	10
	10	Purchases	400	12
	12	Withdrawals	500	–
	16	Purchases	300	11
	19	Issues	200	–
	30	Receipts	100	15

Also explain in brief the reasons for a difference in profit, if any.

(B. Com. (Hons. Delhi)

Solution:

Computation of Cost of Goods Sold and Ending Inventory

Particulars	*Under Perpetual Inventory Method*	*Under Periodic Inventory Method*
	Uits × Rate = Amount Rs.	*Uits × Rate = Amount* Rs.
(i) Cost of Goods sold/withdrawn or issued:		
On 12th Jan.	400 × 12 = 4,800	100 × 15 = 1,500
	100 × 10 = 1,000	300 × 11 = 3,300

(*Contd.*)

(*Contd.*)

		300 × 12 = 3,600
	5,800	700 Rs. 8,400
On 19th Jan.	200 × 11 = 2.200	
	Total Rs. 8,000	
(ii) Ending Inventory	100 × 10 = 1,000	100 × 12 = 1,200
	100 × 11 = 1,100	200 × 10 = 2,000
	100 × 15 = 1,500	
	300 Rs. 3,600	300 Rs. 3,200

Reasons for Difference in Profits. The cost of good sold/issued/withdrawn is more under Periodic Inventory System as compared to Perpetual Inventory System. Hence the profit under the former will be less as compared to the later. Alternatively, it can be so said that less the amount of ending inventory, less will be the profits.

Example 4.19

The following are the particulars regarding receipts and issues of certain material:

Opening stock	1,000 kg @ Rs. 9.00 per kg
Purchased	5,000 kg @ Rs. 8.50 per kg
Issued	600 kg
Issued	3,750 kg
Issued	650 kg
Purchased	2,500 kg @ Rs. 8 per kg

The credit balance of price variance account, before transfer to costing profit and loss account, was Rs. 500.

Calculate the standard rate at which the above issues should be made, and determine the value of closing stock.

Solution:

The standard price at which the materials were issued in the last period was Rs. 9. This gave a profit of Rs. 500.

Therefore, this time, materials should be valued at a lower standard price as compared to last period. The standard price for this period should therefore be:

$$\frac{\text{Rs. } 9{,}000 - \text{Rs. } 500}{1{,}000} = \frac{\text{Rs. } 8{,}500}{1{,}000} = \text{Rs. } 8.50 \text{ per kg}$$

Value of the Closing Stocks:

Opening stock	1,000	per kg @ Rs. 9	Rs. 9,000
Purchases	5,000	kg @ Rs. 8.50	42,500
Purchases	2,500	kg @ Rs. 8	20,000
	8,500		71,500
Less: Issues	5,000	@ Rs. 8.50	42,500
Balance	3,500 units		Rs. 29,000

The value of stock at standard price is Rs. 29,750 (3500 × 8.50). The stock therefore will be valued at Rs. 29,750 and Rs. 750 will be debited to the price variance account.

Example 4.20

The annual accounts of a trading company are to be made up to December 31 but it was not possible to carry out a stock-taking until January 5 at which date the stock was valued at cost at Rs. 68,567.

The following transactions took place between 1st and 5th January:

	Rs.
Goods received	4,600
Goods returned	200
Sales	10,500
Returns by customer	625

The rate of gross profit is 25% of cost.

Prepare a statement to show the valuation of stock as at 31st December.

Solution:

Statement Showing the Valuation of Stock

		Rs.	*Rs.*
Stock as at 5th January			68,567
Add:	Goods returned		200
	Cost of goods sold:		
	Sales	10,500	
Less:	Gross profit $\left(\frac{25}{125} \times 10{,}500\right)$	2,100	
			8,400
			77,167
Less:	Goods received	4,600	
	Returns by customers	625	
			5,225
	Valuation of Stock on 31st December		71,942

PRICING OF MATERIALS RETURNED TO VENDOR

A business firm may return materials to a supplier. In the financial books, purchase returns are valued at the price at which they are purchased. In cost accounting the following rules are generally applicable as to the valuation of such purchase returns.

1. In case the firm is following the FIFO method, the materials returned to the supplier would be valued at the price of the oldest goods in stock on the date on which the materials are returned.
2. The materials returned would be valued at the price of the latest units received and still in stock, if the firm is following the LIFO method.
3. Purchase returns would be valued at average price if the firm is following the average price method. The Quantity and value of materials returned are shown generally in the issues column. Alternatively, they may be shown in the receipts column in red ink.

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Example

200 units were received from *A* @ Rs. 4 per unit
200 units were received from *B* @ Rs. 5 per unit
50 units received from *A* were returned to him.

In the first situation (when the firm is following FIFO method), assume 300 units were issued to production. In this, 50 units will be valued @ Rs. 5 per unit. However, if only 100 units were issued to production, then 50 units will be valued @ Rs. 4 per unit under FIFO method.

In the second situation (LIFO method), if 300 units have already been issued to production, 50 units will be valued @ Rs. 4 per unit. However, if only 100 units have been issued to production, then 50 units returned to A will be valued @ Rs. 5 per unit.

In the third situation, when the firm is following average price method, units returned will be valued in terms of average price (simple or weighted average as the case may be). Simple average or weighted average price will be calculated in the manner as explained earlier in this chapter.

PRICING OF MATERIALS RETURNED TO STOREROOM

When materials are returned from requisitioning departments to the storeroom for credit, the problem arises as to the proper method of handling such returns in stock ledger sheets. The following rules apply in this regard.

1. In case the firm is following the LIFO or FIFO method, the returned materials should be recorded at a price at which they have been originally issued and those units will be issued at the old price on the next requisition which is received. Alternatively, they may be treated as new purchases and retaining the original pricing, they can be given a position after the last purchase received.
2. If the firm is following the average price method, the returned materials should be recorded at the price originally issued, but a new average cost should be computed as if the goods returned were a new purchase.
3. Materials returned can be recorded at the current issue price also. That is, materials returned are priced at a price at which materials have been issued on the date of returns from the stores department. In this way, in this method, the issue price of materials (on the date of returns) is used to price materials returned to storeroom. In this method, there is no need to search original issue price of the materials returned and thus, this method saves time and clerical work.

The quantity and value of materials returned to the storeroom should be shown in the Issues column in red ink or alternatively they may be shown in the Receipts column.

SELECTION OF A MATERIALS PRICING METHOD

The various methods which are in use have advantages and disadvantages from the viewpoint of both convenience and accounting aspects. The factors which should be taken into consideration while deciding materials pricing methods are as follows:

1. Customs and practices within the industry or group of companies: This produces more comparable figures.
2. Frequency of price fluctuations and frequency of materials purchases.
3. Relative value of materials cost to total cost of products or jobs manufactured.
4. Range of price fluctuations.
5. Relative rate of stock turnover.

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6. Quantities of materials to be purchased at any one time.
7. The effect of the different pricing methods on tax liability.
8. The accuracy with which materials issues can be computed.
9. Cost of clerical work involved in maintaining records.
10. The possibility of using different methods for various classes of items in the inventory.
11. The relationship of selling prices to the costs that are matched with those prices.

Costing materials present important, often complex and sometimes highly controversial questions concerning the valuation of materials used in production and the value of inventory remaining to be consumed at a future period. The different methods of materials pricing are difficult to compare adequately; this is a complex task. Some industries prefer the use of market prices for charging materials into production; market prices are the prices prevailing at the time the materials are used. These are the prices which would have to be paid if the materials were purchased at the time. This approach to materials costing has been gaining popularity over the recent years. This method reflects the current position, the current cost and the efficiency of purchasing done by a firm. In periods of rising prices, lowest material cost will flow into production under FIFO, highest materials cost under LIFO, and average costing will produce a material cost figure which is between FIFO and LIFO figures. In a period of falling prices the reverse situation will be found i.e., FIFO will show the highest cost of materials used, LIFO the lowest cost of materials used, and average costing will show a cost figure between FIFO and LIFO figures.

It is true that no one best method can be suggested, which is applicable to all situations; pricing methods may vary within the same company. It must be emphasised that whatever method is adopted, it must be consistently used from period to period. The most appropriate method is the one which produces accurate and meaningful cost figures for purposes of control and analysis and matching costs against revenue produced in order to determine the net operating income.

THEORY QUESTIONS

1. What are the methods of pricing materials issues? When do you advocate pricing the issues at cost price based on last-in, first-out? *(CA Inter)*

2. State the various methods of pricing the issue of materials or stores. State the method to be adopted for the issue of materials for an industry where their cost is fluctuating constantly. *(B .Com. Delhi)*

3. Explain the following two methods of pricing issue of materials and also the circumstance under which these methods are used.
(i) FIFO
(ii) LIFO *(ICWA Inter)*

4. Describe the following methods of valuing materials issued to production and discuss the advantage and disadvantage of each?
(i) First-in, First-out; (ii) Weighted Average; (iii) Replacement Price. *(CA Inter)*

5. Explain the FIFO methods of valuation of materials issues. Discuss the effects of rising prices and falling prices on these two methods of pricing of materials issues. *(CA Inter)*

6. What factors have to be considered for adopting a method for the pricing of materials? In the light of these and relevant factors, give a comparative description of LIFO and FIFO.
(B. Com. (Hons.) Delhi 2000, 2004)

7. What are the conditions that favour the adoption of the Last-in, First-out system of materials pricing ? Explain its working and indicate its advantages and limitations. *(CA Inter)*

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8. Give the advantages and disadvantages of the actual cost basis of pricing of material issues. *(B. Com. (Hons.), Delhi)*
9. Explain FIFO and LIFO methods of pricing of material issues. Which of these should be preferred in rising and falling prices and why? *(B.Com. (Hons.), Delhi, 2007)*
10. Under conditions of rising prices, which of the following two methods of pricing material issues would you recommend and why?
    (i) FIFO
    (ii) LIFO *(B. Com. (Hons.), Delhi)*
11. Briefly contrast the effects of using first-in, first-out with the last-in, first-out methods of pricing material issues from stores. *(B. Com. (Hons.), Delhi)*
12. Write short notes on:
    (i) LIFO vs FIFO
    (ii) Bill of Materials
    (iii) Prepetual Inventory System.

SELF-EVALUATION QUESTIONS

1. Which method of materials pricing best approximates specific identification of the actual flow of costs and units in most manufacturing situations?
   (a) Average cost (b) FIFO
   (c) LIFO (d) Base stock
2. Alpha company was using FIFO (and not LIFO) for materials pricing and its value of inventory was found lower. Assuming no opening inventory, what direction did the purchase prices move during the period?
   (a) Up (b) Down
   (c) Steady (d) Cannot be determined
3. A materials pricing method in which the oldest cost incurred rarely have an effect on the closing inventory valuation is
   (a) FIFO (b) LIFO
   (c) Simple average (d) Weighted average
4. Alpha company has been using LIFO method of materials pricing for 15 years. Its 2008 closing inventory was Rs. 15,000 but it would have been Rs. 26,000 if FIFO had been used. Thus, if FIFO had been used, this company's net income before taxes would have been
   (a) Rs. 11,000 less over 15-year period
   (b) Rs. 11,000 greater over 15-year period
   (c) Rs. 11,000 greater in 2008
   (d) Rs. 11,000 less in 2008

PROBLEMS

1. The following quotation is received from a supplier in respect of a material:

   Lot price 1,000 units — Rs. 5 each.
   ,, 2,000 units — Rs. 4.75 each.
   ,, 3,000 units — Rs. 4,00 each.
   Trade discount — 25%
   Freight charges per order—Rs. 100.
   Containers are charged at Re. 0.50 each.

One container is required for every 100 units and if containers are returned within two months, credit would be received at Re. 0.20 each.

Calculate the material cost for 3,000 units assuming that purchaser decided to purchase this lot.

Ans: Material cost Rs. 9109

2. The particulars relating to the import of sealing ring invoiced by *AB* and Co., during December 2002 are given below:

(a) Sealing ring 1,000 pieces @ $2.00 CIF Bombay Port.
(b) Customs duty was paid @ 100% on invoice value (which was converted to Indian currency by adopting an exchange rate of Rs. 17.20 per $).
(c) Clearing charges Rs. 1,800 for the entire consignment.
(d) Freight charges Rs. 1,400 for transporting the consignment from Mumbai port to factory premises.

It was found on inspection that 100 pieces of the above material were broken, and therefore, rejected. There is no scrap value for the rejected part. Also, no refund for the broken material would be admissible as per the terms of the contract. The management decided to treat 60 pieces as normal loss and the rest 40 pieces as abnormal loss. The entire quantity of 900 pieces was issued to production.

Calculate:

(a) Total cost of material.
(b) Unit cost of material issued to production.

Also state briefly how the value of 100 pieces rejected in inspection will be treated in costs. *(ICWA Inter)*

Ans: (a) Rs. 72,000
(b) Rs. 76.59 per piece

3. Calculate the raw material cost of 100 yards of hessian cloth made in a jute mill. The cloth contains 45% warp yarn and weighs 10 oz per yard. Wastage of yarn is 2% warp and 5% weft. Both the yarns are spun from jute fibre at Rs. 1.25 for warp and Rs. 108 for weft per quintal after treating the fibre with the mixture of water and oil at 50 paise per kg such that warp contains 5% oil and weft contains 7% oil. Loss of fibre up to spinning is 5% warp and 10% weft. All percentage except the yarn content in cloth are input based. *(ICWA, Inter)*

Ans: Rs. 37.50

4. From the following details of stores receipts and issues of material "EXA" in a manufacturing unit, prepare the Stock Ledger using "Weighted Average" method of valuing the issues:

Nov.	1	Opening stock 2,000 units @ Rs. 5 each.
Nov.	3	Issued 1,500 units to Production.
Nov.	4	Received 4,500 units @ Rs. 6.00 each.
Nov.	8	Issued 1,600 units to Production.
Nov.	9	Returned to stores 100 units by Production Department (from the issues of November, 3).
Nov.	16	Received 2,400 units @ Rs. 6.50 each.
Nov.	19	Returned to the supplier 200 units out of the quantity received on November, 4.
Nov.	20	Received 1,000 units @ Rs. 7.00 each.
Nov.	24	Issued to Production 2,100 units.
Nov.	27	Received 1,200 units @ Rs. 7.50 each.
Nov.	29	Issued to Production 2,800 units.

(use rates upto two decimal places). *(ICWA Inter)*

Ans: Cost of issued materials Rs. 18,256
Closing stock Rs. 19,558

5. You are presented with the following information by Sphix Engineering Co. relating to the first week of September, 2008.

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Materials—The transactions in connection with the materials are as follows:

	Receipts		*Issues*
Days	*Units*	*Rate per unit (Rs)*	*Units*
1st	40	15.00	
2nd	20	16.50	
3rd			30
4th	50	14.30	
5th			20
6th			40

Calculate the cost of materials issued under FIFO method and Weighted Average Method of issue of materials.

Ans:

	Cost of materials issued			*Stock*
	Units	*Amt Rs.*	*Units Rs.*	*Amt.*
FIFO	90	1359	20	286
Weighted Average	90	1350	20	295

6. The stores ledger of a manufacturing Company reveals the following entries of a particular material.

Date	*Receipts*			*Issues*		
	Quantity in units	*Rate Rs.*	*Amount Rs.*	*Quantity in units*	*Rate Rs.*	*Amount Rs.*
2002 January						
2	4,000	1.80	7,200			
5	2,000	1.75	3,500			
18				10,000		19,500
February						
5				5,000		9750
14	3,000	1.85	5,550			
18	3,000	1.90	5,700			
20				10,000		19,200

Opening stock as on 1.1.2002 was 20,000 units valued at Rs. 40,000, Closing stock as per physical verification on 28.2.2002 was 6,950 units.

Work out the method of pricing the issue which you consider to have been adopted for the issue of the material and show the working of the issue rates (correct to 2 places of decimal). Complete the account of the material and work out the value of the closing stock as on 28.2.2002 on the basis of valuation adopted and also under any other method of valuation, you are familiar with. *(ICWA Inter)*

Ans: Closing Stock

Weighted Average 6950 units	Rs.	13404
FIFO 6950 units	Rs.	12912.50

In the given question weighted average rate method has been used in preparing the Stores Ledger of the Company.

7. Show the stores ledger entries as they would appear when using
(a) the weighted average method
(b) the LIFO method of pricing issues, in connection with the following transactions:

April		Unit	Value
1	Balance in hand	300	600
2	Purchased	200	440
4	Issued	150	
6	Purchased	200	460
11	Issued	150	
19	Issued	200	
20	Purchased	200	480
27	Issued	250	

In a period of rising prices such as above what are the effects of each method?

Ans: (a) 150 units Rs. 342; (b) 150 units Rs. 300. *(ICWA, Inter)*

8. On January 1, Mr. G started a small business buying and selling a special yarn. He invested his savings of Rs. 4,00,000 in the business and during the next six months, the following transactions occurred:

Date of receipt	*Yarn Purchase*		*Yarn Sales*		
	Quantity boxes	*Total cost (Rs.)*	*Date of despatch*	*Quantity boxes*	*Total value (Rs.)*
January 13	200	7200	February 10	500	25,000
February 8	400	15200	April 20	600	27,000
March 11	600	24000	June 25	400	15,200
April 12	400	14000			
June 15	500	14000			

The yarn is stored in premises Mr G. has rented and the closing stock of yarn counted on 30th June was 500 boxes.

Other expenses incurred and paid in cash during the six months period amounted to Rs. 2300.

Required:

(a) Calculate the value of the material issues during the six month period and the value of closing stock at the end of June, using the following methods of pricing:
(i) FIFO
(ii) LIFO, and
(iii) Weighted average

(b) Calculate and discuss the effect each of the three methods of material pricing will have on the reported profit of the business, and examine the performance of the business during the first six month period.

(ICMA, U.K., Adapted)

Ans:	*Closing stock*	*Cost of sales*	*Profit*
FIFO	Rs. 14,000	Rs. 19,600	4,500
LIFO	Rs. 19,600	Rs. 54,800	10,100
Weighted Average	Rs. 16,486	Rs. 57,914	6,986

9. A consignment consisted of two chemicals *A* and *B*. The invoices gave the following data:

Chemical *A*—4,000 lb @ Rs. 2.50 per lb...	Rs. 10,000
Chemical *B*—3,200 lb @ Rs. 3.25 per lb...	Rs. 10,400
Sales tax	Rs. 816
Railway freight	Rs. 384
Total cost	Rs. 21,600

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A shortage of 200 lb in *A* and 128 lb in *B* was noticed due to breakage. What stock rate would you adopt for pricing issues assuming a provision of 5% towards further deterioration?

Ans: Material *A* Rs. 2.94
Material *B* Rs. 3.76

10. You are the Chief Accountant of a sugar factory, whose cost of production per tonne of sugar is given below:

	30-6-2006 (Rs.)	*30-6-2007 (Rs.)*
Sugarcane cost	1,700	1,900
Sugarcane transport and supervision	50	55
Other process chemicals	45	50
Fuel	15	16
Salaries, wages and bonus	60	75
Repairs, renewals and maintenance	125	135
Packing materials and expenses	75	85
Interest	250	150
Selling overheads	20	20
Administration overheads	85	95
Depreciation	300	300
Total cost	2,725	2,881
Free market sale price	2,800	4,800
Controlled market sale price	2,600	2,600
Export price	1,650	5,400

Salaries, wage and bonus include administration salaries Rs. 20.
You have been valuing the closing stock of sugar consistently at cost or market price whichever is lower. For the purpose of arriving at cost you have been taking the total cost as given above.
The auditor objects to the method of arriving at cost adopted in view of Accounting Standard No. 2 on valuation of inventory and he wants to exclude the depreciation, interest, administration and selling overheads.
Keeping the stipulations of the Accounting Standard-2 in view, give your opinion on:

(a) What shall be the cost for the purpose of valuation of stock in both the above years?
(b) In view of the accumulation of heavy stock, the directors want to be consistent with the method of valuation of stocks as in the past in order to present a reasonable financial position. Will you be able to convince the auditors that the method of arriving at total cost is the correct method and, if yes, how?
(c) If the author's opinion is adopted, what shall be the nature of disclosure in the published accounts, if any?
(d) What shall be the basis for valuing stock in each of the above years?

Note:
Local sales price include excise duty of Rs. 500 per tonne. *(ICWA, Final)*

Ans. (a) Total cost year 2006, Rs. 2,350
Year 2007, Rs. 2,596

(b) Depreciation of factory assets is a part of factory overhead and must be included in product costs. Auditor's opinion to exclude it is not reasonable.
(c) Auditor's opinion amounts to change in accounting policy and as per AS2, it should be disclosed.
(d) Lower of cost and minimum of realisable values.
year 2006 Rs. 1,650
year 2007 Rs. 2,100

11. The Directors of Quality Machineries Ltd. requests you to ascertain the amount at which the inventory should be included in the financial statement for the year 2006-07. The value of inventory as shown in the books is Rs. 12,50,000.

To determine the net realisable value of the inventory (on test check basis), you had selected several items whose books value was Rs. 3,50,000.

You ascertain that except for items (a) to (c) below, the cost was in excess of the realisable value by Rs. 29,532.

The following items require special treatment:

(a) One machine (cost Rs. 1,30,000) can now fetch Rs. 1,15,000. It was priced at Rs. 70,000 and was written down to the same figure at the end of 2006-07.

(b) A pump (cost Rs. 50,000) was expected to realize Rs. 35,000. A special commission of 15% would have to be paid to the broker.

(c) 6 units of product no. 15,710 were in stock and each valued at Rs. 5,520; the selling price was Rs. 4,500 per unit; selling expenses are 10% of the selling price.

Taking into consideration only the above mentionesd items requiring special treatment, compute the value of their inventory as at 31st March, 2007, you would consider reasonable. *(C.A. Final)*

Ans: Value of all the items of inventory Rs. 11,01,398.

5 LABOUR COSTS: ACCOUNTING AND CONTROL

Learning Objectives:

After reading this chapter, you should be able to:

1. explain direct and indirect labours, their nature;
2. discuss the importance of various organisational departments in exercising control over labour costs;
3. explain straight time and piece work methods of wage system, different incentive wage plans;
4. describe method study, time and motion study, work measurement, merit rating and various job evaluation methods, difference between job evaluation and merit rating;
5. discuss labour turnover, its causes and costs; and
6. explain treatment of labour-cost related items such as overtime premium, idle time, fringe benefits etc.

INTRODUCTION

Proper control and accounting for labour costs is one of the most important objectives of all business firms. Cost accounting for labour has three primary objectives:

1. Determining labour costs in the cost of product or service.
2. Reporting labour costs for planning and control.
3. Reporting labour costs for decision-making.

For a manufacturing business firm engaged in producing a specific product, labour costs are accumulated and charged to the product as they are produced. Similarly, in a service (not-for-profit) organisation, total cost as well as the cost of different functions (services) are to be determined. This helps the organisation to know what it costs them to provide a service or perform some activities.

The second objective is to provide management with labour cost information for effective planning of the labour force in the organisation and for adequate control of labour costs. The control process of labour cost involves a comparison of actual labour costs with standard labour cost. The differences between the two are then analysed and possible reasons are determined so that management can take suitable action to control the labour cost expenditure in future periods.

Labour cost information is used for decision-making purposes also. Many managerial decisions, such as pricing decisions, expansion of business, dropping a product line, replacement of plant and equipment, entering into a new market, etc. require information about current actual labour costs and emerging trends therein.

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DIRECT LABOUR AND INDIRECT LABOUR

Direct Labour

Direct labour consists of the wages paid to labour which convert raw materials into some form of finished output. Direct Labour cost comprises the wages which can be identified with, and allocated to cost units. Examples of some direct labour functions in a manufacturing enterprise would be assembly line workers, moulders, operators, samplers and finishers.

Indirect Labour

Indirect labour is the labour which is not engaged in converting raw materials into finished output. The indirect labour cost is the cost which "cannot be allocated* but which can be apportioned to, or absorbed by, cost centres or cost units." Indirect labour includes, among others, formen, inspectors, watchmen, supervisors, factory clerks, store-keepers and time-keepers. In fact, after charging to departments and to products all labour costs which can, as a practical matter, be charged directly, the indirect labour costs remain.

ORGANISATION FOR LABOUR CONTROL

The significant portion of labour costs in the total cost of production points out its importance and need for effective control over labour and labour-related costs. The following departments/functions contribute to the efficient utilisation of labour and adequate control over labour costs.

1. Personnel Department
2. Engineering Department
3. Time-keeping Department
4. Payroll Department
5. Cost Accounting Department

Personnel Department

The main function of the personnel department is to provide an efficient labour force. The personnel manager/director with the help of department heads is responsible for the execution of the policies formulated by board of directors regarding employment, discharge, classification of employees, wages and wage systems. Hiring of employees may be for replacement or for expansion. Replacement hiring starts when a department head or a foreman sends an employee requisition (see Fig. 5.1) to the personnel department.

The personnel department prepares an Employee's Record Card on engaging a new worker. This will show full personal details of the employee, particulars of previous employment, medical category and wage rate. Normally, spaces are also provided for subsequent recording of transfers and promotions, wage rate revisions, details of attendance, merit and conduct reports, sickness and accidents and the date and reason for leaving (see Fig. 5.2).

Engineering Department

The engineering department maintains control over working conditions and production methods for each job and department or process by performing the following functions:

1. Preparation of plans and specifications for each job scheduled for production.
2. Supervision of production activities with production departments.

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* The term "allocation" means the allotment of whole items of cost centres or cost units.

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Employee Requisition

Requisition No. _____
Date _____
Department _____

Report to _____
(Supervisor or Foreman's Name)
on _____

Number of employees requested	Job Specification Description No.

Requisitioned by _____ Approved by _____

Fig. 5.1 **Employee Requisition**

Front

Particulars *Employment Record*

Home address	Date	Department	Grade	Employment
Date employed				
Date of birth				
Married/Single				
Height				
Weight				
General physique (Category)				

Wage Rate Record

Previous Employment	Date	Rate	Particulars	Date	Rate	Particulars
References:						
Notes:						

Fig. 5.2 a **Employee's Record Card (Front Side)**

Back

Time-keeping and Merit					Training, Progress and Conduct		
Year	Days lost		Overtime hours	Lost time hours	Merit and notes	Date	Particulars
	Sickness	Others					

Date left:
Reason for leaving:
General remarks:

Fig. 5.2 b **Employee's Record Card (Back Side)**

3. Inspection of parts and jobs at successive stages of production and at the completion of production.
4. Initiation and supervision of research and experiment work.
5. Safety and efficient working conditions.

Time-keeping Department

The first step in accounting for labour cost is to prepare an accurate record of the time spent by each employee. Time-keeping in labour costing and control is important because of the following reasons:

1. It accumulates the total number of hours worked by each employee so that his earnings can be calculated.
2. Absence of a time-keeping arrangement will create frustration among those employees who are punctual or bound by the attendance rules.
3. Certain benefits like pension and gratuity, leave with pay, provident fund, salary, promotion are linked with continuity of service of employees. Attendance records, in this regard, can be helpful and useful to employees.
4. Overhead costs being indirect costs are apportioned to different products on some equitable basis. Time-keeping is necessary if apportionment is to be done on the basis of labour hours.
5. Time-keeping records and attendance details may be used by the firm for analysis proposes and by researchers, government authorities, etc.

Clock Card

The most common form of attendance record is the clock card on which the employee punches the time at which he comes in and leaves the factory. Each week, a new card is prepared for each employee on the payroll. At the end of the week, the cards are collected and transferred to the payroll department for calculation of gross earnings.

Daily Time Report

No. _____
Name _____
Nature of Work _____

Job No.	*Time on*		*Time off*		*Time worked*	
	Hours	*Minutes*	*Hours*	*Minutes*	*Hours*	*Minutes*
561	8	00	12	00	4	00
357	12	30	1	30	1	00
816	1	30	2	15	0	45
548	2	15	3	00	0	45
751	3	00	4	30	1	30

Foreman

Fig. 5.3 Daily Time Report

Clock cards provide a record of the total hours, employees were available on jobs. However, this card does not reveal as to how employees spend their time which is an important question to be solved before entries can be made in the cost records. This information is supplied by time tickets or daily labour summaries (see Fig. 5.3) on which time-keepers record the daily activities of direct labour; time spent on specific orders, time spent on indirect labour operations such as machine maintenance, or idle time waiting for reassignment or machine set-up.

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Disc Method

A second method of recording time is by using a metal disc which contains an identification number for each employee. A board containing hooks to which employees' discs are attached is kept near the entrance to the plant. On arrival, the employee removes his disc and places it in a box, or alternatively hooks it on a second board against his number. The box is removed at starting time, and the time-keeper becomes aware of late arrivals by requiring the workers concerned to report to him before starting. The time-keeper will record in an Attendance Register any late arrivals and workers leaving early. He will also detail the absentees each day.

Attendance Records

The simplest form of attendance records is a manual register which each employee signs into on arrival and departure, noting his times in and out. This type of time-keeping record is subject to limitations and many abuses by employees. In a business firm where a large number of workers are employed, and if the worker records his own time, it provides very little check upon late arrivals. The disadvantages of manual registers and time registers are the hold-ups that occur when each worker has to sign his name in turn, and the amount of clerical work involved in the posting of entries to individual attendance records.

Time-booking

Time-booking like time-keeping is equally important. Time-booking means recording the time spent by a worker on each job, process or operation. Time-booking fulfils the following purposes:

1. To determine amount of labour cost which can be obtained through time-booking is required.
2. To determine the quantity and value of work done.
3. To determine earnings like wages, bonus which depend on the time taken by a worker in performing job or jobs in a factory.

Recording work time can be done by any one of the following methods:

Job Ticket

Job tickets are given to all workers where time for commencing the job is recorded as well as the time when the job has been completed. After completing one job, the worker is given another job ticket for the next job to be completed by him.

Labour Cost Card

This card is meant for a job which involves many operations or stages of completion. Instead of giving one card to each worker, only one card is passed on to all workers and time taken on the job is recorded by each one of them. This card disclose the aggregate labour cost of the job or the product.

Weekly Time Sheets

A sheet is given to each worker to record time on a weekly basis. However, weekly time sheets should be filled up without much delay on each day failing which some inaccuracies are bound to occur on the time sheets.

Daily Time Sheets

Each worker records the time spent by him on the work during the day for which a sheet is provided to each worker. Since time is recorded on a daily basis, accuracy is built up on the time shees. However, daily time sheets are generally not used. This could be used for maintenance and repairmen who have to do different jobs in different departments.

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Time and Job Card

This card records the attendance time of workers and work time of a worker on a single sheet.

Payroll Department

Preparation of the payroll from clock cards, job or time tickets, or time sheets is done by the payroll department. The payroll department (tabulation) is an intermediate function between the time-keeping (accumulation) and the cost accounting (analysis) department. The following are the functions of the payroll department:

1. To compute employee wages.
2. To pay employees and for prompt and accurate reporting of wages and salaries to employees.
3. To prepare departmental payroll summaries.
4. To maintain individual employee payroll records.
5. To calculate payroll taxes, deductions and other related payroll liabilities.
6. Compilation of labour statistics for management.

The responsibilities of the payroll department in controlling and accounting for labour costs are as follows:

1. To maintain a record of the job classification, department and wage rate for each employee.
2. To verify and to summarise the time of each worker as shown on the daily time cards.
3. To compute the wages earned by each worker.
4. To prepare the payroll for each department showing the total amount earned for the period by each employee.
5. To compute the payroll deductions under the Acts.
6. To compute the payroll deductions authorised by the employee for union dues, charitable donation, saving bonds, and health and accidental insurance.
7. To maintain a permanent payroll record for each employee.
8. To distribute salary and wage payments.

Cost Accounting Department

The cost accounting department is responsible for the accumulation and classification of all cost data of which labour costs are one of the most important elements. On the basis of the labour summary or the time or job cards, the cost department records direct labour cost on the appropriate cost sheets or production reports and indirect costs on the departmental expense sheets.

WAGE SYSTEMS

An important aspect of labour cost control is a wage system designed primarily for exercising management control over labour. The following objectives should be considered in the selection of a wage system:

1. Acceptance by employees to avert slowdowns and work stoppages.
2. Provision for flexibility.
3. Provision for economy in administration.
4. Supplying of labour statistics for use in industrial relations and for trade associations, government agencies, and competitors.
5. Stabilisation of labour turnover.
6. Minimising of absenteeism.
7. Provision for incentive plans.

Basically there are two wage systems to pay for labour: (i) straight time which is by hour, day, or week, and (ii) piece work, which is by the unit of product.

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Straight Time

Under the time basis, the worker is paid at an hourly, daily or weekly rate and his remuneration depends upon the time for which he is employed and not upon his production. If a worker works for an overtime, the wage agreement usually provides that all hours worked in excess of an agreed number are paid for at a higher rate. The time basis wage system for direct labour is found in those industries where:

1. The speed of production cannot be influenced by the energy or dexterity of the worker.
2. The quality of work is of paramount importance.
3. It is difficult to measure the work done by the employee.

From the point of view of the worker, the straight time method has both advantages and disadvantages. Workers have feelings of security and certainty which appeal to them. They can depend upon a definite wage or salary regardless of the amount of work completed or the efficiency of their work, provided it is above the minimum requirements. However, this wage system does not give proper recognition or reward to efficient workers whose productivity is above the average of the other workers. There is little incentive to achieve better or superior performance.

From the employer's view-point, time wage systems are easy to compute and understand and provide economy in time-keeping and payroll recording. But on the other hand, constant supervision is required, otherwise considerable wasted time may be paid for. Among the workers, the inefficient workers receive the same wages as the efficient workers, thus tending to cause dissatisfaction and frustration among the workers and increasing the labour cost per unit produced.

The time basis is still the most popular wage system for workers, such as clerks, accountants, stenographers, factory helpers, members of the supervisory staff and officers whose work cannot be standardised and measured satisfactorily. This is preferred by skilled and efficient workers with whom the quality of work is a more important factor than volume of production.

Piece Work

Under this method, a fixed rate is paid for each unit produced, job performed or number of operations completed, and the worker's wages thus depend upon his output and not upon the time he spends in the factory.

Piece-rates are of advantage to management in the following respects:

1. Managerial superivision is not much needed for production, since each worker assumes responsibility for his own time output.
2. Higher production reduces overhead costs per unit of output.
3. Labour costs can be computed in advance of production with the aid of fixed rate unit or job.
4. Labour control becomes easier by isolating workers whose work is inefficient and below the minimum standard requirements.

Piece work has some limitations too. It attaches more premium to quantity than the quality of work. It has the tendency of increasing imperfections, spoiled work, and detectives and higher depreciation costs result because of considerable wear and tear of plant and machinery. Also, this system does not maintain a regular wage for the employee.

To avoid the limitations of straight or simple piece work system, a guarantee is normally provided in the system that the employee's wages shall not fall below a certain minimum figure. This is known as "Piece-rates with guaranteed day rate". Under this method the worker receives a straight piece-rate for the number of pieces produced, provided that his total wage is greater than his earnings on a time rate basis. When the piece-rate earnings fall below this level, the time rate earnings are paid instead. An alternative form of the

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methods is the guaranteed time rate (per hour, day or week), plus a piece-rate payment for output above a stated minimum. Labour cost per piece decreases with increasing production until piece-rate earnings exceed the guarantee, therefore, the labour cost per piece remains constant.

INCENTIVE WAGE PLANS

The basic purpose of an incentive wage is to induce a worker to produce more so that he can earn a higher wage and, at the same time, unit costs can be reduced. Incentive wage plans aim to ensure greater output, to help control over labour costs by minimisation of total cost for a given volume of production and to have a basis for reward from hours served to work accomplished.

Incentive wage scheme has the following objectives:

1. Un-interrupted and higher production without any dispute between the labour and management.
2. Stability in labour turnover.
3. Reducing labour absenteeism.
4. Developing cooperation, mutual trust, attitude of team work among workers and between workers and supervisory staff.
5. Control of labour cost and reduction in labour cost unit of output.
6. Improving administrative efficiency.
7. Accurate budgeting through reliable labour cost information.
8. Generating workers' satisfaction by avoiding work stoppages, slow down, and by providing incentive schemes.

The following are the essentials (desirable characteristics) of a successful incentive wage plan:

1. A wage incentive system should be based upon standards of performance—time and motion studies, job evaluation, and merit rating.
2. The incentive plan should be understood by all employees before installation (or hiring).
3. All direct labour tasks should be on an incentive basis.
4. Only standard or acceptable quality production should be considered while determining the bonus.
5. Once the standard is set, it should not be changed unless the method changes.
6. The incentive programme must be fairly and intelligently administered.
7. It is highly desirable that indirect personnel participate in the incentive plan.
8. A high reward should be paid for performance above standard.
9. Individual incentives should be used wherever it is possible to do so.
10. Minimum wage should be guaranteed to every worker.
11. The views of both employers and employees should be considered while designing incentive schemes.
12. The cost of establishing and operating the incentive plans should be reasonable.
13. The incentive plans should help in standard cost and budgetory control programmes.

Incentive wage plans involve wage rates based upon various combinations of output and time and are known as "differential piece-rates" and "bonus plans" as well. Generally, the following types of incentive plans are used:

1. Taylor Differential Piece-rate System
2. Merrick Differential Piece-rate System
3. Gantt Task Bonus Plan
4. Premium Bonus Plans (Halsey, Halsey-Weir, Rowan, Bedaux, Emersion, etc.)

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Toylor Differential Piece-rate System

Under this system there are two wage rates, a low one for output below standard and a higher one for above standard performance. The system aims to discourage below average workers by providing no guaranteed hourly wage and by setting low piece-rates for low level production, and a high rate resulting in high earnings if an efficient level of production is attained. For example, in a factory, workers earn Rs. 240 per eight hour day and that production averages 12 units per hour per worker or Rs. 2.50 per unit. The Taylor system might suggest a pay of Rs. 2 per unit if the worker averaged 14 units or less per hour, but Rs. 3 per unit to workers averaging 15 units or more per hour. The main advantages of the Taylor system are that it provides a strong incentive to the efficient worker, and is simple to understand and operate. But the incentive level may be set so high that it cannot attract most workers.

Merrick Differential Piece-rate System

This is an improvement over the Taylor system and depends on using three rates instead of two as in the Taylor system. Normal piece-rates are paid on output, when it does not exceed 83% of the standard output. 110% of normal piece-rate are paid when the output is between 83% and 100%, and 120% of the normal piece-rate is paid if the output is above 100%.

The Merrick system is useful to highly efficient workers as it provides incentives for higher production. Similarly, it takes into account the less efficient worker who can at least achieve 83% of the standard output. This minimum output is probably achievable by all workers.

Gantt Task and Bonus Plan

This system combines a guaranteed time-rate with a bonus and piece rate plan using the differential piece-rate principle. Remuneration under the plan is computed as follows:

Output	*Payment*
1. Output below standard (high task)	Time-rate (guaranteed)
2. Output at standard	Bonus @ 20% on the time-rate
3. Output above standard	High piece-rate on worker's whole output

This plan provides incentives and opportunities to those who reach high level production. At the same time it provides security and encouragement to less skilled workers. It is simple to understand and workers are also satisfied in that they receive the total reward for their efforts. A limitation of the plan is the tendency on the part of trade unions to demand a high fixed guaranteed time-rate. But the incentive element of the plan would be lost in case too high a rate is fixed.

Premium Bonus Plans

Under the time-rates basis, any additional production above normal levels benefits the employer, whereas with the piece-rates system the benefit goes to the employee (apart from indirect benefits to the employer). Bonus plans have been developed to produce a compromise, in that any savings are shared between employer and employee. The following are the principal schemes under premium bonus plans.

Halsey Premium Plan

The principle of the Halsey scheme is that the worker receives a fixed proportion of any time which he can save by completing the job in less than the allowed time. The most common fixed proportion is 50% but this can be varied. This plan ensures that the employee receives time wages until he produces in less than standard time. For above standard production, savings are shared with the employer with the result that the rate of increase happens to be lower for the employee. The cost per unit decreases when production exceeds standard.

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Halsey-Weir Plan

This plan is also known as the Wier Premium Scheme and is based on a $33\frac{1}{3}:66\frac{2}{3}$ sharing plan. Under this scheme the total emoluments of a worker are the aggregate of guaranteed hourly wages for actual time worked, plus the amount of bonus at the rate of $33\frac{1}{3}\%$ of the time saved. Bonus is allowed at the same hourly rate at which he shall be paid for actual time worked.

Rowan Plan

This scheme is similar to the Halsey plan in that a standard time is fixed for the completion of a job and the bonus is paid in respect of the time saved. But a ceiling is applied to the size of the bonus. The bonus hours are calculated as a proportion of the time taken which the time saved bears to the time allowed, and is paid for at time-work rates. The bonus may be computed as follows:

$$\text{Bonus} = \frac{\text{Times taken}}{\text{Time allowed}} \times \text{Time saved} \times \text{Time rate}$$

Bedaux Point Plan

Under the Bedaux point plan a guaranteed hourly rate is paid until standard production is attained, and a premium or additional wage is paid for units in excess of standard. Instead of being paid as piece-rate, an hour's work is converted to points by dividing a standard hour's production in units into 60 minutes. In other words, if 10 units are standard, then each unit is 6 points and if 15 units are standard then each units is 4 points. At standard performance the worker produces a point per minute and for the first 60 points produced in an hour, the worker receives the hourly rate. For excess production, it is common practice to pay the worker 75% of the rate, and the foremen, supervisors and other indirect labour personnel receive 25% of the rate.

Emerson Efficiency Plan

Under the Emerson plan a minimum daily wage is guaranteed and a standard time is determined for each job or operation. During each payroll period a record is kept of the hours worked and the units produced, and the efficiency of each employee is then determined by dividing actual hours into the standard time for the units produced. For example, if the standard is 10 units per hour and a worker produces 320 units in an 80-hour week, the standard time for his output is 32 hours and he has worked at 80% efficiency. Below 67% efficiency, the worker is paid his hourly rate, and from 67% upto 100% efficiency, step bonus rates apply. Above 100% efficiency, an additional bonus of 1% of the hourly rate is paid for each 1% increase in efficiency.

Groups Bonus Schemes

Where a group of workers is collectively responsible for manufacturing a product, it may not be possible to adopt individual incentive schemes. The production of the workers as a whole is measured, and the total bonus determined by one of the individual incentive schemes capable of group application. The computed bonus can then be shared equally, or between workers of different skills in differing specified proportions. A group bonus scheme has the following objectives:

1. Developing collective interest and team spirit among all workers and employees.
2. Developing interest among foremen and supervisors to improve performance.
3. Reducing spoilage in materials consumption.
4. Reducing idle time.
5. Achieving maximum production at minimum cost.
6. Motivating workers to produce more to get bonus on the basis of team performance.

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Group bonus schemes may be employed:

1. where individual output cannot be measured, but that of a group of worker can, for example, on a production line.
2. where output depends less upon the efforts of particular individuals, and more upon the combined efforts of a group, department, or even of the whole undertaking; or
3. where the management wishes to encourage a team spirit.

The following types of group bonus schemes are in common use:

Budgeted Expenditure Bonus

In this scheme the value of bonus depends upon savings in actual expenditure as compared with the budget. This scheme can be applied to indirect workers and staff besides direct workers.

Cost Efficiency Bonus

This bonus is allowed for savings in specific costs, for example, labour cost or materials cost.

Priestman System

This is a system used in foundries in which a production standard is fixed every month for the entire work. Where production exceeds the standard, workers receive during the following month additional pay equal to the percentage in output over standard. Where production does not exceed standard, no bonus is paid though time rates are guaranteed.

Towne Gain-sharing System

This method introduced by H.R. Towne in the USA is based on the principle that bonus consists of half the reduction in labour cost below standard. The bonus is divided between foremen and operatives, but as it is generally paid half-yearly it tends to be ineffectual as an incentive to individual effort. The payment to foremen and supervisory staff, however, encourages them to reduce labour costs.

In India, payment of bonus under the Payment of Bonus Act 1965 is compulsory, although the amount of bonus may vary from company to company. A minimum bonus of 8.33% is payable whether a company has earned profit or not. The amount of minimum bonus is generally treated as an item of direct labour cost. However, the amount exceeding the minimum bonus is an appropriation of profit. Bonus linked with productivity is treated as an item of overhead cost.

Profit Sharing and Co-partnership

Profit sharing schemes are schemes in which there is an agreement between the employer and his workers whereby he pays them in addition to wages, a predetermined share of the profits of undertaking. Co-partnership or co-ownership confers upon employees the opportunity to share in the capital of the business and to receive that part of the profits that accrue to their share of ownership. Both profit sharing and co-partnership schemes recognise the contribution of employees in the profit of the business firm.

These schemes, however, suffer from the following limitations:

1. Lazy and inefficient workers share equally with hard-working and efficient workers.
2. When the share is paid to the workers in cash they tend to regard it merely as a bonus, and not as a share of the result achieved jointly by themselves and their employers.
3. It is difficult to determine the share of profits to be given to each worker and there may be a certain amount of distrust about declared profits also.
4. The additional earnings under these plans are relatively small and may appear to the workers totally insignificant.

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5. The share of profits to be paid to workers may be reduced by bad management.
6. Distribution of the benefit under schemes is done normally once in a year. Therefore, employees do not have much interest in it.
7. Sometimes, this scheme is restricted to employees who have a specified number of years of service in the factory. Thus, this creates dissatisfaction among the newer and younger employees who also have contributed to the profits of the year.
8. The workers share in the good years, but do not bear their share of losses incurred in other years.

Bonus Schemes for Indirect Workers

Indirect work cannot be measured as accurately as the direct work. If only direct workers are paid on incentive scheme, this may create considerable disappointment among indirect workers. Therefore, incentive schemes may be introduced for indirect workers as well, either to increase the efficiency of the services they provide to direct labour or to induce formen and supervisory staff to increase department efficiency and to reduce costs.

WORK STUDY

The successful operation of incentive wage schemes depends on making a proper work study. Work study is the study of job, methods and equipment to ensure that the best way to do the job has been followed by a worker. Work study consists of two complementary techniques or methods: (i) methods study, and (ii) work measurement.

Method Study

Method study is done to improve methods of production and to achieve the most effective use of materials, manpower and plant. The following stages are involved in methods study:

1. First of all, work for the purpose of methods study should be selected. Generally, methods study is done in jobs which involve complexity and costly operations.
2. After selecting a particular job or work, details about the work should be gathered, such as purpose, location, sequence, relationship with the other work, methods of working, operators and facilities, etc.
3. After studing the relevant details of a work, an improved method should be developed for effectiveness, efficiency and operational simplicity. Unnecessary operations and activities should be avoided. An improved method might change the location and sequence of work, production methods, layout.
4. The method so developed should be used for the job or work for which it has been designed.
5. Follow-up is necessary to enquire as to whether the improved method is being implemented in practice and to find out deviations, if any.

Methods study ensures efficient and maximum use of resources like material, labour, plant facilities; it improves the production methods by reducing/eliminating the work content and unnecessary methods; and it attains the maximum production which is good for the firm as well as the workers.

Work Measurement

Work measurement aims at determining the effective time required to perform the work. The ineffective, wasteful or avoidable time is separated from effective required time to complete the work. The effective time so established in work measurement can be used for the following purposes:

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1. Incentive wage schemes which require time taken for completing a work.
2. Improving utilisation of men, machines and materials.
3. Assisting in production control.
4. Setting labour standards.
5. Achieving the objectives of cost control and cost reduction.

The following stages are involved in work measurement:

1. Selection of the work.
2. Measuring the actual time taken in the work done.
3. The total time so established for a job should be adjusted for fatigue, time taken in setting the tools, idleness involved in the work itself, etc.

The standard time is further considered to know the time sayed under incentive schemes and to determine the wage rate at the incentive level. This is explained with the help of the following example:

	Minutes per job
Time before incentive schemes	50
Allowances 10%	5
Basic or standard time	55
Time saved under incentive conditions (20%)	11
Time under incentive conditions	44

JOB EVALUATION AND MERIT RATING

Job Evaluation

Job evaluation is the technique of analysis and assessment of jobs to determine their relative value within the firm so that a fair wage and salary structure can be established for the various job positions. In other words, job evaluation aims at providing a rational and equitable basis for differential salaries and wages for different classes of workers. Following are the objectives (or benefits) of job evaluation:

1. It aims at developing a systematic and rational wage structure as well as job structure.
2. It aims at establishing consistency between the wage and salary structure adopted within the firm and that of other firms within the industry or geographical area.
3. Controversies and disputes relating to salary between the employers and employees can be settled by designing job evaluation techniques within the firm which can satisfy employers and employees both.
4. Wage and salary structure established on the basis of job evaluation will be fair, reliable and satisfying to the employees. Employees' skills, efforts, competence are properly considered in determining wage rates.
5. Stability and fairness in the wage and salary structure are very useful for the administration which can formulate business policies and plans as workers cooperation is fully ensured.
6. Job evaluation discloses characteristics and conditions relating to different jobs and these job requirements are very helpful at the time of recruiting the workers. The employment department can appoint only those workers who are found suitable in terms of such job requirements.

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Methods of Job Evaluation

Methods of job evaluation can be listed as follows:

Point Ranking Method

Under this method each job is analysed in terms of job factors. Job factors may consist of elements like skill, effort, working conditions, hazards, responsibility. However, different job factors may emerge in different jobs. After specifying job factors, each of them is assigned weightage or points depending on its value for the job. For example, in a particular job, education may be given the higher point as compared to supervision, if the job requires a high degree of education. Finally, the jobs are ranked in the order of points or weights secured by them. Grades are further developed for these different weightages so that wages rates or wage structure can be suitably designed for them. For example, the following wage scales can be worked out depending on the weights grade.

Weights or points	*Grade*	*Salary scale (Rs.)*
50–100	I	10000–15000
151–200	II	15000–20000
201–250	III	20000–30000
251–300	IV	30000–40000
301–350	V	40000–50000
351–400	VI	50000–60000
401–450	VII	60000–80000
451–500	VIII	80000–100000

This method is theoretically sound and objective, but it is difficult to operate. The relative weights and points of different job factors need to be developed very carefully and in an objective manner.

Ranking Method

The ranking method only requires that different jobs in an organisation should be rearranged in an order which can be done either from the lowest to the highest or in the reverse. Before doing ordering of jobs, all jobs should be properly studied in terms of job requirements, worker's qualification, responsibilites, working conditions, etc. Finally, wage scales are determined in terms of ranks.

This method is very simple to operate, less costly and easy to understand. However, this method may be useful for small organisations only, where jobs are few and well defined. But in a large organisation where jobs are complex and highly involved, this method cannot be beneficial.

Grading Method

This methods is an improvement over the ranking method. Under this method, a hypothetical scale or standard of job values is determined and each job after being analysed in terms of a predetermined grade, is given a grade or class. Predetermined grades or yardsticks are formulated after examining existing jobs in the enterprise. The grades or the class should be established after making an investigation of job factors, such as complexity in the job, supervision, responsibility, education, etc.

This method is simple, less costly and administratively feasible. It attempts at applying a rational basis for grading jobs.

Merit Rating

Merit rating is the comparative evaluation and analysis of the individual merits of the employees. It analyses the differences in performance between employees who are working on similar jobs and would therefore earn the same wages. In this task, merit rating accomplishes more than job evaluation. Merit rating has the following objectives:

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1. To evaluate the merit of an employee for the purpose of promotion, increment, reward and other benefits.
2. To establish and develop a wage system and incentive scheme.
3. To determine the suitability of an employee for a particular job.
4. To analyse the merits (or demerits) of a worker and help him in developing his capability and competence for the job.

The characteristics and factors that are considered in merit appraisal of the workers are the following:

1. Cooperation
2. Quality of work done
3. Attendance and regularity
4. Education, skill, experience
5. Character and integrity
6. Initiative

Merit rating is beneficial to the business enterprise and the workers. It increases the output, improves labour-management relations and encourages workers to have fair competition among themselves. However, merit rating has the following drawbacks;

1. The rating of employees may be subjective and this creates dissatisfaction among them.
2. Evaluators or raters tend to give much premium to past ratings of an employee who might have improved himself in the course of time.
3. Rates may be influenced by raters' own attitudes and self-made rating factors which are not consistent with the merit rating process. Incentives schemes may not be introduced advantageously if merit rating is inaccurate, unreliable and subjective.

Differences Between Job Evaluation and Merit Rating

Job evaluation and merit rating differ on the following counts:

1. Job evaluation is the assessment of the relative worth of jobs within a business enterprise and merit rating is the assessment of the relative worth of an empolyee with respect to a job. In other words, job evaluation rates the jobs, but merit rating rates employees on their jobs.
2. Job evaluation helps in establishing a rational wage and salary structure. But merit rating helps in fixing fair wages for each worker in terms of his competence and performance.
3. Job evaluation brings uniformity in wage and salary rates. But merit rating aims at providing a fair rate of pay for different workers on the basis of their performances.

TIME AND MOTION STUDY

Time study determines the time spent on each element of a job. The total time taken by all elements (stages) of a job is called the standard time. This standard time is the time which should be taken by an average employee to complete a job under standard (normal) working conditions.

Motion study implies dividing the work into fundamental elements or basic operations of a job or a process for the purpose of eliminating unnecessary (defective) elements or operations in a job. After investigating all movements in a job, process, or operation, it finds out the most scientific and systematic method of performing the operation or completing the job. Thus, time study fixes the standard time for a job or process, and motion study eliminates wasteful motions or the movement of a worker on the job. Both are complementary to each other.

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Objectives

Following are the objectives of time and motion study:

1. Eliminating unnecessary motions, fatigue and improving human efforts.
2. Improving method, procedure, techniques, process relating to a job.
3. Utilising effectively materials, machines, human resources and other facilities.
4. Improving working environment, layout and design of plant and equipment.

Benefits

Time and motion study is quite beneficial to the management in the following respects:

1. Proper and fuller utilisations of materials, plant, labour and other resources.
2. Help in assessment of labour requirements.
3. Setting of labour cost standards and control of the labour cost.
4. Determination of fair wage rates and effective wage incentive schemes.
5. Preparation of labour budgets.
6. Standardising jobs, equipments, methods by determining the best method of operating in the time set.
7. Improvement in work methods by comparing the time taken to complete the same type of work under different possible methods.
8. Proper planning and effective cost control.

LABOUR TURNOVER

Labour turnover is the rate at which employees leave employment at a factory and is normally measured as the ratio of the number of persons leaving in a period to the average number on the payroll. For example, if 100 persons leave a company in a year and the average number on the payroll is 500, labour turnover is expressed as 20% p.a. In this calculation all persons who leave must be included, whether they leave voluntarily or are dismissed and irrespective of whether they are replaced. There are three methods of measurement of labour turnover.

1. $\dfrac{\text{All employees leaving}}{\text{Average number employed}} \times 100$

2. $\dfrac{\text{Number of replacements in a period}}{\text{Average number employed}} \times 100$

3. $\dfrac{\text{All employees leaving plus new employees}}{\text{Average number employed}} \times 100$

Among the three methods, the first method is to be preferred, as it is more appropriately a long-term indicator. This formula is more satisfactory as management is primarily concerned with the loss of labour, after money has been spent on training. The effects of a high or low turnover rate should then be analysed, e.g., on training costs, on production efficiency and employee morale.

Causes of Labour Turnover

Labour turnover is caused by many factors which may be listed as follows:

Avoidable Causes

These causes may be eliminated by taking suitable measures by the business firm. Avoidable causes are the following:

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1. Low wages and earnings.
2. Unsatisfactory working conditions.
3. Bad relations among workers and between workers and supervisor.
4. Existance of rival trade unions in the organisation.
5. Unsuitability of job.
6. Lack of conveyance, accommodation, medical, educational facilities, recreational amenities, etc.

Unavoidable Causes

Sometimes, workers have to leave the organistaion because of management requirements and actions. These are known as unavoidable causes and may be described as follows:

1. Termination of service due to misbehaviour, indiscipline, etc.
2. Retrenchment or lay off due to shortage of resources, low demand, seasonal nature of business.

Personal Causes

Sometimes workers leave the organisation at their own will and management can do nothing in this regard. These are known as personal factors which are the following:

1. Change for better job
2. Death
3. Retirement due to old age and ill health
4. Family troubles and constraints
5. Change for a better place, environment.

Cost of Labour Turnover

The cost of labour turnover consists of two elements:

1. Preventive costs
2. Replacement costs

Preventive Costs

Preventive costs include all those costs which are incurred to prevent workers from leaving the organisation and keeping them satisfied. Preventive costs may broadly be of the following types:

1. Personnel administration A part of personnel administration costs may be incurred to establish a good relationship between the management and the employees and to remove workers' grievances. These costs are known as preventive costs.

2. Medical and health care The costs incurred for providing medical benefits to the workers and their families are included in the labour turnover costs.

3. Welfare measures Welfare measures include facilities like sports, educational facilities, transport, housing, cooperative stores, canteens. The availability of those facilities prevent workers from leaving the organisation and keep them satisfied.

4. Wage and retirement benefits These include facilities like pension, provident fund, gratuity, bonus, incentive schemes. If an organisation has provided these benefits, the rate of labour turnover will be appreciably reduced.

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Replacement Costs

Replacement costs include the costs which are incurred for the recruitment and training of new workers. Also, they cover costs which arise as a result of wastages, losses, lower production because of less competent and inexperienced new employees. Broadly, they include the following items:

1. Personnel department expenses The personnel department has to recruit new workeres in case of high labour turnover and therefore the costs of the personal department goes up.

2. Cost of training of new workers New workers are first to be given necessary trainings before they are given regular jobs. Also, production time is lost during the training of the workers.

3. Inefficiency of new workers New employees are comparatively less efficient and therefore, production is adversely affected.

4. Delay in getting new workers It takes times to find new workers who will be suitable for the jobs. In the meantime, existing employees may be given overtime which is again a burden on the orgainsation.

5. Cost of breakages of tools and equipments New workers, being inexperienced, break more tools than the old experienced workers. Sometimes, machine break-down may occur and hamper production.

6. Costs of spoilage and defectives More spoilage and defectives are likely to occur due to mishandling and carelessness of the new workers. The greater the spoilage and defectives, the larger will be the cost of production.

Measures to Reduce Labour Turnover

Turnover can rarely be traced to one single cause and is usually the result of a combination of a number of causes. The management after knowing the reasons for labour turnover should frame suitable policies and take action to reduce the turnover rate. An appropriate Labour Turnover Accounting can be adopted to manage labour turnover efficiently and effectively. Labour turnover accounting implies the identification, measurement and monitoring of labour turnover data. More specifically, this would include the regular cost measurement of labour turnover and the implementation of a labour turnover cost control programme. Knowledge about the true costs of labour turnover will stimulate management to take appropriate action to reduce its cost.

Job enrichment, "human relations" training for managers, and effective communication throughout the company are vital in reducing labour turnover. Job enrichment means that jobs should, wherever possible, be restructured so that employees have opportunities to increase their skill, use their initiative and assume more responsibility for their work.

Managers should be given training in "human relations" and "management". Any improvement in personnel relations between management and employees will not only bring out improvement in industrial relations within the company but will also reduce the rate of labour turnover.

Furthermore, effective communication throughout the business firm will help control the high rate of labour turnover. There is great need to provide people with information on the affairs of the enterprise where they are working and on matters affecting their working conditions and future employment prospects.

TREATMENT OF LABOUR COST-RELATED ITEMS

Overtime

Overtime is the time put in by employees and work done by them beyond normal hours of work. According to the Factories Act 1948, every worker is to be paid overtime at a higher rate, generally at double the normal wage rate, if he is required to work for more than 8 hours a day. In case the Factories Act is not applicable in some situations, it is the practice to pay to workers for overtime work at higher rate. The excess over normal

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wage rate is called overtime premium. In cost accounting, the overtime premium is separated from regular earnings and consideration must be given to the reasons for the overtime payment to decide as to how they should be treated in cost accounts.

Treatment of Overtime Premium

The treatment of overtime premium is decided in terms of factors and reasons which has caused overtime work. They are explained as follows:

1. Accepting rush orders which can not be finished in regular working hours and therefore, overtime work becomes necessary. In this case, since the overtime work is due to one particular order, the overtime premium should be charged to that particular order or job. Also, payment for such overtime work should be recovered from the customer who has given such an order. That is, the contract price for the job would include the overtime premium factor.
2. Scheduling more production than can be completed in normal working hours. For example, a company with a normal capacity of 8000 units to be completed in 800 labour hours decides to produce 10,000 units which require 1000 labour hours, 200 overtime hours are necessary. Such overtime work may be caused due to temporary higher demand, higher seasonal demand or due to company's own decision for additional production. In this case, the overtime premium will be charged to each of 10000 units completed during the period. Overtime premium cannot be charged to only 2000 units that have to be completed after regular working hours.
3. Overtime work may become necessary because of abnormal circumstances, that is, factors which are beyond the control of management, such as fire, flood, etc. In this case, the overtime premium is transferred to Costing Profit and Loss A/c and is not charged to the units or jobs completed.
4. Overtime work may be caused due to fault, delay of another department in the organisation. In this case, the overtime premium is charged to the department which is at fault or is responsible for the delay.

Overtime payments made to workers engaged in direct labour are treated as direct labour cost and charged to the jobs or units completed. Overtime payments made to indirect labour are the part of factory overheads, overtime payments made to the staff of administrative departments are treated as administrative overheads and overtime payments made to the staff of selling and distribution departments are treated as selling and distribution overheads.

Idle Time

Where workers are remunerated on a time basis some difference between the time for which they are paid and that which they actually spend upon production is bound to arise. This difference is known as idle time, and represents the time for which the employer must pay but from which he obtains no direct advantage. Idle time does not include holidays, leave, etc. Idle time may be normal or abnormal.

Normal Idle Time

Normal idle time is that idle time which is unavoidable, of normal nature and is inherent in a production or work environment. Normal idle time is caused by factors such as:

1. Time lost in moving from one job to another.
2. Time lost in waiting for materials or instructions.
3. Time taken in getting from the gate of the factory to the department in which the worker is engaged and the reverse journey at the end of the day.
4. Temporary absences from duty because of minor accidents, personal needs, tea-breaks, etc.

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The wastage of time due to the above factors cannot be avoided and therefore idle time must be accepted as implied in production. Under the above situations idle time will be of normal variety and constitute a legitimate charge to factory overhead. Thus, payment made for idle time is part of the cost of a product or job.

Abnormal Idle Time

Abnormal idle time is that time which is not caused by or connected with the usual routine of manufacture. The time wasted may represent abnormal idle time. The loss (or expenses) incurred and caused by abnormal conditions, cannot be regarded as part of the cost of the product and should be transferred to the costing profit and loss account. Examples of abnormal idle time would be:

1. Time lost through the break down of machinery due to the inefficiency of the works engineers or to the failure of the power supply.
2. Time lost through lack of materials occasioned by the slackness of the store-keeper in notifying the buying department of his requirements.
3. Bottlenecks in production, resulting in a temporary absence of parts for further processing.
4. Strike, lock-out, fire, wind, water damage, etc.

Fringe Benefits

An employee's salary or wage normally consists of basic wages, dearness allowance, house rent allowance, city compensatory allowance, etc. Besides the salary, workers are provided some indirect cash or fringe benefits, such as vacation and holiday pay, workmen's compensation insurance, pension costs, hospitalisation benefits, group insurance, sick pay, overtime and night shift premium, profit sharing bonus. These indirect benefits constitute fringe benefits. They tend to improve employee morale, loyalty and stability. The cost of these benefits are treated as a direct charge to production by using a supplemental wage rate. Alternatively, they are treated as factory overhead.

Shift Premium

Payment of higher hourly rates for evening and night shifts is a common feature. Treatment of shift premium follows the same reasoning as overtime premium. Where shift premium is needed to meet the requirements of a particular order or job, the additional cost should be charged to the job concerned and is accordingly excluded from production overhead. When shift premium is incurred in order to increase the output as a whole, the premium element should be separated from direct wages and treated as a production overhead. In this case similar operations should carry the same cost, regardless of when they were performed and should be spread over all units manufactured.

Holiday and Vacation Pay

Most employees are entitled to statutory holidays or compulsory holiday such as Independence day, Republic day, etc. Payments which are made to an employee while he is absent on vacation and holidays, are accrued monthly and spread out over the year's production. The total amount is charged to the full year's overhead expense. In this way no single period is forced to carry the whole burden. This should not be treated otherwise because the number of holidays vary from month to month. If the expenses are apportioned monthly on the month's production, the cost of production in a particular month would be too heavy as compared with the costs in other months, when there are no holidays.

Alternatively, an inflated rate of direct wages can be used to absorb both the normal weekly wages and the appropriate part of holidays.

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Learner's or Apprentices' Wages

In many plants new workers receive some preliminary training before they can become economically productive. Apprentices generally take more time than skilled workers to perform a given task and they are likely to cause more scrap. On the other hand, they are paid a lower rate per hour. The wages of workers under training who cannot normally make any real contribution to production, should be treated as production overhead and should be charged to the annual output through inclusion in the factory overhead rates.

In case of unusual training programmes due to the opening of a new plant or the activities of a second or third shift, a case can be made for treating the training cost as development or starting load cost and deferring a portion of the cost over a considerable period of time or over the life of the contract.

Attendance Bonuses

Sometimes workers who perform the full number of shifts in a working week, or who lose no time over a stated period, are entitled to an attendance bonus. Such bonuses are part of wages and sometimes are treated as direct wages and charged by means of an inflated direct wages rate. Alternatively, they may be treated as a production overhead. In process or contracting industries, they may properly be charged direct to the process concerned.

Leave with Pay

In a factory, workers are entitled to annual leave with full pay for some days in a year. Besides, medical leave, casual leave, earned leave, special leave, etc. are also available. It is not generally treated as a direct charge to a product or job but as factory overhead and recovered through departmental overhead rates. Alternatively, an inflated rate of direct wages cost can be applied to absorb both normal wages and an appropriate portion of leave with pay.

Employer's Contribution to Insurance

The employer's share of insurance for the employees engaged in manufacturing is treated as production overhead. When a contractor's employees tend to remain on one job for many weeks at a time, it is possible to treat the contributions as a direct charge to the contract concerned. In the case of process workers too, it is frequently possible to charge insurance contributions direct to the process. Also, an inflated direct labour rate can be employed so as to absorb the contributions, but this practice is rarely followed.

Casual Workers

Casual workers should be issued clock cards to show the number of hours worked. If casual workers are engaged on specific production or jobs, they should be treated as direct charge to the specific production. If these workers are performing indirect work, it should be treated as overhead expense. Due care should be exercised by the wage department in making payment to casual workers. The clock cards should be properly signed by the foremen and forwarded to the wages department for payment.

Out-Workers

In some trades, for example, in knit wear and in manufacturing lampshades certain work is performed by workers in their own homes. In such cases there is no need to maintain time records as the workers are paid according to the work they complete. However, control should be exercised over out-workers in the following respects.

1. Issue of materials to out-workers and its comparison with the finished output.
2. Inspection of the output and rejection of the defective work.
3. Return of the output within the agreed time so as to fulfil customer's orders and contracts.

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Outside Workers

Outside workers are employees working outside the factory on building sites or moving from place to place on small installations or repair work. If these employees report to the factory first for instructions, their arrival times can be recorded. But if they go direct to the site, it may be necessary for them to complete their own time sheets with some supervision or check on the times. For example, a foreman may travel from site to site or the customer may be asked to sign the time sheet which will form the basis of a charge to him. Where a large number of workers are engaged upon a site for a long period, for example, on a civil engineering contract, it is usual for time recording clocks to be installed at the site. When casual workers are engaged for outside work, a head office clerk should attend to pay these workers. Alternatively, the foreman may be issued a petty cash fund from which to make the payments.

Example 5.1

Standard time allocated for a job is 20 hours and the rate per hour is Re. 1 plus a dearness allowance @ 0.30 paise per hour worked.

Actual time taken by a worker is 15 hours.

Calculate earnings under:

(a) time-wage system;
(b) piece-wage system;
(c) Halsey plan;
(d) Rowan scheme.

(B.Com., Delhi, 2004)

Solution:

(a) Time Wage System:

	Rs.
Basic wages for 15 hours @ Re. 1 per hour	15.00
Dearness Allowance (D.A.) for 15 hours @ 30 p. per hour	4.50
	19.50

(b) Piece Wage System:

Basic wages for 20 hours @ Re.1per hour	20.00
D.A. for 15 hours @ 30 p. per hour	4.50
	24.50

Note: Piece wages are calculated on the time allocated + D.A for the hours worked.

(c) Halsey Plan:

Basic wage for 15 hours @ Re. 1 per hour	15.00
Dearness allowance for 15 hours @ 30 p. per hour	4.50
Bonus = 50% of time saved × time rate = (50% × 5 hours × Re. 1)	2.50
	22.00

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(d) Rowan Scheme:

	Rs.
Basic wages for 15 hours @ Re. 1 per hour	15.00
Dearness allowance for 15 hours @ 30 p. per hour	4.50
Bonus*	3.75*
	23.25

where, T = Time taken (actual time)

S = Standard time (time allowed)

R = Rate per hour

$$*\text{Bonus} = \frac{S - T}{S} \times T \times R$$

$$\text{Bonus} = \frac{20 - 15}{20} \times 15 \times 1$$

$$= \frac{5}{20} \times 15 = \text{Rs. } 3.75$$

Example 5.2

From the following particulars, find the amount of cash required for payment of wages in a factory for a particular month:

	Rs.
1. Wages for normal hours worked	40,000
2. Overtime wages	10,500
3. Leave wages	5,000
4. Contribution to Provident Fund:	
Employee's share	4,000
Employer's share	3,500
5. House rent to be recovered from 10 employees @ Rs. 200 per month.	

(B. Com. (Hons), Delhi, 2005)

Solution:

Computation of cash required for payment of wages

	Rs.	Rs.
(i) Wages for normal hours worked		40,000
(ii) Overtime wages	10,500	
(iii) Leave wages	5,000	15,500
Total		55,500
Less: Deductions		
(i) Employee's share (P.F.)	4,000	
(ii) House Rent to be recovered (Rs. 200 × 10)	2,000	6,000
Cash required		49,500

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Example 5.3

A worker is paid Rs. 50 per hour and the 5 days working week contains 42 hours. The daily allowance for approved absence from his place of work, maintenance of machine etc. is 12 minutes and his job card shows that his time chargeable during the week to various jobs is as follows:

Job No.	305	20 hrs.
Job No.	310	10 hrs.
Job No.	320	8 hrs.

The unaccounted time is caused by a power failure. Show how his wages for the week would be dealt with in cost accounts. *(B.Com. (Hons.), Delhi 2003)*

Solution:

Total wages payable to the worker for the week = Rs. 2100 (42 hrs @ Rs. 50 per hour)
Worker's wages are to be dealt with in the cost accounts as follows:

	Rs.
Wages chargeable to Job No. 305 (20 hours @ Rs. 50)	1000
Wages debited to Job No. 310 (10 hours @ Rs. 50)	500
Wages debited to Job No. 320 (8 hours @ Rs. 50)	400
Wages for approved absence for 5 days @ 12 minute per day taken as normal idle time to be recovered as factory overhead (1 hour wages @ Rs. 50)	50
Wages for time wasted due to power failure taken as abnormal loss transferred to costing profit and loss account (3 hours @ Rs. 50) (Hour 42 – 20 – 10 – 8 – 1 = 3 hrs.)	150

Example 5.4

XYZ Co. employs its workers for a single shift of 8 hours per day for 25 days in a month. The Company has recently fixed the standard output of 40 units per day per worker for a mass production item and introduced an incentive scheme to boost output. Details of wages payable to the workers are as follows:

(i)	Basic wages	:	Rs. 3 per unit subject to a guaranteed minimum wages of Rs. 80 per day worked.
(ii)	Dearness allowance	:	Rs. 40 per day worked.
(iii)	Incentive bonus	:	
	Upto 80% efficiency	:	Nil
	For efficiency above 80%	:	Rs. 50 for every 1% increase above 80%.

The details of performance of 2 workers for a particular month are as follows:

Workers	No. of days worked	Output (units)
A	25	820
B	18	500

Calculate the total earnings of both the workers for the month.

(B.Com.(Hons), Delhi, 2004)

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Solution:

Statement of Total Earning of each worker

Workers	*Days Worked*	*Output*	*Basic Wages*	*Dearness Allowance*	*Incentive*	*Total Earnings*
A	25	820 units	2460	1000	100	3560
B	18	500 units	1500	720	—	2220

Workers	*Efficiency*	*Incentive @ Rs. 50 for each 1% in efficiency above 80%*
A	$\frac{820}{25 \times 40} = 82\%$	Rs. 100 (@ Rs. 50 for one percent)
B	$\frac{500}{18 \times 40} = 69\%$	Nil

$$\text{Efficiency} = \frac{\text{Actual output units}}{\text{No. of days worked} \times \text{Rs. } 40} \times 100$$

Example 5.5

A factory has a piece-work scheme for mass production of a certain component for a T.V. manufacturer. The standard production fixed for a day of 8 hours is 40 units. The piece work rate is Rs. 4 per piece. The details of remuneration payable to the workers are as follows:

Production	*Wages*	*Dearness allowance*	*Incentive bonus*
Upto 80% efficiency	Per week wages @ Rs. 4 per piece subject to guaranteed minimum wages of Rs. 100/day	Rs. 60/ day	Nil
Above 80%	-do-	-do-	Rs. 40/- for every 1% increase in efficiency above 80%

Three workers Ram, Salim, Tom gave the following performance for May 2007:

Name of the worker	*No. of days worked*	*Output (units)*
Ram	20	480
Salim	24	864
Tom	25	1,100

Calculate their total earnings.

(I.C.W.A., Inter, Stage I, June 2007)

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Solution:

The earnings are worked out as follows:

Name of worker	*No. of days worked*	*Actual output*	*Standard output*	*Efficiency (%)*	*Basic Wages (Rs.)*	*D.A (Rs.)*	*Incentive Bonus (Rs.)*	*Total (Rs.)*
Ram	20	480	800	60%	2000 (min)	1200	—	3200
Salim	24	864	960	90%	3456 (P.W)	1440	400	5296
Tom	25	1100	1000	110%	4400 (P.W)	1500	1200	7100

Basic Wages = Actual output × Rs. 4 per piece

In case of Ram it will be minimum that is.

20 days × Rs. 100 = Rs. 2,000

Incentive Bonus =

Salim @ Rs. 40 for 1%, total for 10% (90% – 80%)

Tom @ Rs. 40 for 1%, total for 30% (111% – 80%)

Example 5.6

The standard labour time requierd for the production of a certain component has been fixed as 4 hours. An incentive scheme was introduced recently to raise labour productivity. The relevant details of the scheme are as follows:

Efficiency	*Incentive as a percentage of basic wages*
Below 100%	No incentive
100% (that is, 4 hrs/unit)	10%
Above 100%	1% additional incentive for every 1% increase in efficiency above 100% fractions excluded.

Four workers *A*, *B*, *C* and *D* produced 16, 12, 14 and 10 units respectively in a particular week of 48 hours. The basic wages of all the workers is Rs. 15 per hour.

Calculate the efficiency, incentive bonus, total earnings and labour cost per unit in respect of each of the above four workers. *(I.C.W.A. Inter, Stage 1), Dec. 2003)*

Solution:

Calculation of Efficiency and Incentive Bonus

A	16 × 4	64	48	133	43
B	12 × 4	48	48	100	10
C	14 × 4	56	48	116	26
D	10 × 4	40	48	83	—

Computation of Total earnings per worker and labour cost per unit of component

Worker	Basic wages	Incentive		Total earnings	No. of units produced	Labour cost per unit
			Amount			
	Rs.	%	Rs.	Rs.		Rs.
A	720.00	43	309.60	1029.60	16	64.35
B	720.00	10	72.00	792.00	12	66.00
C	720.00	26	187.20	907.20	14	64.80
D	720.00	—	—	720.00	10	72.00

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Basic wages: 48 hours × Rs. 15 = Rs. 720

$$\text{Labour cost per unit} = \frac{\text{Total earnings}}{\text{No. of units produced}}$$

Example 5.7

From the following particulars, you are required to work out the earnings of a worker for a week under

(i) Straight Piece Rate;
(ii) Differential Piece Rate;
(iii) Halsey Premium Scheme (50% sharing) and
(iv) Rowan Premium Scheme:

Weekly working hours	48
Hourly wage rate (Rs.)	7.50
Piece rate per unit (Rs.)	3.00
Normal time taken per piece	24 minutes
Normal output per week	120 pieces
Actual output for the week	150 pieces
Differential piece rate	80% of piece rate when output is below normal and 120% of piece rate when output above normal.

(I.C.W.A. Inter June 1999)

Solution:

Computation of Workers' weekly earning under Different Wage Plans

(i) *Straight Piece Rate*

= Weekly Output × Piece Rate per unit

Earnings = 150 units × Rs. 3 = Rs. 450

(ii) *Differential Piece Rate*

$$\text{Efficiency level achieved} = \frac{150 \text{ pieces}}{120 \text{ pieces}} \times 100 = 125\%$$

The efficiency Level achieved is more than 80%. Hence, a high differential piece rate (that is, at 120%) is applicable that is, (Rs. 3 × 120%) = Rs. 3.60 per piece

Earnings = 150 pieces × Rs. 3.60 = Rs. 540

(iii) *Halsey Premium Scheme (50% sharing)*

Standard Hours for Actual Production = (48/120) × 150 = 60 hours

Time Saved = 60 hours – 48 hours = 12 hours

Earnings = Hours Worked × Rate per hour + 1/2 of time saved × Rate per hour.

= 48 × Rs. 7.50 + 1/2 × 12 × 7.50 = Rs. 360 + Rs. 45

= Rs. 405

(iv) *Rowan Premium Scheme*

$$\text{Earnings} = \text{Hours Worked} \times \text{Rate per hour} + \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time Taken} \times \text{Rate per hour.}$$

= 48 × Rs. 7.50 + 12/60 × 48 × Rs. 7.50

= Rs. 360 + 72 = Rs. 432

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Example 5.8

In a manufacturing unit, a multiple piece rate plan is operated as under:

(i) Basic piece rate up to 85% efficiency;
(ii) 115% basic piece rate between 90% and 100% efficiency;
(iii) 125% basic piece rate above 100% efficiency.

The workers are eligible for a "Guaranteed Day Rate" which is equal to 75% efficiency and the piece rate is Rs. 2.00 per piece.

Compute the labour cost per piece at 5% intervals between 65% and 125% efficiency, assuming that at 100% efficiency 60 pieces are produced per day. *(I.C.W.A. Inter Dec. 1997)*

Solution:

Computation of Labour Cost Per Piece

Efficiency %	*Output per day (units)*	*Piece Wage @ Rs 2 per piece*	*Guaranteed Time wages per day Rs.*	*15% Additional piece wage Rs.*	*25% Additional piece wage Rs.*	*Total Labour Cost Rs.*	*Labour Cost per piece Rs.*
65	39	78	90	–	–	90.00	2.31
70	42	84	90	–	–	90.00	2.14
75	45	90	90	–	–	90.00	2.00
80	48	96	–	–	–	96.00	2.00
85	51	102	–	–	–	102.00	2.00
90	54	108	–	16.20	–	124.20	2.30
95	57	114	–	17.10	–	131.10	2.30
100	60	120	–	18.00	–	138.00	2.30
105	63	126	–	–	31.50	157.50	2.50
110	66	132	–	–	33.00	165.00	2.50
115	69	138	–	–	34.50	172.50	2.50
120	72	144	–	–	36.00	180.00	2.50
125	75	150	–	–	37.50	187.50	2.50

Working Notes:

1. The guaranteed time wage is payable at 75% efficiency. Hence, the time wages of Rs. 90 per day is payable for efficiency up to 75%.
2. Normal piece wages are payable at 80% and 85% efficiency levels.
3. At efficiency levels between 90% and 100%, additional 15% of the piece wages have been allowed.
4. At efficiency levels above 100%, additional 25% of the piece wages have been allowed.

Example 5.9

A worker produced 200 units in a week's time. The guaranteed weekly wage payment for 45 hours is Rs. 81. The expected time to produced one unit is 15 minutes which is raised further by 20% under the incentive scheme. What will be the earnings per hour of that worker under Halsey (50% sharing) and Rowan bonus schemes? *(CA, PE, Exam II, Group II, May 1995)*

Solution:

Earning per hour under Halsey (50% sharing) Bonus Scheme

$$\text{Time allowed for actual weekly production} = \frac{200 \text{ units} \times 18 \text{ minutes}}{60 \text{ minutes}}$$

$$= 60 \text{ hours}$$

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Time saved = Time allowed – Actual time taken
= 60 hours – 45 hours = 15 hours

Earning = (Hours worked × Rate per hour) + 1/2 (Time saved) × Rate per hour
= 45 hours × Rs. 1.80 + 1/2 × 15 hour × Rs. 1.80
= Rs. 81 + Rs. 13.50 = Rs. 94.50

$$\text{Earnings (per hour)} = \frac{\text{Rs. } 94.50}{45 \text{ hours}} = \text{Rs. } 2.10 \text{ per hour}$$

Earnings per hour under Rowan Bonus Scheme

$$\text{Earnings} = \text{Hours worked} \times \text{Rate per hour} + \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

$$= 45 \text{ hours} \times \text{Rs. } 1.80 + \frac{15 \text{ hours}}{60 \text{ hours}} \times 45 \text{ hours} \times \text{Rs. } 1.80$$

$$\text{Earnings per hour} = \frac{\text{Rs. } 101.25}{45 \text{ hour}} = \text{Rs. } 2.25 \text{ per hour}$$

Working Notes:

1. Expected time to produce one unit under incentive scheme = 15 + 20%
   = 18 minutes
2. Wage rate per hour (Rs. 81/45 hours) = Rs. 1.80

Example 5.10

Three workers Govind, Ram and Shyam respectively produced 80, 100 and 120 pieces of product *X* on a particular day in May 2007 in a factory. The time allowed for 10 units of product *X* is 1 hour and their hourly rate is Rs. 4. Calculate for each of these three workers the following:

(i) Earnings for the day, and
(ii) Effective rate of earnings per hour under:
   (a) Straight Piece Rate
   (b) Halsey Premium Bonus (50% sharing) and
   (c) Rowan Premium Bonus Method of Labour Remuneration *(ICWA, Inter)*

Solution:

A day has been assumed of 8 working hours

(a) Straight Piece Rate

Workers	*Hours worked*	*Output units*	*Piece rate (Rs.)*	*Earnings for the day (Rs.)*	*Effective rate of earnings per hour (Rs.)*
Govind	8	80	0.40	32	4
Ram	8	100	0.40	40	5
Shyam	8	120	0.40	48	6

$$\text{Price rate} = \frac{\text{Hourly rate}}{\text{Standard output per hour}} = \frac{\text{Rs. } 4}{10} = \text{Re. } 0.40$$

(b) Halsey Premium Plan (50% sharing)

Workers	*Hours worked*	*Output units*	*Time allowed (hours)*	*Time saved (4 – 2)*	*Time rate (Rs.)*	*Basic wages (Rs.)*	*Bonus (Rs.)*	*Earnings for the day (7 + 8)*	*Effective rate per hour (Rs.)*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Govind	8	80	8	0	4	32	0	32	4.00
Ram	8	100	10	2	4	32	4	36	4.50
Shyam	8	120	12	4	4	32	8	40	5.00

Notes:

(a) Time allowed

(i) Standard output per hour = 10 units

(ii) Time allowed per piece = $\frac{1}{\text{Standard output per hour}} \times \frac{1}{10}$ hours

(iii) Time allowed = Output units $\times \frac{1}{10}$ hours

(b) Basic wages = Hours worked × Time rate

(c) Bonus = $\frac{1}{2}$ Time saved × Time rate

(c) Rowan Premium Bonus

Workers	*Hours worked*	*Output units*	*Time allowed (hours)*	*Time saved (4 – 2)*	*Time rate (Rs.)*	*Basic wages (Rs.)*	*Bonus (Rs.)*	*Earnings for the day (7 + 8)*	*Effective rate per hour (Rs.)*
Govind	8	80	8	0	4	32	0	32.00	4.00
Ram	8	100	10	2	4	32	6.40	38.40	4.80
Shyam	8	120	12	4	4	32	10.67	42.67	5.33

Note:

$$\text{Bonus} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Basic wages}$$

Example 5.11

A skilled worker in *XYZ* Ltd. is paid a guaranteed wage rate of Rs. 30 per hour. The standard time per unit for a particular product is 4 hours. *P*, a machineman, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of Rs. 37.50 on the manufacture of that particular product.

What could have been his total earnings and effective hourly rate, had he been put on Halsey Incentive Scheme (50%)? *(CA, PE, Exam II, Group II, Nov. 1999)*

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Solution:

Let T hours be the total time worked in hours by the skilled worker (machineman P); Rs 30 is the rate per hour; standard time is 4 hours per unit and effective hourly earning rate is Rs. 37.50 then

$$\text{Earning} = \text{Hours worked} \times \text{Rate per hour} + \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$$

(Under Rowan incentive plan)

$$\text{Rs. } 37.5\text{T} = T \times \text{Rs. } 30 + \frac{(4 - T)}{4} \times T \times \text{Rs. } 30 = \text{Rs. } 105$$

$$\text{Rs. } 37.5 = \text{Rs. } 30 + (4 - T) \times \text{Rs. } 7.5$$

Or $\quad \text{Rs. } 7.5\ T = \text{Rs. } 22.5$

Or $\quad T = 3 \text{ hours}$

Total earnings and effective hourly rate of skilled worker (machineman *P*) under Halsey Incentive Scheme (50%)

$$\text{Total earnings} = \text{Hours worked} \times \text{Rate per hour} + 1/2 \text{ Time saved} \times \text{Rate per hour}$$

(Under 50% Halsey Incentive Scheme)

$$= 3 \text{ hours} \times \text{Rs. } 30 + 1/2 \times 1 \text{ hour} \times \text{Rs. } 30$$

$$\text{Effective hourly rate} = \frac{\text{Total earnings}}{\text{Hours taken}} = \frac{\text{Rs. } 105}{3 \text{ hours}} = \text{Rs. } 35$$

Example 5.12

A company is undecided as to what kind of wage scheme should be introduced. The following particulars have been compiled in respect of three systems, which are under consideration of the management.

	Workers		
Actual hours worked in a week	38	40	34
Hourly rate of wages	Rs. 6	Rs. 5	Rs. 7.20
Production in units			
Production *P*	21	—	60
Product *Q*	36	—	135
Product *R*	46	25	—
Standard time allowed per unit of each product is:			
	P	Q	R
	12	18	30

Minutes

For the purpose of piece rate, each minute is valued at Re. 0.10

You are required to calculate the wages of each worker under:

(i) Guaranteed hourly rates basis.

(ii) Piece work earnings basis, but guaranteed at 75% of basis pay (guaranteed hourly rate) if his earnings are less than 50% of basic pay.

(iii) Premium bonus basis where the worker receives bonus based on Rowan scheme.

(CA, PE, Exam II, Group II, Nov. 2002)

Solution:

(i) Computation of wages of each worker under guaranteed hourly rate basis

Workers (a)	*Actual hours worked in a weak* (b)	*Hourly rate of wages (Rs.)* (c)	*Wages (Rs.)* (d) = (b) × (c)
A	38	6.00	228.00
B	40	5.00	200.00
C	34	7.20	244.80

(ii) Computation of wages of each worker under piece work earnings basis

Product per unit	*Piece rate*	*Worker A*		*Worker B*		*Worker C*	
		Units	*Wages*	*Units*	*Wages*	*Units*	*Wages*
(Refer to working note 1) (a)	(b)	(c)	Rs. (d) = (b) × (c)	(e)	Rs. (f) = (b) × (e)	(g)	Rs. (h) = (b) × (g)
P	1.20	21	25.20	–	–	60	72
Q	1.80	36	64.80	–	–	135	243
R	3.00	46	138.00	25	75	–	–

Since each worker has been guaranteed at 75% of basic pay, if his earnings are less than 50% of basic pay, therefore, workers *A* and *C* will be paid the wages as computed viz., Rs. 228 and Rs. 315 respectively. The computed wage of worker *B* is Rs. 75 which is less than 50% of basic pay viz., Rs. 100 therefore he would be paid 75% × Rs. 200 or Rs. 150.

Working Notes:

1. Piece rate/per unit

Product	*Standard time per unit in minute*	*Piece rate each minute (Rs.)*	*Piece rate per unit (Rs.)*
(a)	(b)	(c)	(d) = (b) × (c)
P	12	0.10	1.20
Q	18	0.10	1.80
R	30	0.10	3.00

2. Time allowed to each worker

Worker *A* = 21 units × 12 minutes + 36 units × 18 minutes + 46 units × 30 minutes
= 2,280 minuets = 38 hours
Worker *B* = 25 units × 30 minutes = 750 minutes = 12.5 hours
Worker *C* = 60 units × 12 minutes + 135 units × 18 minutes
= 720 minutes + 2.430 minutes = 3,150 minutes = 52.50 hours

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(ii) Computation of wages of each worker under Premium bonus basis (where each worker receives bonus based on Rowan Scheme)

Workers	*Time allowed hours (Refer to W. Note 2)*	*Time taken hours*	*Time saved hours*	*Wage rate/hour (Rs.)*	*Earnings (Rs.)*	*Bonus (Rs.)*	*Total of earning & bonus (Rs.)*
A	38.00	38.00	–	6.00	228.00	–	228.00
B	12.50	40.00	–	5.00	200.00	–	200.00
C	52.50	34.00	18.50	7.20	244.80	86.26	331.06

Example 5.13

The finishing shop of a company employs 60 direct workers. Each worker is paid Rs. 400 as wages per weak of 40 hours. When necessary, overtime is worked upto a maximum of 15 hours per weak per worker at time rate plus one-half as premium. The current output on an average is 6 units per man hour which may be regarded as standard output. If bonus scheme is introduced, it is expected that the output will increase to 8 units per man hour. The workers will, if necessary, continue to work overtime upto the specified limit although no premium on incentives will be paid.

The company is considering introduction of either Halsey Scheme or Rowan Scheme of Wage Incentive system. The budgeted weekly output is 19,200 units. The selling price is Rs. 11 per unit and the direct material cost is Rs. 8 per unit. The variable overheads amount to Re. 0.50 per direct labour hour and the fixed overhead is Rs. 9,000 per week.

Prepare a statement to show the effect on the company's weekly profit of the proposal to introduce (a) Halsey Scheme and (b) Rowan Scheme. *(CA, PE, Exam II, Group II, May 2002)*

Solution:

Working Notes:

1. Total available hours per week (60 workers × 40 hours) 2,400
2. Total standard hours required to produced 19,200 units (19,200 units/6 units per hour) 3,200
3. Total labour hours required after the introduction of bonus scheme to produce 19,200 units (19,200 units/8 units per man hour) 2,400
4. Time saved in hours (3,200 hours – 2,400 hours) 800
5. Wage rate per hour (Rs.) (Rs. 400/40 hours) 10
6. Bonus:

(i) Halsey Scheme $= \frac{1}{2} \times$ Time saved × Wage rate per hour

$= \frac{1}{2} \times 800$ hours × Rs. 10 = Rs. 4,000

(ii) Rowan Scheme $= \frac{\text{Time saved}}{\text{Time allowed}} \times$ Time taken × Wage rate per hour

$= \frac{800 \text{ hours}}{3{,}200 \text{ hours}} \times 2{,}400$ hours × Rs. 10

= Rs. 6,000

Statement showing the effect on the Company's Weekly present profit by the introduction of Halsey and Rowan schemes

	Present (Rs.)	*Halsey (Rs.)*	*Rowan (Rs.)*
Sales revenue: (*A*) (19,200 units × Rs. 11)	2,11,200	2,11,200	2,11,200
Direct material cost (19,200 units × Rs. 8)	1,53,600	1,53,600	1,53,600
Direct wages (Refer to working notes 2 and 3)	32,000 (3,200 hrs. × Rs. 10)	24,000 2,400 hrs. × Rs. 10)	24,000 (2,400 hrs. × Rs. 10)
Overtime premium	4,000 (800 hrs. × Rs. 5)		
Bonus	–	4,000	6,000
(Refer to working notes 6 (i) and (ii)) Variable overheads	1,600 (3,200 hrs. × 0.50 *P*)	1,200 (2,400 hrs. × 0.50 *P*)	1,200 (2,400 hrs. × 0.50 *P*)
Fixed overheads	9,000	9,000	9,000
Total cost: (*B*)	2,00,200	1,91,800	1,93,800
Profit: {(*A*) – (*B*)}	11,000	19,400	17,400

Example 5.14

ZED Limited employing 50 skilled workers is considering the introduction of incentive scheme-either Halsey scheme (with 50% bonus) or Rowan scheme of wage payment for increasing the labour productivity to cope up the increasing demand for the product by 40%. It is believed that proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers; it could act as sufficient incentive for them to produce more.

Because of assurance, the increase in productivity has been observed as revealed by the figures for the month of April, 2004.

Hourly rate of wages (guaranteed)	Rs. 30
Average time for producing one unit by one worker at the previous Performance (This may be taken as time allowed)	1.975 hours
Number of working days in the month	24
Number of working hours per day of each worker	8
Actual production during the month	6,120 units

Required:

(i) Calculate the effective rate of earnings under the Halsey scheme and the Rowan scheme.
(ii) Calculate the savings to the *ZED* Limited in terms of direct labour cost per piece.
(iii) Advise *ZED* Limited about the selection of the scheme to fulfill their assurance.

(CA, PE, Exam II, Group II, May 2004)

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Solution:

Working Notes:

1. Computation of time saved (in hours) per month:

= (Standard production time of 6,120 units – Actual time taken by the workers)
= (6,120 units × 1,975 hours – 24 days × 8 hrs. per day × 50 skilled workers)
= (12,087 hours – 9,600 hours)
= 2,487 hours

2. Computation of bonus for time saved hours under Halsey and Rowan schemes:

Time saved hours (*Refer to Working Note 1*)	=	2,487 hours
Wage rate per hour	=	Rs. 30
Bonus under Halsey Scheme (*With 50% bonus*)	=	1/2 × 2,487 hours × Rs. 30
	=	Rs. 37,305
Bonus under Rowan Scheme	=	$\frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$
	=	$\frac{2{,}487 \text{ hours}}{12{,}087} \times 9{,}600 \text{ hours} \times \text{Rs. } 30$
	=	Rs. 59,258.38

(i) Computation of effective rate of earnings under the Halsey and Rowan Schemes:

Total earnings (under Halsey scheme) (*Refer to Working Note 2*)	=	Time wages + Bonus
	=	24 days × 8 hours + 50 skilled workers × Rs. 30 + Rs. 37,305
	=	Rs. 2,88,000 + Rs. 37,305 = Rs. 3,25,305
Total earnings (under Rowan scheme) (*Refer to Working Note 2*)	=	Time wages + Bonus
	=	Rs. 2,88,000 + Rs. 59, 258.38
	=	Rs. 3,47,258.38
Effective rate of earnings per hour (under Halsey Plan (*Rs. 3,25,305/9,600 hrs*)	=	Rs. 33.89
Effective rate of earnings per hour (under Rowan Plan (*Rs. 3,47,258.38/9,600 hrs*)	=	Rs. 36.17

(ii) Savings to the ZED Ltd., in terms of direct labour cost per piece:

	Rs.
Direct labour cost (per unit) under time wages system (1.975 hrs *per unit* × *Rs. 30*)	59.25
Direct labour cost (per unit) under Halsey Plan (*Rs. 3,25,305/6,120 units*)	53.15
Direct labour cost (per unit) under Rowan Plan (*Rs. 3,47,258.38/6,120 units*)	56.74
Saving of direct labour cost under:	
* Halsey Plan (*Rs. 59.25 – 53.15*)	Rs. 6.10
* Rowan Plan (*Rs. 59.25 – 56.74*)	Rs. 2.51

(iii) Advise to ZED Ltd: (*about the selection of the scheme to fulfill assurance*)
Halsey scheme brings more savings to the management of *ZED* Ltd., over the present earnings of Rs. 2,88,000 but the other scheme viz. Rowan fulfils the promise of 20% increase over the present earnings of Rs. 2,88,000 by paying 20.58% in the form of bonus. Hence Rowan Plan may be adoped.

Example 5.7

A job can be executed either through workman *A* or *B*. *A* takes 32 hours to complete the job while *B* finishes it in 30 hours. The standard time to finish the job is 40 hours.

The hourly wage rate is same for both the workers. In addition workman *A* is entitled to receive bonus according to Halsey plan (50% sharing) while *B* is paid bonus as per Rowan plan. The works overheads are absorbed on the job at Rs 7.50 per labour hour worked. The factory cost of the job comes to Rs. 2,600 irrespective of the workman engaged.

Find out the hourly wage rate and cost of raw materials input. Also show cost against each element of cost included in factory cost. *(C.A. Inter Nov. 1997)*

Solution:

Basic Calculations

1. *Computation of Time Saved and Wages*

Workman	*A*	*B*
Standard Time (hrs.)	40	40
Actual Time (hrs.)	32	30
Time Saved (hrs.)	08	10
Wages paid @ Rs *x* per hr. (Rs.)	$32x$	$30x$

2. *Computation of Bonus*

	Halsey Plan	Rowan Plan
Time saved (hrs.)	8	10
Bonus (Rs.)	$\frac{8 \text{ hrs.} \times \text{Rs. } x}{2} = 4x$	$\frac{10 \text{ hrs.}}{40 \text{ hrs}} \times 30 \text{ hrs.} \times \text{Rs. } x = 7.5x$

3. *Computation of Total Wages*

Workman *A*: $32x + 4x = \text{Rs. } 36x$
Workman *B*: $30x + 7.5x = \text{Rs. } 37.5x$

4. *Computation of Factory Cost of the Job*

Workman	*A*	*B*
	Rs.	Rs.
Material	*y*	*y*
Wages (as per above)	$36x$	$37.5x$
Works Overhead	240	225
Factory Cost	2,600	2,600

From the above, the following simultaneous equation can be made out:

$$36x + y + 240 = 2{,}600 \quad \text{(i)}$$

$$37.5x + y + 225 = 2{,}600 \quad \text{(ii)}$$

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On subtracting (i) from (ii) we get the following results:

$$1.5x - 15 = 0$$

or $$1.5x = 15$$

or $$x = \text{Rs. } 10 \text{ per hour.}$$

On substituting the value of x in Eq. (i)

$$36 \times 10 + y + 240 = 2{,}600$$

or $$y' = 2{,}600 - 360 - 240$$

or $$y = \text{Rs. } 2{,}000$$

The wage rate per hour is Rs. 10 and the cost of raw material input is Rs. 2,000 for the job.

Example 5.16

In a factory Ram and Sham produce the same product using the same input of same material and at the same normal wage rate.

Bonus is paid to both of them in the form of normal time wage rate adjusted by the proportion which time saved bears to the standard time for the completion of the product. The time allotted to the product is fifty hours. Ram takes thirty hours and Sham takes forty hours to produce the product. The factory cost of the product for Ram is Rs. 3,100 and for Sham Rs. 3,280. The factory overhead rate is Rs. 12 per man hour.

Calculate (i) Normal Wage Rate; (ii) Cost of material used for the product; and (iii) the input of material if the unit material cost is Rs. 16. *(B.Com. (Hons.) Delhi 1997)*

Solution Let x be the cost of material and y be the normal rate of wages per hour

Factory Cost of Workman Ram

	Rs.
Material	x
Wages	$30y$
Bonus ($30y \times 20/50$)	$12y$
Overheads	360
Factory Cost	$x + 42y +$ Rs 360

Factory Cost of Workman Sham

Material	x
Wages	$40y$
Bonus ($40y \times 10/50$)	$8y$
Overheads	480
	$x + 48y + 480$

The following two equations can be made

$$x + 42y + 360 = \text{Rs. } 3{,}100 \quad \text{(i)}$$

$$x + 48y + 480 = \text{Rs. } 3{,}280 \quad \text{(ii)}$$

On subtracting Eq. (i) from Eq. (ii)

$$6y + 120 = 180$$

or $$6y = 180 - 120$$

$$y = 60/6 = 10$$

On substituting the value of y in Eq. (i)

$$x + 420 + 360 = 3{,}100$$

or $$x = 3{,}100 - 780$$

or $$x = 2{,}320$$

Thus:

(i) Normal Wage Rate is Rs. 10 per hour
(ii) Cost of material used for the product is Rs. 2,320
(iii) Input of material is 2,320/16 = 145 units.

Example 5.17

An article passes through five hand operations as follows:

Operation No.	*Time per article*	*Grade of worker*	*Wage rate per hour*
1	15 minutes	*A*	Re. 0.65
2	25 minutes	*B*	Re. 0.50
3	10 minutes	*C*	Re. 0.40
4	30 minutes	*D*	Re. 0.35
5	20 minutes	*E*	Re. 0.30

The factory works 40 hours a week and the production target is 600 dozens per week. Prepare a statement showing for each operation and in total the number of operators required, the labour cost per dozen and the total labour cost per week to produce the total targeted output. *(C.A. Inter May 1996)*

Solution: *Statement of Number of Operators Required and Labour Cost*

Operation No.	*No. of Operators required* (see Working Note)*	*Labour Cost of 600 dozens per week* *Rs.*	*Labour Cost per dozen* *Rs.*
1	45	1,170 (45 × 40 × 0.65 p)	1.95 (Rs. 1,170/600)
2	75	1,500 (75 × 40 × 0.50 p)	2.50 (Rs. 1.500/600)
3	30	480 (30 × 40 × 0.40 p)	0.80 (Rs. 480/600)
4	90	1,260 (90 × 40 × 0.35 p)	2.10 (Rs. 1,260/600)
5	60	720 (60 × 40 × 0.30 p)	1.20 (Rs. 720/600)
	300	5,130	8.55

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Working Notes:

Operation No.	*No. of operators required*
1	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{15}{60} = 45$
2	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{25}{60} = 75$
3	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{10}{60} = 30$
4	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{30}{60} = 90$
5	$\frac{600 \text{ dozens} \times 12}{40} \times \frac{20}{60} = 60$

Example 5.18

A company has its factories at two locations. Rowan plan is in use at location *A* and Halsey plan at location *B*. Standard time and basic rate of wages are same for a job which is similar and is carried out on similar machinery. Time allowed is 60 hours.

Job at location *A* is completed in 36 hours while at *B*, it has taken 48 hours. Conversion costs at respective places are Rs. 1,224 and Rs. 1,500. Overheads account for Rs. 20 per hour.

Required:

(a) To find out the normal wage rate and
(b) To compare respective conversion costs. *(C.A. Inter June 1995)*

Solution:

Let Rs x per hour be the normal wage rate
$\therefore$ Wages at location *A* will be Rs. 36 x and Rs. 48 x for location *B*.
Time allowed is 60 hours
Hence, for time saved, bonus will be payable as under

Location A

$$\text{Bonus under Rowan Scheme} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{hrs worked} \times \text{Rate}$$

$$= \frac{24}{60} \times 36 \times x = \text{Rs } 14.4x$$

Total wages Rs. 36 x + Rs. 14.4 x = Rs. 50.4 x

Overheads @ Rs 20 per hour worked Rs. 720

Hence, total conversion cost is 50.4 x + 720 = Rs. 1,224 (given)

or $x = 10$.

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Location B

Bonus under Halsey plan	=	50% of Time saved × Rate per hour
	=	50% of 12 × x = Rs. 6 x
Total Wages	=	48 x + Rs. 6 x = Rs. 54 x
Overheads Rs. 20 per hour	=	Rs. 960
Total Conversion Cost is 54 x + 960	=	Rs. 1,500
or	x =	Rs. 10.

Comparative Conversion Cost

Particulars	*A (Rowan)*	*B (Halsey)*
Wages @ Rs. 10 per hour	Rs. 360	Rs. 480
Bonus	Rs. 144	Rs. 60
Overheads	Rs. 720	Rs. 960
	Rs. 1,224	Rs. 1,500

Example 5.19

Following are the particulars for April, 2002 relating to four employees working in Department '*M*' of a factory, exclusively for Job. No. 120.

Name	*Designation*	*Wages (Rs.)*	*Per*
A	Foreman	8000	month
B	Mechanic	150	day
C	Machine operator	120	day
D	Workman	100	day

The normal working hours per week of six days are 48, or 8 hours per day. Sundays are paid holidays. (There were no other holidays during the month).

Provident Fund contribution was 8% of monthly wages by employee.

Provident Fund contribution was 8% of monthly wages by employer.

Employee State Insurance Contribution was 3% of monthly wages by employee and 5% of monthly wages by employer.

From the foregoing data, calculate:

(a) Net wages payable by the employer for the month;
(b) The total amount of Provident Fund contribution to be deposited by employer:
(c) Employee State Insurance contribution to be deposited by employer;
(d) Total labour cost to the employer for the month of April, chargeable to the job; and
(e) The total cost of the job requiring materials is valued at Rs. 60,000 and overheads at 50% of prime cost. *(ICWA Inter)*

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Solution:

(a) Calculation of Net Wages Payable for the Month

Gross wages for April, 2002		Rs.	
A	Foreman (a) Rs. 8000 p.m.	8000	
B	Mechanic (a) Rs. 150 per day × 30 days	4500	
C	Machine Operator @ Rs. 120 per day × 30 days	3600	
D	Workman (a) Rs. 100 per day × 30 days	3000	
			19100.00
Less: Deductions			
(i)	Provident Fund Contribution @ 8% of Rs. 19100 by employees	1528	
(ii)	ESI Contribution @ 3% of Rs. 19100 by employees	573	
			2101.00
	Net Wages Payable		16999.00

(b)	Employer's share of Provident Fund (8% of Rs. 19100)	Rs 1528
	Employee's share of Provident Fund (8% of Rs. 19100)	1528
	Total amount of Provident Fund contribution to be deposited by employer (both contributions)	3056
(c)	Employer's share of ESI (5% of Rs. 19100)	955
	Employee's share of ESI (3% of Rs. 19100)	573
	ESI contribution to be deposited by employer (both contributions)	1528
(d)	Total labour cost to employer	
	Total gross wage	19100
	Add: Employer's contribution towards P.F.	1528
	Employer's contribution towards ESI	955
		21583
(e)	Total cost of job	
	Material	Rs. 60,000
	Labour cost as per (d) above	21,583
	Prime cost	81,583
	Overheads at 50% of Prime cost	40791
	Total cost of the job	1,22,374

Example 5.20

During audit of accounts of *G*. Company, your assistant found errors in the calculation of the wages of factory workers and he wants you to verify his work.
He has extracted the following information:

(i) The contract provides that the minimum wage for a worker is his base rate. It is also paid for downtimes (that is, the machine is under repair or the worker is without work). The standard work week is 40 hours. For overtime production, workers are paid 150 percent of base rates.
(ii) Straight Piece Work—The worker is paid at the rate of 20 paise per piece.

(iii) Percentage Bonus Plan—Standard quantities of production per hour are established by the engineering department. The workers' average hourly production, determined from his total hours worked and his production, is divided by the standard quantity of production to determine his efficiency ratio. The efficiency ratio is then applied to his base rate to determine his hourly earnings for the period.

(iv) Emerson Efficiency Plan—A minimum wages is paid for production upto $66\frac{2}{3}\%$ of standard output or efficiency. When the workers production exceeds $66\frac{2}{3}\%$ of the standard output he is paid bonus as per the following table:

Efficiency Level	*Bonus*
Upto $66\frac{2}{3}\%$	Nil
Above $66\frac{2}{3}\%$ to 79%	10%
80% – 99%	20%
100% – 125%	45%

Your assistant has produced the following schedule pertaining to certain workers of a weekly pay roll:

Workers	*Wage Incentive Plan*	*Total Hours*	*Down Time Hours*	*Units Produced*	*Standard Units*	*Base Rate (Rs.)*	*Gross Wages as per Book (Rs.)*
Rajesh	Straight piece work	40	5	400	—	1.80	85
Mohan*	Straight piece work	46	—	455	—	1.80	95
John	Straight piece work	44	—	425	—	1.80	85
Harish	Percentage bonus plan	40	4	250	200	2.20	120
Mahesh	Emerson	40	—	240	300	2.10	93
Anil	Emerson (40 hours production)	40	—	600	500	2.00	126

* Total hours of Mohan include 6 overtime hours.

Prepare a schedule showing whether the above computation of workers' wages are correct or not. Give details. *(C.A. Inter May 1999)*

Solution:

Minimum Wages
(Gross Wages and Wages to be paid)

Workers		*Wage Incentive Plan*	*Minimum Wages (Rs.)*	*Gross Wages computed as per incentive Plan (Rs.)*	*Gross Wages as per book (Rs.)*	*Wages to be paid (Rs.)*
Rajesh	(WN 1)	Straight piece work	72.00	80.00	85	80.00
Mohan	(WN 2)	Straight piece work	88.20	91.00	95	91.00
John	(WN 3)	Straight piece work	82.80	85.00	85	85.00
Harish	(WN 4)	Percentage bonus plan	88.00	110.00	120	110.00
Mahesh	(WN 5)	Emerson	84.00	100.80	93	100.80
Anil	(WN 6)	Emerson	80.00	116.00	126	116.00

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Working Notes:

1. Minimum Wages for Rajesh = Total Normal Hours × Rate per Hour
   = 40 hours × Rs. 1.80 = Rs. 72

   Gross wages (Computed) as per incentive plan = No. of units × Rate per unit
   = 400 units × Rs. 0.20 = Rs. 80
2. Minimum Wages for Mohan = Total Normal Hours × Rate per Hour + Overtime Hours × Overtime Rate per Hour
   = 40 hours × Rs. 1.80 + 6 hours × Rs. 2.70
   = Rs. 72 + Rs. 16.20 = Rs. 88.20

   Gross wages (computed) as per incentive plan = 455 units × Rs. 0.20 = Rs. 91.00
3. Minimum Wages for John = 40 hours × Rs. 1.80 + 4 hours × Rs. 2.70
   = Rs. 72 + Rs. 10.80 = Rs. 82.80

   Gross Wages (computed) as per incentive plan = 425 units × Rs 0.20 = Rs. 85
4. Minimum Wages for Harish = 40 hours × Rs. 2.20 = Rs. 88

   Efficiency of Worker $= \frac{\text{Actual Production per hour}}{\text{Standard Production per hour}} \times 100$

   $= \frac{(250 \text{ units}/40 \text{ hours})}{(200 \text{ units}/40 \text{ hours})} \times 100 = 125\%$

   Hourly rate = Rate per hour × Efficiency of worker
   Gross Wages Computed (as per percentage bonus plan) = Rs. 2.20 × 125% = Rs. 2.75
   = 40 hours × Rs. 2.75 = Rs. 110
5. Minimum wages for Mahesh = 40 hours × Rs. 2.10 = Rs. 84

   Efficiency of worker $= \frac{(240 \text{ units}/40 \text{ hours})}{(300 \text{ units}/40 \text{ hours})} \times 100 = 80\%$

   Bonus (as per Emerson's plan) = Total Minimum Wages × Bonus Percentage
   = Rs. 84 × 20% = Rs. 16.80

   Gross Wages as per Emerson's Efficiency plan = Minimum wages + Bonus
   = Rs. 84 + Rs. 16.80 = Rs. 100.80
6. Minimum Wages for Anil = 40 hours × Rs. 2 = Rs. 80

   Efficiency of worker $= \frac{600}{500} \times 100 = 120\%$

   Bonus as per Emerson's plan = Rs. 80 × 45% = Rs. 36
   Gross wages as per Emerson's Efficiency plan = Rs. 80 + Rs. 36 = Rs. 116

Example 5.21

The Cost Accountant of Tirupati Electronics Ltd. has computed labour turnover rates for the quarter ending 31st March, 1998 as 10%, 5% and 3% respectively under 'Flux Method', Replacement Method', and 'Separation Method'. If the number of workers replaced during that quarter is 30, find out the number of (a) workers recruited and joined and (b) workers left and discharged.

(B. Com.(Hons). Delhi 1998, 2006)

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Solution *Computation of Labour Turnover Rate*

1. Replacement Method $= \dfrac{\text{Number of replacements}}{\text{Average number of workers}}$

$=$ Putting the values in formula

$$\frac{5}{100} = \frac{30}{\text{Av. No. of workers}}$$

Hence, average number of workers $= \dfrac{30 \times 100}{5} = 600$

2. Separation Method

$$\frac{\text{No. of separations}}{\text{Average number of workers}}$$

or $= \dfrac{3}{100} = \dfrac{X}{600}$

$X = 18$

3. Flux Method $= \dfrac{\text{Number of separations} + \text{Number of additions}}{\text{Average number of workers}}$

$= \dfrac{10}{100} = \dfrac{18 + \text{No. of additions}}{600}$

$= \text{No. of additions} = \dfrac{600 - 1800}{100} = \dfrac{4200}{100}$

$= 42$

Hence, the number of Additions $= 42$

From the above, the following information as desired by the question can be computed.

(a) Workers recruited and joined = 42

(b) Workers left and discharged = 18

Example 5.22

The following information relates to work force in a factory during the year 2001–02:

Number of workers on April 1, 2001	2,350
Number of workers on March 31, 2002	2,850
Number of workers who quit on their own	200
Number of workers who availed golden Handshake opportunity	100
Number of workers employed during 2001–2002 including those employed due to expansion	800

Calculate annual labour turnover rate and equivalent monthly turnover rate under different methods.

(B.Com. (Hons), Delhi, 2004)

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Solution:

According to Separation Method:

Annual Labour Turnover Ratio

$$= \frac{\text{No. of separations during the year}}{\text{Average No. of worker}} \times 100$$

$$= \frac{\frac{200 + 100}{2}}{\frac{2350 + 2850}{2}} \times 100 = 11.54\%$$

Equivalent monthly rate

$$= \frac{\text{Annual Labour Turnover Rate}}{12}$$

$$\frac{11.54}{12} = .96\%$$

2. **According to Replacement Method:**

Annual Labour Turnover Ratio

$$= \frac{\text{Actual No. of Replacement}}{\text{Average No. of workers}} \times 100$$

$$= \frac{100}{2600} \times 100 = \frac{100}{26} = 3.85\%$$

Equivalent monthly turnover rate $= \frac{\text{Annual labour turnover rate}}{12}$

$$= \frac{3.85}{12} = .32\%$$

3. **According to Flux Method:**
Annual Labour Turnover Rate

$$= \frac{\text{No. of separations + No. of Replacements}}{\text{Average No. of workers}}$$

$$= \frac{400}{2600} \times 100 = 15.39\%$$

Equivalent monthly Labour Turnover Rate $\frac{15.39}{12} = 1.28\%$

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Example 5.23

The management of Sunshine Ltd. wants to have an idea of the profit lost/foregone as a result of labour turnover last year.

Last year sales amounted to Rs. 66,00,000 and the *P/V* Ratio was 20%. The total number of actual hours worked by the direct labour force was 3.45 lakhs. As a result of the delays by the personnel department in filling vacancies due to labour turnover, 75,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive. The costs incurred consequent on labour turnover revealed an analysis of the following:

	Rs.
Settlement cost due to leaving	27,420
Recruitment costs	18,725
Selection costs	12,750
Training costs	16,105

Assuming that the potential production lost due to labour turnover could have been sold at prevailing prices, ascertain the profit foregone/lost last year on account of labour turnover. *(C.A. Inter May 1998)*

Solution:

Basic Calculations

(i) Actual Productive Hours = Actual hrs. Worked – Unproductive Training hrs.
= 3,45,000 hrs. – 15,000 hrs. = 3,30,000

(ii) Sales per Productive Hour = Total Sales/Actual Productive hrs.
= Rs. 66,00,000/3,30,000 hrs. = Rs. 20

(iii) Potential Productive Hours Lost = 75,000 hrs.

(iv) Sales Foregone = 75,000 hrs. × Rs. 20 = Rs. 15,00,000

(v) Contribution Foregone = Sales Foregone × *P/V* Ratio
= Rs. 15,00,000 × 20% = Rs. 3,00,000

M/s Sunshine Ltd.
Statement of Profit Foregone as a Result of Labour Turnover

		Rs.
Contribution Foregone (See note (v) above)		3,00,000
Add: Settlement Cost due to leaving	27,420	
Recruitment Costs	18,725	
Selection Costs	12,750	
Training Costs	16,105	
		75,000
Total Profit Foregone		3,75,000

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Example 5.24

From the following information calculate Labour turnover rate:

No. of workers as on 01.01.2000 = 7,600

No. of workers as on 31.12.2000 = 8,400

During the year, 80 workers left while 320 workers were discharged. 1,500 workers were recruited during the year of these, 300 workers were recruited because of exits and the rest were recruited in accordance with expansion plans. *(C.A. Inter May 2001)*

Solution:

Labour turnover rate:

It comprises of computation of labour turnover by using following methods:

(i) *Separation Method:*

$$= \frac{\text{No. of workers left} + \text{No. of workers discharged}}{\text{Average number of workers}} \times 100$$

$$= \frac{(80 + 320)}{(7{,}600 + 8{,}400) \div 2} \times 100$$

$$= \frac{400}{8{,}000} \times 100 = 5\%$$

(ii) *Replacement Method:*

$$= \frac{\text{No. of workers replaced}}{\text{Average number of workers}} \times 100$$

$$= \frac{300}{8{,}000} \times 100 = 3.75\%$$

(iii) *New Recruitment:*

$$= \frac{\text{No. of workers newly recruited}}{\text{Average number of workers}} \times 100$$

$$= \frac{1{,}200}{8{,}000} \times 100 = 15\%$$

Flux Method:

$$= \frac{\text{No. of separations} + \text{No. of workers recruited}}{\text{Average number of workers}} \times 100$$

$$= \frac{(400 + 1500)}{(7{,}600 + 8{,}400) \div 2} \times 100$$

$$= \frac{1{,}900}{8{,}000} \times 100 = 23.75\%$$

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Example 5.25

The capacity usage ratio and the capacity utilisation ratio in respect of a machine for a particular month is 80% and 90% respectively. The available working hours in a month is 200 hours.

The break-up of idle-time is as follows:

Waiting for job	5 hours
Breakdown	4 hours
Waiting for tools	3 hours

Calculate the idle-time cost and present the same in a tabular form when the hourly fixed cost of running the machine is Rs. 8.00. *(ICWA, Inter)*

Solution:

Total available working hours		200 hours
Standard capacity usage	0.80 × 200	160 hours
Normal (unavoidable) idle-time	(200 – 160)	40 hours
Actual hours worked	0.90 × 160	144 hours
Abnormal idle capacity	(160 – 144)	16 hours
Available idle-time	(16 – 12)	4 hours

Idle-time Report

Particulars	*Hours*		*Amount*		
Normal idle-time		40	Rs. 8 × 40		Rs. 320
Abnormal idle-time:					
Waiting for job	5		Rs. 8 × 5	Rs. 40	
Breakdown	4		Rs. 8 × 4	32	
Waiting for tools	3		Rs. 8 × 3	24	
Avoidable	4	16	Rs. 8 × 4	32	Rs. 128
Total		56			Rs. 448

Example 5.26

The profitabililty position of TARGET LTD. for the year ending 31.03.2006 is as under.

	(Rs. in lakhs)	(Rs. in lakhs)
Annual Turnover		200
Variable Costs:		
Direct Material	60	
Direct Labour	40	
Variable Overheads	50	150
Marginal Contribution		50
Fixed Overheads		10
Profit		40

The profit for the year did not mach with company's expectation and works management attributed it to labour turnover.

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Analysis of the data revealed the following:

Permanent workmen worked during the year	960,000 Direct labour hours
Apprentice workmen worked	80,000 Direct labour hours
	1,040,000 Direct labour hours

The effectiveness of direct labour hours put in by apprentice workmen was 50% and delay in replacing against separations during the year resulted in loss of 20,000 Direct labour hours.

You are required to calculate the loss of profit on account of loss of production from Labour turnover.

(I.C.W.A., Inter, Stage 1, June 2006)

Solution:

Effective direct labour hours:

Permanent workmen	9,60,000 hours
Apprentice workmen 50% of 80,000 hrs	40,000 hours
	Total 10,00,000 hours

Sales per direct labour hour = Rs. 200 lakhs ÷ 100,00,000
= Rs. 20

Loss of production hours:

For replacement	20,000 hours
For apprentices	40,000 hours
	Total 60,000 hours

= 60,000 hrs × Rs. 20 = Rs. 12,00,000
= Rs. (200 + 12) Lakhs = Rs. 212 lakhs
= (Rs. 40 lakhs/10,40,000 hrs) × 20,000 = Rs. 76,923

Materials and Variable OH for extra 12 lakhs of Sales:
Rs. (110 lakhs/200 lakhs) × 12 lakhs = Rs. 6,60,000

Potential Profit with no Labour Turnover		Rs.
Sales		2,12,00,000
Less Variable Costs:		
Direct labour Rs. (40,00,000) + 76,923)		40,76,923
Direct materials and variable OHs Rs. (1,10,00,000 + 6,60,000)		1,16,60,000
	Total	1,57,36,923
Contribution		54,63,077
Less: Fixed Costs		10,00,000
Potential profit		44,63,077
Actual profit		40,00,000
Loss of profit due to labour Turnover		4,63,077

Alternatively:		Rs.
Loss of potential Sales		12,00,000
Less: Variable Costs		
Direct labour costs	76,923	
Materials and Variable Overheads	6,60,000	7,36,923
Contribution Loss for Labour Turnover:		4,63,077

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Example 5.27

Sona Corporation has filed the following income statement for the year ending 31st March, 2003.

Particulars	Rs.	Rs.
Sales		24,00,000
Less variable costs:		
Material	6,01,000	
Direct labour	5,19,000	
Variable factory overheads	3,20,000	
Variable selling and distribution overheads	1,90,000	16,30,000
Contribution		7,70,000
Less fixed overheads		5,30,000
Net income before tax		2,40,000
Capital employed		12,00,000

The actual number of hours direct labour worked, in the year under review is 2,06,000. As a consequence of delays in filling vacancies of employees who quit, 6,000 potential direct hours were not worked, and the actual hours worked were 4,000 hours of trainees, half the time of which was unproductive. The costs incurred in consequence of re-employment were as follows: (a) Separation costs Rs. 25,630; (b) Selection costs Rs. 32,080; (c) Recruitment costs Rs. 23,140 and (d) Training costs Rs. 31,160.

Calculate the profit foregone on account of labour turnover (round off to the nearest rupee) and the potential return on capital and sales and turnover ratio. *(ICWA, Final)*

Solution:

Determination of Contribution Foregone

	Rs.
Actual labour hours worked	2,06,000
Less unproductive training hours (50% of 4,000)	2,000
Actual productive hours	2,04,000
Potential labour hours not worked	6,000
Add unproductive training hours	2,000
Effective labour hours lost	8,000
Contribution lost Rs. 7,70,000 × 8,000/2,04,000 = Rs. 30,196	

Saving in Cost

	Rs.
Separation costs	25,630
Selection costs	32,080
Recruitment costs	23,140
Training costs	31,160
	1,12,010

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Profit Foregone and other Ratios

		Rs.
Contribution lost	Rs.	30,196
Savings in cost		1,12,010
Total profit foregone	Rs.	1,42,206
Net profit before tax	Rs.	2,40,000
Profit foregone		1,42,206
Potential profit	Rs.	3,82,206
Actual sales	Rs.	24,00,000
Sales foregone 24,00,000 × 8,000/2,04,000		94,118
Potential sales	Rs.	24,94,118
Actual labour hours worked		2,04,000
Labour hours lost		8,000
Potential labour hours		2,12,000
Potential profit on capital employed:		3,82,206/12,00,000 = 31.851%
Potential profit on potential sales:		3,82,206/24,94,118 = 15.324%
Turnover ratio = labour hour lost/potential labour hours		= 8,000/2,12,000 = 3.774%

THEORY QUESTIONS

1. Describe the various methods of recording time. *(B.Com. (Hons), Delhi, 2007)*
2. What are the merits and demerits of time rate and piece-rate systems of wage payment? State the situations in which each system is effective and useful. *(CA Inter)*
3. What are the reasons for booking workers on idle time in a factory? How is idle time controlled and treated in cost accounts? *(CA Inter)*
4. Discuss individual bonus systems, group bonus systems and bonus systems for indirect workers.
5. List the characteristics desirable in any Incentive Wages Plan.
6. Distinguish between systems of wage payments known as Taylor's Differential Piece-Rate and Emerson's Efficiency system.
7. What is labour turnover? How will you measure it? What are its causes and effects on labour costs? *(CA Inter, ICWA Inter)*
8. What is idle time? Indicate the different categories into which idle time can be classified and state which of them can be effectively controlled and how? *(ICWA Inter)*
9. A company is considering installing a workers' profit sharing scheme in lieu of an individual bonus scheme. You are required to specify the disadvantages of the former. *(ICWA Inter)*
10. (a) Describe the treatment of payments to labour for overtime work and in respect of holiday with pay in cost accounts. *(B. Com., Delhi)*
    (b) Distinguish between Taylor's differential piece-rate and the Emerson Efficiency Plan system of incentive wage payments. *(B. Com. Delhi)*
11. For each of the pay roll costs given below, state the accounting treatment that you would recommend, giving your reason:
    (a) Idle time in the finishing department because the assembly department delayed its production.

(b) Overtime resulting from a customer saying "I want this job done in a week, and if you have to work overtime, I do not mind".

(c) Labour time involved in reworking 5 units out of a batch of 50, on a process where 10% of the completed units are expected to be defective. *(B.Com. (Hons), Delhi, 2002)*

12. Discuss labour turnover and different methods of measuring it. *(B.Com. (Hons), Delhi, 2005)*

13. What do you mean by labour turnover? What are the costs associated with it? How would you treat these costs in cost accounting? *(B.Com. (Hons), Delhi, 2006, 2007, I.C.W.A. Inter, Stage 1, June 2006)*

14. Under the Rowan Premium Bonus system, a less efficient worker can obtain same bonus as a highly efficient worker. Discuss with suitable example. *(CA, PE, Exam II, Group II, May 2007)*

15. Discuss the effect of overtime payment on productivity. *(CA, PE, Exam II, Group II, Nov. 2004)*

16. Explain the purpose of time keeping and time booking and state what detailed records are normally maintained under each. Do you feel any need for reconciliation of these two? What is the benefit you expect if such reconciliation is carried out? *(ICWA Inter)*

17. Write a short essay on "Time and Motion Study", stating the benefits to be derived by management from such study. *(ICWA Inter)*

18. How are payments to workers in respect of overtime work and set-up time treated in cost accounts? *(CA, PE, Exam. II, Group II, Nov. 2004)*

19. What is idle time? Explain the causes leading to idle time and its treatment in cost accounts. *(B. Com. (Hons), Delhi 2004)(B. Com., Delhi 2003, 2007)*

20. Explain the nature and significance of 'Labour Turnover'. *(B. Com. (Hons) Delhi 1999)*

21. What are the effects of labour turnover on cost of production? *(B. Com. (Hons), Delhi 2000)*

22. Enumerate the causes of labour turnover. What is the impact of high labour turnover on the cost of production? *(B. Com. (Hons), Delhi 2001)*

23. "High wages do not necessarily mean high labour cost". Elucidate. *(ICWA Inter)*

24. How is payroll accounting function organised in a manufacturing establishment? *(B. Com. (Hons), Delhi)*

25. Explain what is meant by group bonus and state the objectives of introducing a group bonus schemes. *(CA Inter)*

26. What do you understand by overtime premium? What is the effect of overtime payment on productivity and cost? Discuss the treatment of overtime premium in cost accounts and suggest a procedure for control of overtime. *(B. Com. (Hons), Delhi 2004)*

27. What do you understand by time and motion study? Explain how standard time is set under time study. State how time and motion study is useful to management. *(CA Inter)*

28. Define job evaluation and distinguish it from merit rating. Explain the method and objectives of job evaluation. *(CA Inter)*

29. What do you understand by 'idle time'? Distinguish between 'Normal' and 'Abnormal idle time'. How would you deal with each one of them in cost accounts? Give a suitable example to clarify your answer. *(B. Com. (Hons), Delhi 2005, 2007, B. Com. Delhi 2002)*

30. How will you treat the following in cost accounts:

(i) Interest on capital

(ii) Leave wages

(iii) Research and development cost

(iv) Audit fees *(B. Com. (Hons), Delhi)*

31. State the circumstances in which time rate system of wage payment can be preferred in a factory. *(CA, PE, Exam II, Group II, Nov. 2004)*

32. Discuss briefly how will you deal with casual workers and workers employed on outdoor work in cost accounts. *(CA, PE, Exam II, Group II, May 2002)*

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PROBLEMS

1. There are two piece-workers, Rakhal and Upendra, who are paid Rs. 5 for each piece work executed, which costs Rs. 15 per piece in materials.
In a working day of 8 hours, Rakhal can complete 4 pieces and Upendra only 3. If the overhead charges be Rs. 1.50 per hour show which of the two piece workers is more useful to the factory. *(ICWA Inter)*

Ans: Rakhal's cost of production is Rs. 23 per unit. Upendra's cost of production is Rs. 24 per unit. Rakhal's employment will be useful as his cost is lesser than that of Upendra's cost.

2. The standard hours of job *X* is 100 hours. The job has been completed by Amar in 60 hours, Akbar in 70 hours and Anthony in 95 hours. The bonus system applicable to the job is as follows:

Percentage of time saved to time allowed	*Bonus*
Saving upto 10%	10% of time saved
From 11% to 20%	15% of time saved
From 21% to 40%	20% of time saved
From 41% to 100%	25% of time saved

The rate of pay is Rs. 10 per hour. Calculate the total earnings of each worker and also the rate of earnings per hour. *(CA. Inter year,)*

Ans: Amar Rs. 11.33, Akbar Rs. 10.857, Anthony Rs. 10.052

3. Calculate total monthly remuneration of three workers *A*, *B* and *C* from the following data:
(a) Standard production per month per worker – 1,000 units. Actual production during month *A*–850 units, *B*–750 units, *C*-950 units.
(b) Piecework rate Rs. 10 per unit (actual production).
(c) Additional production bonus is Rs. 10 for each percentage or actual production exceeding 80%. *(ICWA Inter.)*
(d) Dearness pay fixed Rs. 50 per month.

Ans: A—Rs. 8,600, *B*—Rs. 7,550, *C*—Rs. 9,700

4. *XYZ* Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. The company has recently fixed the standard output for a mass production item and introduced an incentive scheme to boost output. Details of wages payable to the workers are as follows:
(i) Basic wages/piece work wages @ Rs. 2 per unit subject to a guaranteed minimum wages of Rs. 60 per day.
(ii) Dearness allowance at Rs. 40 per day.
(iii) Incentive bonus:
Standard output per day per worker: 40 units;
Incentive bonus up to 80% efficiency: Nil;
Incentive bonus for efficiency above 80%: Rs. 50 for every 1% increase above 80%.
The details of performance of four workers for the month of April 1998 are as follows:

Worker	*No. of days worked*	*Output (units)*
A	25	820
B	18	500
C	25	910
D	24	780

Calculate the total earnings of each of the workers. *(I.C.W.A. Inter Dec. 1998)*

Ans: Total earnings *A*—Rs. 2,740, *B*—Rs. 1,800, *C*—Rs. 3,370, *D*—Rs. 2,570

5. A worker produced 200 units in a week's time. The guaranteed weekly wage payment for 45 hours is Rs. 81. The expected time to produce one unit is 15 minutes which is raised further by 20% under the incentive scheme. What will be the earnings per hour of that worker under Halsey (50% sharing) and Rowan bonus schemes? *(C.A. Inter 1995)*

Ans: Earnings under Halsey scheme Rs. 94.50
Earnings under Rawan scheme Rs. 101.25

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6. Calculate the earnings of workers *A*, *B* and *C* under Straight Piece Rate System and Merrick's Multiple Piece Rate System from the following particulars:

Normal Rate per Hour	Rs. 5.40
Standard Time per Unit	1 Minute

Output per day is as follows:

Worker *A*—390 Units
Worker *B*—450 Units
Worker *C*—600 Units *(C.A. Inter May 1998)*

Working hours per day are 8.

Ans:

	Straight Piece Rate	Earnings under Merrick's Piece Rate
A	Rs. 35.10	Rs. 35.10
B	40.50	44.50
C	54.00	64.80

7. A worker, whose day-work wages are Rs. 25 per hour, received production bonus under the Rowan Scheme. He carried out the following work in a 48-hour week:

Job 1—1,500 items at 4 hours per 1,000
Job 2—1,800 items at 3 hours per 1,000
Job 3—9,000 items at 6 hours per 1,000
Job 4—1,500 items for which no 'standard time' was fixed and it was arranged that the worker would be paid a bonus time of 25 per cent. Actual time on the job was 4 hours.
Job 5—2,000 items at 8 hours per 1,000, this job was estimated to be half-finished.

Job No. 2 was carried out on a machine running at 90 per cent efficiency and an extra allowance of 1/9th of actual time was given to compensate the worker.

4 hours were lost due to power cut. Calculate the earnings of the worker, clearly stating your assumptions for the treatment given by you for the hours lost due to power-cut. *(ICWA Inter)*

Ans: Rs. 1,687.34

8. Following particulars have been extracted from the books of Supreme Engineers Limited:

Time allowed for the job	15 hrs	15 hrs	15 hrs
Time taken	15 hrs	12 hrs	9 hrs
Bonus ratio for Halsey 50%			
Rate per hour Rs. 2			

(a) You are required to compute the quantum of wages under Halsey Scheme and Rowan Schemes. Which of these schemes would you like to introduce in this company if the time taken to complete the job is likely to reduce to 6 hours after three months?

(b) An alternative method of payment by result is by a straight piece work rate for completion of the job in 7 hours is feasible. Would you like to switch over to this method of payment given further that hourly rate would be reckoned at Rs. 1.50 for fixation of the piece rate? Please give reasons for your advice. *(ICWA, Inter)*

Ans:

Time taken	Wages Halsey Rs.	Wages Rowan Rs.
15	30	30
12	27	28.80
9	24	25.20
6	21	19.20

9. The management of Bina and Rina Ltd. is worried about its increasing labour turnover in the factory and before analysing the causes and taking remedial steps it wants to have an idea of the profit foregone as a result of labour turnover in the last year.

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Last year sales amounted to Rs. 83,03,300 and P/V ratio was 20 per cent. The total number of actual hours worked by the direct labour force were 4.45 lakhs. As a result of the delays by the personnel department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive. The cost incurred consequent on labour turnover revealed, on analysis, the following:

Settlement cost due to leaving	Rs. 43,820
Recruitment costs	Rs. 26,740
Selection costs	Rs. 12,750
Training costs	Rs. 30,490

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit fore gone last year on account of labour turnover.

(CA. Inter Nov. 2001, CA, PE, Exam II, Group II, Nov. 2004)

Ans: Profit foregone Rs. 5,00,000.

10. A company's basic wage rate is Rs. 3.00 per hour and its overtime rates are:

Evenings	Time and one-third
Weekends	Double time

During the previous year the following hours were worked:

	Hours
Normal time	2,20,000
Time plus one-third	20,000
Double time	10,000

The following times have been worked on these jobs:

	Job-*A* Clock hours	Job-*B* Clock hours	Job-*C* Clock hours
Normal time	3,000	5,000	4,000
Evening overtime	300	600	1,050
Weekend overtime	100	50	300
Total	3,400	5,650	5,350

You are required to calculate the labour cost chargeable to each job where overtime is worked regularly throughout the year as the company policy due to labour shortage.

Ans: Job *A* Rs. 10,880; Job *B* Rs. 18080; Job *C* Rs. 17,120.

11. The following particulars for the first week of September 2003 relate to *X* and *Y*, two workers employed in a factory.

	X	*Y*
(a) Job completed (units)	3,600	4,200
(b) Out of above, output rejected and unsaleable	540	420
(c) Time allowed	12 minutes per dozen	3 hours for 200 units
(d) Basic wages rate per hour	Rs. 5	Rs. 6
(e) Hours worked	45	50

The normal working hours per week are fixed at 42 hours. Bonus is paid @ 2/3 of basic wage rate for gross time worked and gross output produced without deduction of rejected output. The rate of overtime for first 4 hours is paid at time plus 1/3 and next 4 hours is paid at time plus $\frac{1}{2}$.

From the above data, calculate for each employee:

(a) Number of bonus hours earned and amount of bonus earned.

(b) Total wages earned including basic wages, overtime premium and bonus.

(c) Direct wages cost per 100 saleable units. *(ICWA, Inter)*

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Ans: (a)

	Worker	
	X	*Y*
Bonus earned	Rs. 50	Rs. 52
Total Wages	280	372
Direct Wages	Rs. 7.78	Rs. 8.86

12. Both direct and indirect labour of a department in a factory are entitled to production bonus in accordance with a group incentive scheme, the outline of which is as follows:

(a) For any production in excess of the standard rate fixed at 10,000 units per month (of 25 days) a general incentive of Rs. 10 per unit is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely @ 70% by direct labour, @ 10% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.

(b) Moreover, if the excess production is more than 20 per cent above the standard, direct labours also get a special bonus @ Rs. 5 per unit for all production in excess of 120% of standard.

(c) Inspection staff are penalised @ Rs. 20 per unit for rejection by customer in excess of 1% of production.

(d) Maintenance staff are also penalised @ Rs. 20 per hour of breakdown.

From the following particulars for a month, work out the production bonus earned by each group:

(a) Actual working days: 20

(b) Production: 11,000 units

(c) Rejection by customer: 200 units

(d) Machine breakdown: 40 hours. *(ICWA, Inter)*

Ans: Direct labour Rs. 28,000; Inspection staff Rs. 1,200; Maintenance staff Rs. 2,800; supervisory staff Rs. 2,400.

13. In a unit, 10 men work as a group. When the production of the group exceeds the standard output of 200 pieces per hour, each man is paid an incentive for the excess production in addition to his wages at hourly rates. The incentive is at half of the percentage of the excess production over the standard production. Each man is paid incentive at the rate of this percentage of wage rate of Rs. 2 per hour. There is no relation between the individual workman's hourly rate and the bonus rate.

In a week, the hours worked are 500 hours and the total production is 1,20,000 pieces.

(a) Compute the total amount of the bonus for the week.

(b) Calculate the total earnings of two workers *A* and *B* of the group:
A worked 44 hours and his basic rate per hour was Rs. 2.20
B worked 48 hours and his basic rate per hour was Rs. 1.90 *(CA, Inter)*

Ans: Total earnings *A* Rs. 105, *B* Rs. 100.80

14. Calculate normal overtime and total wages payable to a worker from the particulars given below:

Days	*Hours worked*
Monday	10
Tuesday	9
Wednesday	8
Thursday	12
Friday	9
Saturday	4

Normal working hours = 8 per day; Saturdays: 4 per day
Normal rate = Rs. 5 per day
Overtime rate = upto 9 hours per day, single rate,
and beyond 9 hours a day, double rate.

(ICWA, Inter)

Ans: Total wages Rs. 280.

15. The time taken for a particular operation for Operator *X* in the process division of a manufacturing concern on three different counts was 24,22 and 27 minutes while that of Operator *Y* was 20, 23 and 26 minutes. It has been ascertained that the rating of *X* is 70/60 and that of *Y* is 55/60. Allowances for fatigue, and personal needs are assumed at 15%. Calculate, using the above information as a base for that particular operation,

(i) the standard time

(ii) the time allowed under an incentive allowance of 30% of standard time. *(ICWA, Inter)*

Ans: Standard time 28.448 minutes
Time allowed 36.982 minutes.

FACTORY OVERHEADS: DISTRIBUTION

6

Learning Objectives:

After reading this chapter, you should be able to:

1. explain factory overheads—concepts, its classification, nature, its collection and codification, its allocation and apportionment, its accounting and distribution;
2. discuss different methods of absorption of factory overheads and merits and demerits of apportionment and absorption of overheads; and
3. explain actual overhead rate, predetermined overhead rate, under- or over-absorption of overhead.

CONCEPT

Factory overhead costs are operating costs of a business enterprise which cannot be traced directly to a particular unit of output, that is, product or jobs. Factory overhead is the aggregate of indirect materials, indirect wages and indirect expenses. The term "overhead" is used interchangeably with such terms as "burden", "supplementary costs", "indirect expense", "factory expense". The word "overhead" is more appropriate than burden and supplementary costs because the latter terms imply an unnecessary charge, an extra cost or an element of cost resulting from inefficiency. The term "overhead" is preferable to manufacturing expenses, because manufacturing expenses often refer to all manufacturing costs, both direct and indirect. Overhead may be used for all types of business enterprises while manufacturing expense is restricted in its use to manufacturing concerns.

FACTORY OVERHEAD—FIXED, SEMI-VARIABLE AND VARIABLE

Factory Overhead costs can be divided into fixed, semi-variable and variable costs. Fixed overhead costs are commonly described as those that do not vary in total amount with increases or decreases in productive activity or volume of output for a given period of time, usually, a year. Management salaries, building depreciation, rent, property taxes and amortisation of leaseholds are some examples of fixed overhead. Fixed costs are constant in total amount, but vary per unit as production activity changes.

Semi-variable or semi-fixed are those which remain fixed in total amount over a relatively short range of variation in output and then are abruptly changed to a new level, where they remain fixed in total amount for another short range of output. For example, if a third shift is added without increasing plant facilities,

normally fixed costs, such as supervision salaries may increase because of the necessity of night supervision, insurance premiums may be raised because of additional fire, theft, and accident risk, and some equipment rentals may be accelerated.

Variable costs include repairs, powers, workmen's compensation, supplies and indirect labour which are typical of cost varying in total amount, with changes in productive activity. The increase or decrease in variable overhead costs need not be in the same proportion to the change in output. However, in many cases there is a directly proportional relationship. Variable costs per unit remain relatively constant with changes in production. Thus, variable costs fluctuate in total amount but tend to remain constant per unit as production activity changes. Variable overheads are generally considered controllable as they directly relate to the volume of output and by reducing the level of activity they can be reduced/avoided. Also, by comparing the actual variable overheads with budgeted variable overheads, such overheads can be controlled and kept within targets and tolerance limits.

FACTORY OVERHEADS—ACCOUNTING AND DISTRIBUTION

Factory Overheads by nature cannot be identified or associated directly with specific products or jobs. However, they should be included in total cost of products or jobs. The following steps are important in distribution of overhead costs among products or jobs.

1. Collection and codification
2. Allocation and apportionment
3. Absorption

COLLECTION AND CODIFICATION OF FACTORY OVERHEADS

The first step in distribution of factory overhead costs is their collection and codification under proper headings. Similar overhead cost items should be grouped together. The grouping of overhead costs is done through a technique known as "codification". Codification is a method of identifying and describing various overhead expenses in numbers or letters or in a combination of both so that cost data can easily be collected. Codification of the entire items is done through a proper coding system. Following are briefly the objectives of codification:

1. To collect overhead items of similar nature.
2. To help in the allocation and apportionment of overhead costs to different departments or cost centres.
3. To make an analysis of overhead cost items for planning and control purposes.
4. To help in adopting a mechanised system of accounting.
5. To maintain a reasonable number of accounts which could be economical and useful.

Methods of Codification

Generally, the codification follows Standing Order Number or Cost Accounting Number. Standing Order Number covers production overhead items and Cost Accounting Number includes administration, selling and distribution overhead items. However, both follow the same principle of accumulating overhead cost items. Some important methods of codification are the following:

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Serial Numbering System

Under this method each item is allotted a fixed number in serial order, for example,

01 Factory supplies
02 Indirect labour
03 Insurance
04 Factory rent

Number Blocks

Under this method, a block number is assigned to cover items of expenditure, for example, 0–10 for maintenance expenses, 11–20 for supervision expenses, etc.

Combination of Alphabets and Numbers

Under this method a code is used which combines the number as well as the alphabets, for example,

M_1 = Maintenance of plant
M_2 = Maintenance of tools
M_3 = Maintenance of factory building
M_4 = Maintenance of office building

In the above example, *M* stands for maintenance and different numbers for different types of maintenance expenses.

Numerical Codes

Under this system, a code number usually consisting of nine digits is used. The first two digits signify wherther the cost is fixed or variable, the next three indicate head of expense, the next two the analysis of expense for further subdivision, and the last two digits indicate the cost centre which incurs the expenditure, for example,.

10/121/05/08 Fixed/salary/officers/production.

Mnemonic Method

Under this method, the letters/alphabets are used to indicate an item such as D.P.T. for depreciation on plant and tools.

Among the above methods, the numerical code method is more suitable than the others for a large organisation. This method is easy to operate where a mechanical system of accounting is used. A large number of items could be covered under this method.

Sources of Overhead Collection

Different sources are available in an organisation to collect overhead expenses such as:

1. Store requisitions for items like indirect materials.
2. Financial accounts—A large number of items may be taken from the financial accounts of the business enterprise.
3. Wages book—Most indirect wages and labour-related costs.
4. Cash book—for indirect expenses.
5. Registers and reports—Plant and machinery register for depreciation; scrap, waste, spoilage can be discovered through investigation.

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ALLOCATION AND APPORTIONMENT OF FACTORY OVERHEADS

Departmentalisation of Overhead

Departmentalisation of factory overhead means dividing the company into segments called departments or cost centres where expenses are incurred. In a manufacturing concern, there are mainly two types of cost centres—producing departments and service departments. A production department represents a subunit of the company where manufacturing activity takes place. Some typical examples of producing departments include assembly finishing, blending, painting and grinding departments. Service departments represent cost centres which provide support for the producing departments. Materials handling, personnel, plant maintenance, inspection, storage, purchasing, receiving, shipping, medical and other similar activities which are not directly involved in production are considered to be service activities.

Benefits of Departmentalisation

Departmentalisation serves two purposes: (i) closer control of factory overhead costs, and (ii) more accurate costing of jobs and products. Closer control is possible because departmentalisation makes the incurrence of costs in a department or cost centre, the responsibility of someone who heads the department or the cost centre.

More accurate costing of jobs and products is possible, if products are passed through more than one department. A job or product going through a department is charged with factory overhead for work done on that product in that department. Therefore, jobs or products are charged with different amounts of factory overhead depending on the number of departments through which they pass. This process results in accurate and reliable cost figures for the products or job.

Primary Distribution

Some factory overheads can be directly identified with a particular department or cost centre as having been incurred for that cost centre. Examples of such factory overheads are repairs and maintenance expenses incurred in specific departments, supervision, indirect labour, overtime, indirect materials and factory supplies, equipment depreciation.

Expenses such as power, light, rent, depreciation of factory building, expenses shared by all departments, cannot be charged directly to a department, be it producing or service. These expenses do not originate in any specific department. They are incurred for all and must, therefore, be apportioned or prorated to any or all departments using such items. Cost apportionment is the process of charging expenses in an equitable proportion to the various cost centres or departments. The Institute of Cost and Management Accountants (U.K.) defines cost apportionment, "as the allottment of proportions of items of cost to cost centres or cost units." The apportionment should be done on some rational and equitable bases. In cost accounting this is known as primary distribution of factory overhead.

It would be difficult to give a comprehensive list of the bases of apportionment, but the following bases are in common use:

1. Floor area occupied—overheads such as lighting and heating, rent and rates, depreciation on building, building repairs, caretaking, watching and patrolling.
2. Capital values—Depreciation on plant and machinery, insurance on building, and plant and machinery, maintenance of plant and machinery.
3. Direct labour hours and/or machine hours—Insurance on jigs, tools and fixtures, power, works management remuneration, repairs and maintenance cost.

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4. Number of workers employed—Canteen, accident insurance, medical, dental and first aid, pensions, personnel department expenses, profit sharing payments, recreation, supervision, time office, wages department.
5. Technical estimate—Fire prevention, oil and grease, steam, water withoug meter.

Example 6.1

The Moden Company has four departments. *A*, *B* and *C* are the production departments and *D* is a servicing department. The actual cost for a period are as follows:

		Rs. ('000)
Indirect materials		
Production department	*A*	950
	B	1,200
	C	200
Servicing department		1,500
Indirect wages		
Production department	*A*	900
	B	1,100
	C	300
Servicing department		1,000
Rent		2,000
Repair		1,200
Depreciation		900
Light		200
Supervision		3,000
Insurance		1,000
Employee's insurance (employer's liability)		300
Power		1,800

The following data are also available in respect of four departments:

	Departments			
	A	*B*	*C*	*D*
Area (sq. ft)	150	110	90	50
No. of workers	24	16	12	8
Total wages ('000)	Rs. 8,000	Rs. 6,000	Rs. 4,000	Rs .2,000
Value of plant ('000)	Rs. 24,000	Rs. 18,000	Rs. 12,000	Rs. 6,000
Value of stock ('000)	Rs. 15,000	Rs. 9,000	Rs. 6,000	—

Apportion the above costs to the various departments on the most equitable method.

Solution:

Departmental Distribution Summary **(Rs. '000)**

			Production departments		*Sevicing deptts.*	
Items	*Basis*	*Total*	*A*	*B*	*C*	*D*
Indirect material	Allocation	3,850	950	1,200	200	1,500
Indirect wages	Allocation	3,300	900	1,100	300	1,000
Rent	Area	2,000	750	550	450	250
Repairs	Plant value	1,200	480	360	240	120

(*Contd.*)

(*Contd.*)

			Production departments			Sevicing deptts.
Items	*Basis*	*Total*	*A*	*B*	*C*	*D*
Depreciation	Plant value	900	360	270	180	90
Light	Area	200	75	55	45	25
Supervision	No of workers	3,000	1,200	800	600	400
Insurance	Value of stock	1,000	500	300	200	—
Employees Insurance	Wages	300	120	90	60	30
Power	Plant value	1,800	720	540	360	180
	Total	17,550	6,055	5,265	2,635	3,595

Notes: (i) It has been assumed that insurance has been taken for stock.

(ii) Power expenses have been apportioned on the basis of value of plant because no other information has been given.

Example 6.2

Selfhelp Ltd. has gensets and produces its own power. Data for power costs are as follows:

Horse Power Hours	Production deptts.		Service deptts.	
	A	*B*	*X*	*Y*
Needed capacity production	10,000	20,000	12,000	8,000
Used during the month of May	8,000	13,000	7,000	6,000

During the month of May, costs for generating power amounted to Rs. 9,30,000; of this Rs. 2,50,000 was considered to be fixed cost. Service Deptt *X* renders service to *A*, *B* and *Y* in the ratio 13:6:1, while *Y* renders service to *A* and *B* in the ratio 31:3. Given that the direct labour hours in Deptts *A* and *B* are 1,650 hours and 2,175 hours respectively, find the power cost per labour hour in each of these two Deptts.

Solution:

Selfhelp Ltd. Overheads Distribution Summary

Particulars	*Basis of charge*	*Total Rs.*	*Production deptts*		*Service deptts.*	
			A Rs.	*B* Rs.	*X* Rs.	*Y* Rs.
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*
Fixed Cost	H.P. Hours needed at capacity production (5:10:6:4)	2,50,000	50,000	1,00,000	60,000	40,000
Variable Cost	H.P. hours used (8:13:7:6)	6,80,000	1,60,000	2,60,000	1,40,000	1,20,000
Total overheads		9,30,000	2,10,000	3,60,000	2,00,000	1,60,000
Service Deptt. *X* overheads apportioned to *A*, *B* and *Y* (13:6:1)			1,30,000	60,000	– 2,00,000	10,000

(*Contd.*)

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(1)	(2)	(3)	(4)	(5)	(6)	(7)
Service Deptt.			1,55,000	15000		–1,70,000
Y overheads apportioned to *A* and *B* (31:3)						
Total overheads of production Deptts.			4,95,000	4,35,000	—	—
Labour hours worked			1,650	2,175		
Power cost per labour hour			300	200		

APPORTIONMENT OF SERVICE DEPARTMENTS OVERHEADS TO PRODUCING DEPARTMENTS

Secondary Distribution

The primary distribution of factory overhead apportions all overhead costs to the different departments or cost centres—production and service departments both. However, it is necessary that overhead costs of service departments (accumulated through direct allocation or primary distribution) should be further assigned to producing departments. This is due to the reason that service departments do not themselves manufacture anything and it is the production departments or cost centres which are involved in manufacturing activities. The reassignment or reapportionment of service departments overhead to producing departments or centres is termed as secondary distribution.

Secondary distribution is useful in the following manner:

1. It helps in determining the cost of products or jobs sold and value of inventory.
2. It helps in determining the effect of various managerial decisions and actions on the total cost of the business firm. For example, decisions as to add or to drop a product line require information about its cost effect, which can be estimated after secondary distribution has been made.
3. It helps subsequently in determining the price of the product or job. In case of contracts based on cost in place of market price, secondary distribution helps in fixing a selling price which is advantageous to the parties concerned.
4. It promotes motivation among employees of the producing departments to take up service department activities.

Bases for Secondary Distribution

It is difficult to suggest a sample list of service departments and equitable bases of distribution of overhead costs. The general basis for apportioning service departments' overheads to producing departments are the following:

1. Services rendered (benefits obtained)—This is perhaps the most popular method of apportioning service department costs. The services rendered to different departments, that is, benefits obtained by them can be a suitable basis. If a producing department has received large benefits, it must be charged for a share of overhead costs incurred to provide that quantity of benefits. This method is simple and economical.
2. *Ability to pay*—This method suggests that a large share of servicing departments overhead costs should be assigned to those producing departments whose product contributes the most to the income of a business enterprise. However, it is difficult to measure the "ability to pay" of different departments and this method is also not based on equity.

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3. *Survey or analysis*—This method is applied where a suitable base is difficult to find or it would be too costly to select a method which is considered suitable. For example, the postage cost could be apportioned on a survey of postage used during a year.
4. *Efficiency or incentives*—This method uses standards and budgets and apportions the overhead costs on the basis of a present budget or standard. Sometimes, this method is used along with the bases of services rendered or ability to pay method.

In selecting a suitable base for apportioning service department overheads, considerations should be given to practicability, simplicity, economy, theoretical soundness and assistance in accurate costing and cost control.

The following list gives a few service departments and bases commonly used to apportion the respective overhead costs:

Service Department	*Apportionment Base*
Personnel	Number of employees, labour hours, labour cost.
Purchasing	Number of orders, cost of materials.
Receiving	Cost of materials, number of units, number of orders.
Stores	Cost of materials, number of requisitions filled, number of units handled.
Factory Office	Number of employees, labour hours, labour cost.
Machine Maintenance and Repair	Machine hours, labour hours, labour cost, services rendered.
Engineering	Machine hours, labour hours, service rendered.
Payroll or Time-keeping Department	Total labour or machine hours or number of employees in each department.
Welfare, Canteen, Recreation, Medical	Number of employees in each department.
Building Service Department	Relative area of each department.
Internal Transport Service	Weight, value, graded products, weight and distance.

Inter-departmental Services

While apportioning service departments overheads, one may notice two situations: (i) The entire amount of a servicing department is to be distributed to only the producing departments. This does not involve any practical difficulty and provides the simplest and quickest method for apportioning costs of the servicing department. (ii) Services provided by some servicing departments are used partly by other servicing departments. That is, many service departments serve each other. For example, the payroll department in a firm prepares payroll for the entire organisation, but it depends on the building maintenance department for repair and maintenance services, Similarly, the building maintenance department provides services for all departments using the building, but it gets service from departments like stores, factory office, and personnel. This second situation is known as inter-departmental services.

Methods

There are mainly two methods of dealing with inter-departmental service:

A. *Continuous apportionment* In this method, the process of apportioning service departments overhead is continued until the figures become immaterial or totally exhausted. The following steps are involved in this method:

   (a) Use the given percentages to apportion the original total of the first service department. This closes the account of the first service department and transfers prorated amounts to other departments.

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(b) Use the given percentages of second service department whose total is made up of original amount plus prorated amount of service department first. This closes the account of second service department and assigns prorated amounts to the other departments including service department first also.
(c) Follow the same procedure to all other service departments.
(d) Repeat a second cycle of apportionment starting with the service department first, whose total consists, at present, only of amounts prorated from other service departments. In this way, the service department totals become less and less with each cycle of apportionment because each time a substantial amount is apportioned to the producing departments.
(e) Stop the above cycle at any point where it is found that the remaining figure (to be apportioned) are too small to be of any consequence or when the figures are totally exhausted.

Example 6.3

The overhead of a manufacturing company has been analysed to the point of primary distribution as given below.

		Rs.
Production departments:	Machine	10,00,000
	Assembly	4,00,000
Service departments:	Canteen	2,00,000
	Powerhouse	3,00,000

The canteen is to be apportioned on the basis of employees:

	Employees	%
Machine	240	60
Assembly	140	35
Powerhouse	20	5
	400	100

The powerhouse is to be apportioned on the basis of electricity used:

	Thousand kilowatts	%
Machine	270	75
Assembly	36	10
Canteen	54	15
	360	100

Solution:

The apportionment would be done in the following manner:

	Machine	*Assembly*	*Canteen*	*Powerhouse*
Primary apportionment	10,00,000	4,00,000	2,00,000	3,00,000
Apportion: Canteen	1,20,000	70,000	– 2,00,000	10,000
Powerhouse	2,32,500	31,000	46,500	– 3,10,000
Canteen	27,900	16,300	– 46,500	2,300
Powerhouse	1,800	200	300	– 2,300
Canteen	200	100	– 300	
Total Service Deptts.	3,82,400	1,17,600		
Total Production Overhead	13,82,400	5,17,600		

B. Algebraic method or simultaneous equation This method helps in finding out the amount of overhead of each servicing department by solving simultaneous equations. The total expenses of service departments can be directly transferred to production departments.

Example 6.4

A company has three production departments, *A*, *B* and *C* and two service departments, *P* and *Q*. The following figures are available as per departmental distribution summary:

		Rs.
Production departments	*A*	3,150
	B	3,700
	C	1,400
Service departments	*P*	2,250
	Q	1,000

The expenses of the service departments are to be apportioned on a percentage basis as follows:

		A	*B*	*C*	*P*	*Q*
Service deptt.	*P*	40%	30%	20%	—	10%
Service deptt.	*Q*	30%	30%	20%	20%	—

Solution:

Let X = total overhead of deptt. *P*

Y = total overhead of deptt. *Q*

Therefore
$$X = 2{,}250 + \frac{20}{100}Y \quad (1)$$

$$Y = 1{,}000 + \frac{10}{100}X \quad (2)$$

$$10X = 22{,}500 + 2Y \quad (3)$$

$$10Y = 10{,}000 + 1X \quad (4)$$

Multiplying Eq. (3) by 5

$$50X - 10Y = 1{,}12{,}500 \quad (5)$$

$$-X + 10Y = 10{,}000 \quad (6)$$

Adding
$$49X = 1{,}22{,}500$$

$$X = 2{,}500$$

and
$$Y = 1{,}250$$

Secondary Distribution Summary

	Total	*Production Department*			*Servicing Deptt.*	
	Rs.	*A* *Rs.*	*B* *Rs.*	*C* *Rs.*	*P* *Rs.*	*Q* *Rs.*
As per summary	11,500	3,150	3,700	1,400	2,250	1,000
Service deptt. *P*		1,000	750	500	– 2,250	250
	11,500	4,150	4,450	1,900		– 1,250
Service deptt. *Q*		375	375	250	250	– 1,250
	11,500	4,525	4,825	2,150	—	—

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Service departments' overheads represent the sum of the service department cost plus the costs apportioned from other service departments. After obtaining total overhead cost of servicing departments, the total of each service department is apportioned to producing departments on the basis of percentage or proportion (for the services rendered) of the specific producing departments.

Example 6.5

A factory is having three production departments *A*, *B* and *C* and two service departments—Boiler-House and Pump-Room. The boiler-house has to depend upon the pump-room for supply of water and pump-room in its turn is dependent on the boiler-house for supply of driving the pump. The expenses incurred by the production departments during a period are: *A*, Rs. 8,00,000; *B*, Rs. 7,00,000; and *C*, Rs. 5,00,000. The expenses for boiler-house are Rs. 2,34,000 and the pumproom are Rs. 3,00,000.

The expenses of the boiler-house and pump-room are apportioned to the production departments on the following basis:

	A	*B*	*C*	*B.H.*	*P.R.*
Expenses of boiler-house	30%	40%	30%	—	10%
Expenses of pump-room	40%	20%	20%	20%	—

Show clearly as to how the expenses of boiler-house and pump-room would be apportioned to *A*, *B* and *C* departments. Use algebraical equation. *(CS Final)*

Solution:

Let X be the overhead of boiler-house and Y be the total overhead of pump-room.

$$X = 2{,}34{,}000 + .2Y$$

$$Y = 3{,}00{,}000 + .1X$$

$$10X - 2Y = 23{,}40{,}000 \quad \text{(i)}$$

$$-X + 10Y = 30{,}00{,}000 \quad \text{(ii)}$$

On multiplying Eq. (i) by 5 and adding it to Eq. (ii)

$$50X - 10Y = 1{,}17{,}00{,}000$$

$$-X + 10Y = 30{,}00{,}000$$

$$49X = 1{,}47{,}00{,}000$$

$$X = 3{,}00{,}000$$

On substituting this value in Eq. (ii)

$$-3{,}00{,}000 + 10Y = 30{,}00{,}000$$

$$10Y = 33{,}00{,}000$$

$$Y = 3{,}30{,}000$$

Distribution of Overheads

	Total	*Departments*		
	Rs.	*A* *Rs.*	*B* *Rs.*	*C* *Rs.*
Amount for the Departments	20,00,000	8,00,000	7,00,000	5,00,000
Boiler-house	2,70,000*	60,000	1,20,000	90,000
Pump-room	2,64,000**	1,32,000	66,000	66,000
	25,34,000	9,92,000	8,86,000	6,56,000

* Rs. 3,00,000 less 1/10 for the Pumproom

** Rs. 3,30,000 less 1/5 for the Boilerhouse

Example 6.6

A company has 3 production departments *A*, *B* and *C* and two service departments *X* and *Y*. The following data are extracted from the records of the company for a particular given period:

		Rs.
(i)	Rent and rates	25,000
(ii)	General lighting	3,000
(iii)	Indirect wages	7,500
(iv)	Power	7,500
(v)	Depreciation on machinery	50,000
(vi)	Sundries	50,000

Additional Data, Departmentwise

	Total	*Departments*				
		A	*B*	*C*	*X*	*Y*
Direct wages (Rs.)	50,000	15,000	10,000	15,000	7,500	2,500
Horsepower of machines used	150	60	30	50	10	—
Cost of machinery (Rs.)	12,50,000	3,00,000	4,00,000	5,00,000	25,000	25,000
Production hours worked	—	6,226	4,028	4,066	—	—
Floor space used (Sq. mtr.)	10,000	2,000	2,500	3,000	2,000	500
Lighting points (nos.)	60	10	15	20	10	5

Service Departments' Expenses Allocation

Departments	*A*	*B*	*C*	*X*	*Y*
X	20%	30%	40%	—	10%
Y	40%	20%	30%	10%	—

You are required to:

(a) compute the overhead rate of production departments using the repeated distribution method; and

(b) hence, determine the total cost of a product whose direct material cost and direct labour cost are respectively Rs. 250 and Rs. 150 and which would consume 4 hours, 5 hours and 3 hours in departments *A*, *B* and *C* respectively. *(ICWA Inter, June 1997, B.com. (Hons), Delhi)*

Solution:

Overheads Distribution Summary

Items	*Basis of apportionment*	*Total*	*Production Deptts.*			*Service Deptts.*	
			A	*B*	*C*	*X*	*Y*
		Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
Primary Distribution							
Direct wages	Actual (only service deptts.)	10,000	—	—	—	7,500	2,500
Rent and Rates	Floor space @ Rs. 2.50 per sq. m.	25,000	5,000	6,250	7,500	5,000	1,250
General Lighting	Lighting points @ Rs. 50 per point	3,000	500	750	1,000	500	250

(*Contd.*)

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(*Contd.*)

Items	*Basis of apportionment*	*Total*	*Production Deptts.*			*Service Deptts.*	
			A	*B*	*C*	*X*	*Y*
		Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	*Rs.*
Indirect Wages	Direct wages (15%)	7,500	2,250	1,500	2,250	1,125	375
Power	Horse power @ Rs. 50	7,500	3,000	1,500	2,500	500	—
Depreciation on Machinery	Cost of Machinery 4% of cost of mach.	50,000	12,000	16,000	20,000	1,000	1,000
Sundries	Direct wages @ Re. 1.	50,000	15,000	10,000	15,000	7,500	2,500
	Total	1,53,000	37,750	36,000	48,250	23,125	7,875
Secondary Distribution							
Service Deptt. *X* overheads apportioned to Deptts. *A*, *B*, *C* & *Y* in (20 : 30 : 40 : 10)			4,625	6,937	9,250	(23,125)	2,313
Service Deptt. *Y* overheads apportioned to Deptts. *A*, *B*, *C* & *X* in (40 : 20 : 30 : 10)			4,075	2,038	3,056	1,019	(10,188)
Service Deptt. *X* overheads apportioned to Deptts. *A*, *B*, *C* & *Y* in the given proportion			204	306	407	(1,019)	102
Service Deptt. *Y* overheads apportioned to Deptts. *A*, *B*, *C* & *X* in the given proportion			41	20	31	10	(102)
Service Deptt. *X* overheads apportioned to Deptts. *A*, *B*, *C*, & *Y* in the given proportion			2	3	5	(10)	
(1) Total Overheads		1,53,000	46,697	45,304	60,999	23,125	7,875
(2) Production hours (worked)			6,226	4,028	4,066		
(3) Overhead Rate 1÷2 (Rs.)			7.50	11.25	15.00		

The Overhead Rates (per hour) for Production depts. *A*, *B*, and *C* are as under:

Departments	*Rate per hour (Rs.)*
A	7.50
B	11.25
C	15.00

Statement of Total Cost of a Product

Particulars				*Rs.*
		Rs.		
Direct Material (given)		250.00		
Direct Labour (given)		150.00		
				400.00
Prime Cost				
Overheads Cost				
Deptts.	*Hours Consumed*	*Rate*	Rs.	
A	4	7.50	= 30.00	
B	5	11.25	= 56.25	
C	3	15.00	= 45.00	131.25
Total Cost of Production				531.25

Example 6.7

A factory has three production departments (P_1, P_2 and P_3) and two service departments (S_1 and S_2). Budgeted overheads for the next year have been allocated/apportioned by the cost department among the five departments. The secondary distribution of service department overheads is pending and the following details are given to you:

Department	*Overheads apportioned/ allocated to activity*	*Estimated level*
P_1	Rs. 48,000	5,000 labour hours
P_2	Rs. 1,12,000	12,000 machine hours
P_3	Rs. 52,000	6,000 labour hours
		Apportionment of service department costs
S_1	Rs. 16,000	P_1(20%), P_2 (40%), P_3 (20%), S_2 (20%)
S_2	Rs. 24,000	P_1(10%), P_2 (60%), P_3 (20%), S_1 (10%)

Calculate the overhead rate of each production department after completing the distribution of service department costs. *(ICWA Inter, June 1998)*

Solution:

Let x be the total overhead costs S_1 and y that of S_2. Then we get the simultaneous equations:

$$x = 16{,}000 + 0.1y$$

$$y = 24{,}000 + 0.2x$$

Solving these equations we get $x = 18{,}775$

$$y = 27{,}755$$

The distribution/apportionment of overheads among the three production departments would be as under:

Overheads Distribution Summary

Particulars	P_1 *Rs.*	P_2 *Rs.*	P_3 *Rs.*
Direct allocation	48,000	1,12,000	52,000
Apportionment of Overhead Cost of S_1	(20%) 3,755	(40%) 7,510	(20%) 3,755
Apportionment of Overhead Cost of S_2	(10%) 2,776	(60%) 16,653	(20%) 5,551
Total:	54,531	1,36,163	61,306
Budgeted Capacity	5,000 Labour hrs.	12,000 Machine hrs.	6,000 Labour hrs.
Overhead Cost per hour	Rs. 10.91	Rs. 11.35	Rs. 10.22

Example 6.8

A manufacturing company has two production departments *X* and *Y* and three service departments—time keeping, stores and maintenance.

Time-keeping department is rendering services to two production departments and two other service departments, store department is rendering services to maintenance department along with production departments and maintenance department is rendering service to production departments only. You are required to prepare a statement showing apportionment of overheads of service departments from the following information:

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Production departments	Rs.	Total
X	16,000	
Y	10,000	26,000
Service departments:		
Time-keeping	4,000	
Stores	5,000	
Maintenance	3,000	12,000

The other information is:

	X	*Y*	Time-keeping	Stores	Maintenance
Number of Employees	40	30	20	16	10
Number of stores requisition	24	20	–	–	6
Number of machine hours	2400	1600	–	–	–

(B.Com. (Hons), Delhi, 2004)

Solution:

Departments	*As per primary distribution summary* Rs.	Rs.			
Time-keeping	4000	(–) 4000			
Store	5000	800	(–) 5800		
Maintenance	3000	400	696	(–) 4096	
X	16000	1600	2784	2458	22842
Y	10000	1200	2320	1638	15148
	38000				38000

Note: Basis of apportionment:

(a) Time-keeping: No of employees (that is, 2 : 1 : 4 : 3)
(b) Stores: Number of store requisition (that is, 3 : 12 : 10)
(c) Maintenance: Machine hours (that is, 3 : 2)

The most important limitation of this method is that cost of one service centre to other service cost centres is ignored and thus the cost of individual cost centres are not truly reflected.

Example 6.9

A company has three production departments and two service departments. The departmental distribution summary for a particular period has the following totals. You are required to compute the total share of overheads of the service departments to be distributed to production departments:

Production Department:	Total
(P_1—Rs. 800; P_2—Rs. 700; P_3—Rs. 500)	Rs. 2,000
Service Departments:	
(S_1—Rs. 234; S_2—Rs. 300)	Rs. 534

The expenses of Service Departments are charged out on a percentage basis as follows:

	P_1	P_2	P_3	S_1	S_2
S_1	20%	40%	30%	—	10%
S_2	40%	20%	20%	20%	—

(B.Com. (Hons). Delhi, 2006)

Solution:

Overhead Apportionment Summary (using Repeated Distribution Method)

Details	*Production Department*			*Service Deptt.*	
	P_1	P_2	P_3	S_1	S_2
Allocated Exp	800	700	500	234	300
Apportion Expenses of S_1 to all other deptt. in 2 : 4 :3 : 1	46.80	97.60	70.20	– 234	23.40
	846.80	797.60	570.20	0	323.40
Apportioning Exp. of S_2 to all other in the ratio of 4 : 2 : 2 : 2	129.36	64.68	64.88	64.88	– 323.40
	976.16	862.28	634.88	64.68	0
Apportioning Exp. of S_1 to other deptt. in the ratio of 2 : 4 : 3 : 1	12.94	25.88	19.40	– 64.68	6.46
	989.10	888.16	654.28	0	6.46
Apportioning Exp. of S_2 to other deptt. in the ratio of 4 : 2 : 2 : 2	2.59	1.29	1.29	1.29	– 6.64
	991.69	889.45	655.57	1.29	0
Apportioning Exp. of S_1 to other deptts in the ratio of 2 : 4 : 3 : 1	0.29	0.57	0.43	– 1.29	0.12
	991.98	890.02	656.00	0	0.12
					Negligible
Total overhead of Production deptts. are	992	890	656 (Rounded off)		

Simultaneous Equation Method

Let x be the total overhead of service department S_1 and y be the total overhead of service department S_2.

$\therefore$ $x = 234 + 20\%\ y = x = 234 + 1/5^{y}$ (i)

$y = 300 + 10\%\ x = y = 300 + 1/10_{x}$ (ii)

Multiply Eq. (i) by 5 and (ii) by 10

$5x = 1170 + y$ (i)

$10y = 3000 + x$ (ii)

or

$5x - y = 1170$ (i)

$-\text{x} + 10y = 3000$ (ii)

Multiply Eq. (i) by 10

$50x - 10y = 11700$

$-x + 10y = 3000$

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$$49x = 14700$$

$$x = \frac{14700}{49} \text{ Rs. } 300$$

Putting the value of x in Eq. (ii)

$$10y = 3000 + 300$$
$$10y = 3300$$

$$y = \frac{3300}{10} = 300$$

Secondary Distribution Summary

		P_1	P_2	P_3
(i)	Primary Distribution	Rs. 800	700	500
(ii)	90% of S_1 Exp distributed in Prod. deptt. in the ratio of 2 : 4 : 3	60	120	90
(iii)	80% of S_2 Exp distri. in Prod. deptt. in the ratio of 4: 2: 2	132	66	66
	Total overhead of P_1, P_2, P_3	992	886	656

Example 6.10

A factory has three production departments *A*, *B* and *C* and also two service departments *X* and *Y*. The primary distribution of the estimated overheads in the factory has just been completed. These details and the quantum of service rendered by the service departments, to the other departments are given below:

Departments	*A*	*B*	*C*	*X*	*Y*
Primary distribution (Rs.)	2,40,000	2,10,000	2,50,000	1,40,000	96,000
Service rendered by					
Deptt. *'X'*	30%	20%	35%	—	15%
Deptt. *'Y'*	25%	40%	25%	10%	—

Prepare a statement showing the distribution of service deptt. overheads to the production departments by the simultaneous equation method. *(I.C.W.A., Inter, Stage 1, Dec. 2004)*

Solution:

Let P and N be the total overheads of the service departments X and Y respectively.

Then, $P = 1{,}40{,}000 + 0.10\,N$ that is, $10P - N = 1{,}40{,}000$

$N = 96{,}000 + 0.15P$ and $-0.15P + N = 96{,}000$

(By adding) $9.85P = 14{,}96{,}000$

$$P = \frac{14{,}96{,}000}{9.85} = \text{Rs. } 1{,}51{,}878$$

By substitution, $N = 96{,}000 + 0.15 \times 1{,}51{,}878$

$= 96{,}000 + 22{,}782 = \text{Rs. } 1{,}18{,}782$

Statement showing the distribution of service departments overheads to the Production departments

	(Production deptts)			
Distribution of overheads of	*A*(Rs.)	*B*(Rs.)	*C*(Rs.)	Total(Rs.)
Deptt *X* (85% of Rs. 1,51,878)	45,563	30,376	53,157	1,29,096
Deptt *Y* (90% of Rs. 1,18,782)	29,696	47,513	29,695	1,06,904
Total	75,259	77,889	82,852	2,36,000

Example 6.11

The following cost information for a period is available for a small engineering unit:

(a) Allocated expenditure

	Allocated				
	Total	*Production Departments*		*Service Departments*	
	(Rs.)	*Machine Shop*	*Assembly*	*General Plant Services*	*Stores and Misc.*
Indirect wages	29,300	8,000	6,000	4,000	11,300
Stores consumed	6,700	2,200	1,700	1,100	1,700
Supervisory salaries	14,000	—	—	14,000	—
Other salaries	10,000	—	—	10,000	—

(b) Expenditure to be apportioned

Power and Fuel	Rs. 15,000
Rent	15,000
Insurance	3,000
Depreciation	1,00,000

(c) Additional information available:

	Floor Area (Sq. ft.)	*H.P. hrs.* —	*No. of Employees*	*Investment (Rs.)*
Machine Shop	2,000	3,500	30	6,40,000
Assembly	1,000	500	15	2,00,000
General Plant	500	—	5	10,000
Stores and Maintenance	1,500	1,000	10	1,50,000

(d) Basis of distribution of service deptt. costs:

	Machine Shop	*Assembly*	*General Plant Services*	*Stores and Misc.*
Stores and Maintenance	50%	20%	30%	—
General Plant and Service	In proportion to the number of employees			

You are required to prepare an overhead distribution statement in detail. Service department costs are to be distributed by continued distribution. Carry through three cycles. Calculations to be shown to the nearest rupee. *(I.C.W.A., Inter, Stage 1, Dec. 2003)*

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Solution:

Small Engineering Unit
Departmental Primary Distribution Summary

Rs.

	Basis of allocition	*Total*	*Production Departments*		*Service Departments*	
			Machine shop	*Assembly*	*General Plant Services*	*Storesand Misc.*
(A) Allocated Expenditure (Rs.)						
Indirect wages	Direct	29,300	8,000	6,000	4,000	11,300
Stores consumed	Direct	6,700	2,200	1,700	1,100	1,700
Supervisory salaries	Direct	14,000	—	—	14,000	—
Other salaries	Direct	10,000	—	—	10,000	—
(B) Apportioned Expenditure (Rs.)						
Power and Fuel	H.P. × hrs	15,000	10,500	1,500	—	3,000
Rent	Floor Area (Sq. ft)	15,000	6,000	3,000	1,500	4,500
Insurance	Investment	3,000	1,920	600	30	450
Depreciation	Investment	1,00,000	64.000	20,000	1,000	15,000
		1,93,000	92,620	32,800	31,630	35,950

Secondary Distribution Summary

Rs.

Particulars	*Total*	*Production Departments*		*Service Departments*	
		Machine shop	*Assembly*	*General Plant*	*Stores and Misc.*
As per Primary Distribution	1,93,000	92,620	32,800	31,630	35,950
Re-distribution of Stores & Misc. (50%, 20%, 30%)		17,975	7,190	10,785	(35,950)
		1,10,595	39,990	42,415	—
Re-distribution of General Plant (30 : 15 : 10)		23,135	11,568	(42,415)	7,712
		1,33,730	51,558	—	7,712
Re-distribution of Stores & Misc. (50, 20%, 30%)		3,856	1,542	2,314	(7,712)
		1,37,586	53,100	2,314	—
Re-distribution of General Plant (30 : 15 : 10)		1,262	631	(2,314)	421
		1,38,848	53,731	—	421
Re-distribution of Stores & Misc. (50%, 20%, 30%)		211	84	126	(421)
		1,39,059	53,815	126	—
Re-distribution of General Plant & (30, 15, 10)		69	34	(126)	23
		1,39,128	53,540	—	23
Distribution of Stores & Misc. (50%, 20%, 30%)		16	7	—	(23)
	1,93,000	1,39,144	53,856	—	—

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Example 6.12

MM Ltd. has three production departments *X*, *Y*, *Z* and two service departments *S* and *C*. The following details are extracted from the books of accounts in respect of indirect expenses incurred during April 2005:

Indirect Cost:	Amount (Rs.)
Indirect wages	9,000
Lighting and heating	1,200
Rent and rates	12,000
Electric power	6,000
Depreciation	24,000
Sundry expenses	7,800
	60,000

Following further details are collected for distribution of the above costs:

Particulars	*Departments*				
	X	*Y*	*Z*	*S*	*C*
Value of machinery (in Rs. '000)	60	50	80	10	–
Horse power of machines	40	45	60	5	–
Light points (Nos.)	20	30	40	20	10
Floor space(sq. metres)	150	200	250	100	50
Direct wages (in Rs. '000)	30	20	40	4	6
Machine hours worked	4250	3380	7120		

The costs of the service departments are apportioned percentagewise as follows:

Departments	*X*	*Y*	*Z*	*S*	*C*
S	20	30	40	–	10
C	40	20	30	10	–

Calculate:

(a) Overhead Recovery Rates showing the basis of apportionment.
(b) Total cost of job 321 (with elementwise and departmentwise cost break down), the job card of which contain the following details:

Particulars	*Deptt. X*	*Deptt. Y*	*Deptt. Z*
Direct materials used	Rs. 268	Rs. 131	Rs. 102
Direct wages	Rs. 300	Rs. 250	Rs. 300
Machine hours worked	10	12	12

(I.C.W.A, Inter, Stage 1, Dec. 2005, Dec. 2006)

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Solution: M.M. LTD

(a) Overhead Recovery Rates:

Departmental Overhead Distribution Summary
(Repeated Distribution Method) **Rs.**

Items	*Basis of Apportionment*	*Total*	*Production Deptt.*			*Service Deptt.*	
			X	*Y*	*Z*	*S*	*C*
Indirect wages	Direct wages	9,000	2,700	1,800	3,600	360	540
Lighting and heating	No. of light points	1,200	200	300	400	200	100
Rent and rates	Floor space	12,000	2,400	3,200	4,000	1,600	800
Electric power	H.P. of machines	6,000	1,600	1,800	2,400	200	
Depreciation	Value of machines	24,000	7,200	6,000	9,600	1,200	
Sundry Expenses	Direct wages	7,800	2,340	1,560	3,120	312	468
Direct wages	As given	10,000	–	–	–	4,000	6,000
Total		70,000	16,440	14,660	23,120	7,872	7,908
Service Deptt. *S*	Given (20%, 30%, 40%, 10%)		1,574	2,362	3,149	(7,872)	787
Service Deptt.*C*	(40%, 20%, 30%, 10%)		3,478	1,739	2,609	869	(8,695)
Service Deptt *S*	(20%, 30%, 40%, 10%)		174	261	347	(869)	87
Service Deptt. *C*	(40%, 20%, 30%, 10%)		35	17	26	9	(87)
Service Deptt. *S*	(20%, 30%, 40%)		2	3	4	(9)	–
Total			21,703	19,042	29,255	–	–
Machine hours worked	Hrs.		4,250	3,380	7,120		
Overhead Recovery Rate (Rs.) (overhead/Machine hr.)			5.11	5.63	4.11		

(b) Computation of Total Cost of Job-321

Particulars	*Deptt. X*	*Deptt. Y*	*Deptt. Z*	*Total*
Machine hours worked	10	12	12	
	Rs.	Rs.	Rs.	Rs.
Direct material used	268	131	102	501
Direct wages	300	250	300	850
Overhead Cost	51	68	49	168
Total	619	449	451	1519

Example 6.13

PQR Ltd. has its own power plant, which has two users, cutting department and welding department. When the plans were prepared for the power plant, top management decided that its practical capacity should be 1,50,000 machine hours. Annual budgeted practical capacity fixed costs are Rs. 9,00,000 and budgeted variable costs Rs. 4 per machine-hour. The following data are available:

	Cutting Department	*Welding Department*	*Total*
Actual Usage in 2002–03 (Machine hours)	60,000	40,000	1,00,000
Practical capacity for each department (machine hours)	90,000	60,000	1,50,000

Required

(i) Allocate the power plant's cost to the cutting and the welding department using a single rate method in which the budgeted rate is calculated using practical capacity and costs are allocated based on the actual usage.

(ii) Allocate the power plant's cost to the cutting and welding departments, using the dual-rate method in which fixed costs are allocated based on practical capacity and variable costs are allocated based on actual usage.

(iii) Allocate the power plant's cost to the cutting and welding departments using the dual-rate method in which the fixed-cost rate is calculated using practical capacity, but fixed costs are allocated to the cutting and welding department based on actual usage. Variable costs are allocated based on actual usage.

(iv) Comment on your results in requirements (i), (ii) and (iii).

(CA, PE, Exam II, Group II, May 2003)

Solution:

Working Notes:

1. Fixed practical capacity cost per machine hour:

Practical capacity (machine hours)	1,50,000
Practical capacity fixed costs (Rs.)	9,00,000
Fixed practical capacity cost per machine hour (Rs. 9,00,000/1,50,000 hours)	Rs. 6

2. Budgeted rate per machine hour (using practical capacity):
   = Fixed practical capacity cost per machine hour + Budgeted variable cost per machine hour
   = Rs. 6 + Rs. 4 = Rs. 10

(i) Statement showing Power Plant's cost allocation to the Cutting and Welding departments by using single rate method on actual usage of machine hours.

	Cutting Department Rs.	*Welding Department Rs.*	*Total Rs.*
Power plants cost allocation by using actual usage (machine hours) (Refer to Working Note 2)	6,00,000 (50,000 hours × Rs. 10)	4,00,000 (40,000 hours × Rs. 10)	10,00,000

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(ii) Statement showing Power Plant's cost allocation to the Cutting and Welding departments by using dual rate method.

	Cutting Department Rs.	*Welding Department Rs.*	*Total Rs.*
Fixed Cost	5,40,000	3,60,000	9,00,000
(Allocated on practical capacity for each department that is,) (90,000 hours: 60,000 hours)	$\left(\frac{\text{Rs. } 9,00,000 \times 3}{5}\right)$	$\left(\frac{\text{Rs. } 9,00,000 \times 2}{5}\right)$	
Variable cost (Based on actual usage of machine hours)	2,40,000 (60,000 hours × Rs. 4)	1,60,000 (40,000 hours × Rs. 4)	4,00,000
Total cost	7,80,000	5,20,000	13,00,000

(iii) Statement showing power plant's cost allocation to the cutting and welding Department using dual rate method

	Cutting Department Rs.	*Welding Department Rs.*	*Total Rs.*
Fixed Cost Allocation of fixed cost on actual usage basis (Refer to Working Note 1)	3,60,000 (60,000 hours × Rs. 6)	2,40,000 (40,000 hours × Rs. 6)	6,00,000
Variable cost (Based on actual usage)	2,40,000 (60,000 hours × Rs. 4)	1,60,000 (40,000 hours × Rs. 4)	4,00,000
Total cost	6,00,000	4,00,000	10,00,000

(iv) Comments:

Under dual rate method, under (iii) and single rate method under (i), the allocation of fixed cost of practical capacity of plant over each department are based on single rate. The major advantage of this approach is that the user departments are allocated fixed capacity costs only for the capacity used. The unused capacity cost Rs. 3,00,00 (Rs. 9,00,000 – Rs. 6,00,000) will not be allocated to the user departments. This highlights the cost of unused capacity.

Under (ii) fixed cost of capacity are allocated to operating departments on the basis of practical capacity, so all fixed costs are allocated and there is no unused capacity identified with the power plant.

Example 6.14

E-books is an online book retailer. The company has four departments. The two sales departments are corporate sales and consumer sales. The two support–departments are administrative (human resources accounting and information systems). Each of the sales department conducts merchandising and marketing operations independently.

The following data are available for October, 2003:

Departments	*Revenues*	*Number of Employees*	*Processing Time used (in minutes)*
Corporate Sales	Rs. 16,67,750	42	2,400
Consumer Sales	Rs. 8,33,875	28	2,000
Administrative	–	14	400
Information system	–	21	1,400

Cost incurred in each of four departments for October, 2003 are as follows:

Corporate Sales	Rs. 12,97,751
Consumer Sales	Rs. 6,36,818
Administrative	Rs. 94,510
Information Systems	Rs. 3,04,720

The company uses number of employees as a basis to allocate Administrative costs and processing time as a basis to allocate information systems costs.

Required:

(i) Allocate the support department costs to the sales departments using the direct method.

(ii) Rank the support departments based on percentage of their services rendered to other support departments. Use this ranking to allocate support costs based on the step-down allocation method.

(iii) How could you have ranked the support departments differently?

(iv) Allocate the support department costs to two sales departments using the reciprocal allocation method. *(CA, PE, Exam II, Group II, Nov. 2003)*

Solution:

(i)

Statement showing the allocation of support department costs to the sales departments (using the direct method)

Particulars	*Basis of allocation*	*Sales department*		*Support department*	
		Corporate sales	*Consumer sales*	*Administrative*	*Information systems*
		Rs.	*Rs.*	*Rs.*	*Rs.*
Cost incurred		12,97,751	6,36,818	94,510	3,04,720
Re-allocation of cost of administrative department	Number of employees (6:4:–:–)	56,706	37,804	(94,510)	
Re-allocation of costs of information systems department	Processing time (6:5:–:–)	1,66,211	1,38,509		(3,04,720)
Total		15,20,668	8,13,131		

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(ii)

Ranking of support departments based on percentage of their services rendered to other support departments

- Administration support department provides 23.077% $\left(\frac{21\times100}{42+28+1}\right)$ of its services to information systems support department. Thus 23.077% of Rs. 94,510 = Rs. 21,810
- Information system support department provides 8.33% $\left(\frac{400}{2,400+2,000+400}\times100\right)$ of its services to Administration support department. Thus 8.33% of Rs. 3,04,720 = Rs. 25,383.

Statement showing allocation of support costs (By using step-down allocation method)

Particulars	*Basis of allocation*	*Sales department*		*Support department*	
		Corporate sales Rs.	*Consumer sales* Rs.	*Administrative* Rs.	*Information systems* Rs.
Cost incurred		12,97,751	6,36,818	94,510	3,04,720
Re-allocation of cost of administrative department	Number of employees (6:4:–:–3)	43,520	29,080	(94,510)	21,810
					3,26,530
Re-allocation of costs of information systems department	Processing time (6:5:–:–: –)	1,78,107	1,48,423		(3,26,530)
Total		15,19,478	8,14,321		

(iii) An alternative ranking is based on the rupee amount of services rendered to other service departments, using the rupee figures obtained under requirement (ii). This approach would use the following sequence of ranking.

- Allocation of information system overheads as first (Rs. 25,383 provided to administrative).
- Allocated administrative overheads as second (Rs. 21,810 provided to information systems).

(iv) Working Notes:

(1) Percentage of services provided by each service department to other service department and sales departments.

Particulars	*Service departments*		*Sale departments*	
	Administrative	*Information system*	*Corporate Sales*	*Consumer Sales*
Administrative	–	23.07%	46.16%	30.77%
Information systems	8.33%	–	50%	41.67%

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(2) Total cost of the support department: (By using simultaneous equation method). Let *AD* and *IS* be the total costs of support departments Administrative and Information systems respectively. These costs can be determined by using the following simultaneous equations:

	AD	=	94,510 + 0.0833 *IS*
	IS	=	3,04,720 + 0.2307 *AD*
or	*AD*	=	94,510 + 0.0833 {3,04,720 + 0.2307 *AD*}
or	*AD*	=	94,510 + 25,383 + 0.01922 *AD*
or	0.98078*AD*	=	1,19,893
or	*AD*	=	Rs. 1,22,243
and	*IS*	=	Rs. 3,32,922

Statement showing the allocation of support departments costs to the sales departments (Using reciprocal allocation method)

Particulars	*Sales department*	
	Corporate sales Rs.	*Consumer Sales* Rs.
Costs incurred	12,97,571	6,36,818
Re-allocation of cost administrative department *(46.16% and 30.77% of Rs. 1,22,243)*	56,427	37,614
Re-allocation of costs of information systems department *(50% and 41.67% of Rs. 3,32,922)*	1,66,461	1,38,729
Total	15,20,639	8,13,161

ABSORPTION OF FACTORY OVERHEADS

Meaning of Absorption

After all service departments overheads have been apportioned to producing departments, the next step is to spread factory overhead to different products or jobs produced. This is termed as "overhead absorption" in cost accounting. The Institute of Cost and Management Accountants (U.K.) define overhead absorption as "the allotment of overhead to cost units." Known by different names, such as recovery, overhead application, overhead costing, levy, burden rate, etc. the term "absorption" implies that expenses pertaining to a producing department or cost centre are, finally charged to or absorbed in the cost of products, jobs, etc. passing through it. As a result of absorption, the cost of each unit of product of the producing departments includes an equitable share of the total overhead of that department.

Methods of Absorption

Some method of overhead absorption has to be applied to absorb factory overhead to individual products or jobs, etc. on some equitable basis. The rate which is used to charge overhead cost to the products or jobs is known as absorption rate. The following are the generally recognised methods of absorption or absorption rates.

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Example 6.20

Calculate machine hour rate from the following data:

Cost of machine	Rs. 1,16,000
Estimated scrap value	Rs. 16,000
Estimated working life	20,000 hrs.
Estimated maintenance cost during working life of machine	Rs. 2,400
Power used per machine	Re. 1 per hour
Rent rates per month (10% to be charged to machine)	Rs. 3,000
Normal machine running hours during a month	180
Standing charges other than rent, rates etc. per month	Rs. 400

(B.Com. Delhi, 2007)

Solution:

Calculation of Machine Hour Rate (180 × 12 = 2160 hrs)

Standing Charges	*Total*	*Machine Hours Rate*
Rent and Rates (3,000 × 12 × 10%)	3,600	
Other Standing charges (400 × 12)	4,800	
Total standing charges	8,400	
Per Hour standing charges $\frac{8400}{2160}$		3.89
Running Charges		
Depreciation $\frac{116,000 - 16,000}{20,000}$		5.00
Maintenance $\frac{2400}{20,000}$		0.12
Power		1.00
Machine Hour Rate		10.01

Example 6.21

From the following particulars, calculate machine hour rate:

(i) Cost of machine Rs. 1,00,000
Estimated life 10 years
Scrap value Rs. 10,000

(ii) Estimated working time 50 weeks of 44 hours each. It includes the following:
Time taken up in maintenance 200 hrs.
Setting up time 100 hrs.
However, setting up time is regarded as productive time.

(iii) Power used during production is 16 units per hour @ 9 paise per unit. No current is taken during maintenance or setting up time.

(iv) The machine requires a chemical solution which is replaced at the end of each week at a cost of Rs. 20 each time.

(v) Cost of maintenance Rs. 1,200 per annum.

(vi) Two attendants control the operation of this machine together with five other identical machines. Their combined weekly wages amount to Rs. 120.

(vii) General work overheads allocated to this machine for the year amount to Rs. 2,000.

(B.Com; Delhi, 2007, B.Com (Hons.) Delhi, 2006)

Solution:

Working Note:

Effective Machine Hours	**Hrs.**
Actual working hours 50 weeks × 44 hrs	2,200
Less: Time required for maintenance	200
Effective Machine Hours	2000

Computation of Machine Hour Rate

Standing Charges		**Rs.**
Overhead allocated to machine		2,000
Wages of attendants	$\frac{120 \times 50}{6}$	1,000
Total Standing Charges		3,000
Hourly Rate of Standing Charges	$\frac{3000}{2000}$	1.50
Machine Expenses		
Depreciation	$\frac{1,00,000 - 10,000}{10 \times 2000}$	4.50
Repair and Maintenance	$\left(\frac{1200}{2000}\right)$	0.60
Chemical	$\left(\frac{20 \times 50}{2000}\right)$	0.50
Power	$\left(\frac{1900 \times 16 \times 0.09}{2000}\right)$	1.37
Machine Hour Rate		8.47

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Example 6.22

The following information relates to the activities of a production department for the month of January:

		Rs.
Materials used		72,000
Direct wages		60,000
Machine hours	20,000	
Labour hours	24,000	
Overhead chargeable to the deptt.		48,000

On one order to be carried out in the month of February, the relevant data were:

		Rs.
Materials		4,000
Direct wages		3,300
Machine hours	1,200	
Labour hours	1,650	

Prepare a comparative statement of cost of this order by using the following methods of absorption of overheads:

(i) Direct labour hour rate
(ii) Percentage of direct wages; and
(iii) Machine hour rate. *(B.Com. (Hons), Delhi, 2003)*

Solution:

(i) **Direct Labour Hour Rate Method:**

$$\text{Direct Labour Hour Rate} = \frac{\text{Overhead chargeable to the department}}{\text{Labour hours worked}}$$

$$= \frac{48,000}{24,000} = \text{Rs. } 2$$

(ii) **Percentage of Direct Wage Rate Method:**

$$\text{Percentage of Direct Wages} = \frac{\text{Overhead for the department}}{\text{Direct Wages}} \times 100$$

$$= \frac{\text{Rs. } 48,000}{\text{Rs. } 60,000} \times 100 = 80\%$$

(iii) **Machine Hour Rate Method:**

$$\text{Machine Hour Rate} = \frac{\text{Overhead for department}}{\text{Hours of machine operation}}$$

$$= \frac{\text{Rs. } 48,000}{\text{Rs. } 20,000} = \text{Rs. } 2.40$$

Comparative Statement of Cost of Order

Particulars	*Direct labour hour rate* (i)	*Percentage of direct wages* (ii)	*Machine hour rate* (iii)
Material used	4,000	4,000	4,000
Direct wages	3,300	3,300	3,300
Prime Cost	7,300	7,300	7,300
(i) Rs. 2 per hour for 1650 labour hours	3,300	—	—
(ii) 80% of Rs. 3300 (i.e. Direct wages)	—	2,640	—
(iii) Rs. 2.40 per hour for 1,200 machine hours	—	—	2,880
Works Cost	10,600	9,940	10,180

Example 6.23

A machine shop in a factory has five machines of exactly similar type and specification. One operator is employed on each machine at Rs. 20 per hour. The factory works a 40-hour week which includes four hours for set-up time for each machine. The operators are paid fully for 40 hours. Cost are reported for the machine shop on the basis of thirteen four-weekly periods.

The following details applicable to the cost centre/machine are available:

1. Set up time is unproductive and no power is consumed during the set up time.
2. Original cost of machine is Rs. 1,30,000.
3. Depreciation on machine is to be provided at 10% per annum on original cost.
4. Maintenance and repairs per work per machine amouts to Rs. 25.
5. Consumable stores per week per machine amount to Rs. 27.
6. Power consumed is 10 units per hour per machine at 80 paise per unit.
7. Wages paid to the operators are considered as indirect.
8. Overheads apportioned to the cost centre are:

Rent	Rs. 3,000 p.a.
Heat and light	Rs. 4,000 p.a.
Misc. Expenses	Rs. 6,000 p.a.

You are required to calculate:

(i) Cost of running one machine for a four-week period; and

(ii) The machine hour rate. *(B.Com. (Hons), Delhi, 2005)*

Solution:

Calculations of cost of Running One Machine for a Four week period.

Standing Charges:	Rs.
1. Rent	3,000
2. Heat and Light	4,000
3. Sundry Exp.	6,000
Total Exp. of 5 Machines	13,000

Total Exp. for one machine for 4 week period

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$= \frac{13,000}{5} \times \frac{4}{13}$	800
4. Wages of operator (40 × 4 × Rs. 20)	3,200
1. Total Standing charges (i)	4,000
(ii) Machine Expenses:	
1. Depreciation $\left(1,30,000 \frac{10}{100}\right) \times \frac{4}{13}$	4,000
2. Repairs and Maintenance (25 × 4)	100
3. Power (36 × 10 × .80)	288
Total Machine Expenses (ii)	4,496
Total Machine Exp. (i + ii)	8,496

2. Machine Hour Rate:

= Total cost ÷ Total Productive Time

= Rs. 8,496 ÷ 36 hrs × 4

= Rs. 59 per effective productive hour

Example 6.24

From the following data of textile factory machine room, compute an hourly machine rate, assuming that the machine room will work on 90% capacity throughout the year and that a breakdown of 10% is reasonable. There are three days holiday at Deepawali, 2 days at Holi and 2 days at Christmas exclusive of Sundays. The factory works 8 hours a day and 4 hours on Saturday. Number of machines (each of the same type)—40.

Expenses per annum:

	Rs.
Power	3,12,000
Light	64,000
Salaries to foreman	1,20,000
Lubricating oil	6,600
Repairs to machine	1,44,600
Depreciation	78,560

(B.Com. (Hons), Delhi, 2006, 2007 B.Com., Delhi, 2006)

Solution:

Computation of Machine Hour Rate

Standing Charges	*Rs.*	*Rs. Per Hour (80,640 hrs)*
Light	64,000	
Salaries to foreman	1,20,000	
Lubrication oil (Assumed fixed)	6,600	

		1,90,600	2.364
Running Charges		(3,12,000/80640)	3.869
Repair		(144600/80640)	1.793
Depreciation		(78,560/80,640)	0.974
Machine Hour rate			9.000

Machine Hour rate

Working Note: Calculation of Effective Machine Hours

			(Hrs.)
Total Hours 365 × 8	=		2920
Less: Saturday only 4 hours works (52 × 4)	208		
Sundays Holiday (52 × 8)	416		
Holiday on Deepawali, Holi and Christmas (3 + 2 + 2) × 8	56	680	
Machine Hours worked		2,240	
Less: 10% Break Down (Normal)		224	
Effective Machine Hour per Machine		2,016	

Total Machine Hours = Effective Machine Hours per machine × Number of machines

= 2,016 × 40 = 80,640 Hrs.

Example 6.25

A machine shop of Avon Ltd. has six identical machines manned by 6 operators. The machines cannot be worked without an operator wholly engaged on it. The cost of all these 6 machines including installation charges works out to Rs. 12 lakhs and these machines are deemed to have a scrap value of 10% at the end of its effective life (9 years). These particulars are furnished for a six months period.

Normal available hours per month	218
Absenteeism (without pay) hours	18
Leave (with pay) – hours	20
Stoppage for repairs and maintenance etc. hours	20
Average rate of wages per day of 8 hours	Rs. 80
Production bonus estimated	15% on wages
Value of power consumed	Rs. 24,150
Supervision and indirect labour	Rs. 9,900
Lighting and electricity	Rs. 4,800
These particulars are for a year:	
Repairs and maintenance including consumables	Rs. 36,000
Insurance	Rs. 60,000
Other sundry works expenses	Rs. 36,000
General management expenses allocated	Rs.1,09,040

You are required to work out a comprehensive machine hour rate for the machine shop.

(I.C.W.A. Inter, Stage 1, June 2005)

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Solution:

AVON LTD.

(1) Computation of total Machine hours utilised:

Normal available hours p.m. per operator:		218 hours
Less: Unutilised hours due to:		
Absenteeism	18 hours	
Leave	20	
Stoppage for repairs and maintenance etc.	20	58
Total hours utilised p.m. per operator		160
Total hours utilised for 6 months for 6 operator: 160 × 6 × 6		= 5760 hours

It is given in the question that the machine cannot work without an operator wholly engaged on it. Therefore, hours utilised for six operators that is, 5760 hours represent the total machine hours.

(2) Total wage to 6 operators for six months:

Average rate of wages per hour = Rs. 80/8 = Rs. 10
Normal hours for which wages are to be paid: 218 – 18 = 200 hours.
Wages for 6 months for 6 operators @ Rs. 10 = 200 × 6 × 6 × 10 = Rs. 72,000.

Computation of Comprehensive Machine Hour Rate for the Machine Shop

		Rs.
Operator Wages (Ref: W-2)	(for six months)	72,000
Production Bonus (15% of wages)	,,	10,800
Power consumed	,,	24,150
Supervision and Indirect Labour	,,	9,900
Lighting and Electricity	,,	4,800
Repair and maintenance (36000/2)	,,	18,000
Insurance (60000/2)	,,	30,000
Depreciation for 6 months [(12 lakhs – 1.20 lakhs)/9]/2	,,	60,000
Other Sundry works Expenses for 6 months		18,000
General Management Expenses for 6 months		54,520
Total overheads for six months		3,02,170
Comprehensive Machine hour Rate (302170/5760)		52.46

Example 6.26

Calculate the comprehensive Machine Hour Rate of a machine from the following:

(i) Cost of the machine Rs. 25 lakhs, having a scrap value of Rs. 1 lakh after 10 years.

(ii) The machine will be operated for three shifts of 7 hrs. each for 300 working days in a year of which 300 hrs. will be utilised for minor repairs and maintenance.

(iii) Wages payable: Rs. 8,000 p.m. for an operator and Rs. 3,000 p.m. for a helper for every shift. Rs. 16,000 per month to one supervisor per shift for the department accommodating four machines including the above machine.

(iv) Other details :
Power consumption : 25 units (kWh @ Rs. 4.80 per unit
Repairs and maintenance : Rs. 30,000 per annum
General lighting and heating : Rs. 4,000 p.m. for the whole department having the four machines
Insurance : Rs. 18,000 per machine per annum
Rent, Rates and Taxes : Rs. 3,000 p.m. for the department
Factory overhead : Rs. 36,000 per annum for the department

(I.C.W.A., Inter, Stage I, June 2007)

Solution:

Computation of Comprehensive Machine Hour Rate

	Annual Working Hours ($300 \times 7 \times 3$)	6,300
Cost: Rs. 25,00,000	Less: for minor repair and maintenance	300
Life: 10 years, scrap value: Rs. 1,00,000	Net working hours	6,000
Depreciation: Rs. 2,40,000 p.a.		

(i) Running Expenses:

	Per annum (Rs.)	Per hour (based on 6000 hours) (Rs.)
Wages to operators: $3 \times$ Rs. $8,000 \times 12$	2,88,000	48
Wages to helper: $3 \times$ Rs. $3,000 \times 12$	1,08,000	18
Power: $6,000 \times 25 \times$ Rs. 4.80	7,20,000	120
Repairs and Maintenance	30,000	5
	11,46,000	191

(ii) Fixed Expenses:

Supervisor's Salary: Rs. $\frac{16,000 \times 12 \times 3}{4}$	1,44,000	24
General lighting and heating Rs. $\frac{4000 \times 12}{4}$	12,000	2
Insurance	18,000	3
Rent, Rates and Taxes Rs. $\frac{3000 \times 12}{4}$	9,000	1.50
Factory Overhead Rs. $\frac{3600}{4}$	9,000	1.50
Depreciation	2,40,000	40
	4,32,000	72
Total	**15,78,000**	**263**

Comprehensive Machine Hour Rate: Rs. 263

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Example 6.27

In a factory, a machine is considered to work for 208 hours in a month. It includes maintenance time of 8 hours and set up time of 20 hours.

The expense data relating to the machine are as under:

– Cost of the machine is Rs. 5,00,000. Life 10 years. Estimated scrap value at the end of life is Rs. 20,000.

	Rs.
– Repairs and maintenance per annum	60,480
– Consumable stores per annum	47,520
– Rent of building per annum (The machine under reference occupies 1/6 of the area)	72,000
– Supervisor's salary per month (Common to three machines)	6,000
– Wages of operator per month per machine	2,500
– General lighting charges per month allocated to the machine	1,000
– Power 25 units per hour at Rs. 2 per unit	

Power is required for productive purposes only. Set up time, though productive, does not require power. The Supervisor and Operator are permanent. Repairs and maintenance and consumable stores vary with the running of the machine.

Required

Calculate a two-tier machine hour rate for (a) set up time, and (b) running time.

(CA, PE, Exam II, Group II, May 2003)

Solution:

Computation of Machine Hour Rate

Working Notes:

(i)	Effective hours for standing charges (208 hours – 8 hours)	200
(ii)	Effective hours for variable costs (208 hours – 28 hours)	180

1. *Standing charges per hour*

	Per month Rs.	Per hour Rs.
Supervisor's salary (Rs. 6,000/3 machines)	2,000	
General Lighting	1,000	
Rent (Rs. 72,000/6 × 12)	1,000	
Total standing charges	4,000	
Standing charges per hour (Rs. 4,000/200 hours)		20

2. *Machine expenses per hour*

	Per month Rs.	Per hour Rs.
Depreciation (Rs. 5,00,000 – Rs. 20,000)/ (10 years × 12 months)	4,000	20 (Rs. 4,000/200 hours)
Repairs and maintenance (Rs. 60,480/12 months)	5,040	28 (Rs. 5,040/180 hours)
Consumable stores (Rs. 47,520/12 months)	3,960	22 (Rs. 3,960/180 hours)
Power (25 units × Rs. 2 × 180 hours)	9,000	50 (Rs. 9,000/180 hours)
Wages	2,500	12.50 (Rs. 2,500/200 hours)
Total machine expenses	24,500	132.50

Computation of Two-tier machine hour rate

	Set up time rate per machine hour Rs.	Running time rate per machine hour Rs.
Standing Charges *(Refer to Working Note 2)*	20.00	20.00
Machine expenses *(Refer to Working Note 3)*		
Depreciation	20.00	20.00
Repair and maintenance	–	28.00
Consumable stores	–	22.00
Power	–	50.00
Machine hour rate of overheads	40.00	140.00
Wages	12.50	12.50
Comprehensive machine hour rate	52.50	152.50

Example 6.28

M/s. Sistas & Co. manufacture product *A* at the rate of 80 pieces per hour. The company has been producing and selling 1,60,000 units annually during the period 1991 to 1995. However, during the year 1996 the company was able to produce 1,46,000 units only. The company's annual fixed overhead for 1996 amounted to Rs 5,84,000. The company works on single shift only at 8 hours per day and 6 days a week. The company had declared 13 holidays during the year 1996. The quarterly preventive maintenance and repairs work involved 77 hours.

You are required to:

(a) calculate the maximum, practical, normal and actual capacities in 1996, in terms of hours;

(b) compute the idle capacity and hourly rate for recovery of overhead rates for each of the capacities computed at (a) above; and

(c) prepare a statement showing the idle capacity cost assuming that the overhead rates of recovery are based on the various capacities arrived at (a) above. *(ICWA Inter, June 1997)*

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Solution:

(a) Computation of Maximum, Practical, Normal and Actual Capacities in 1996

(i)	*Maximum Capacity:*			Hours
	Total Days in 1996 × Single eight hours shift:			
	= 366* × 8			2,928
(ii)	*Practical Capacity:*		Hours	
	Maximum Capacity		2,928	
	Less: Idle capacity due to various reasons:			
	Idle capacity due to			
	Sundays—52 × 8	= 416 hrs		
	Holidays—13 × 8	= 104 hrs		
	Quarterly preventive			
	Maintenance & Repairs 77 × 4	= 308 hrs	828	2,100
(iii)	*Normal Capacity:*			
	(Normal Production and			
	Sales expected) ÷ Rate of Production per hour = (1,60,000 ÷ 80 units)			2,000
(iv)	*Actual Capacity:*			
	Actual capacity utilised:			
	(Total Production ÷ Hourly Rate of Production) = 1,46,000 ÷ 80			1,825

(b) Statement Showing Idle Capacity and Hourly Rate for Recovery of Overhead Rates

Base	*Base capacity (hours)*	*Capacity utilised (hours)*	*Idle capacity (hours)*	*Hourly Rate of recovery for Fixed Ovhds (Rs) See Working Note*
(i) Maximum Capacity	2,928	1,825	1,103	199.45
(ii) Production Capacity	2,100	1,825	275	278.10
(iii) Normal Capacity	2,000	1,825	175	292.00
(iv) Actual Capacity	1,825	1,825	—	320.00

* In 1996, February will be of 29 days. Therefore, total days will be 366 days.

Working Note:

Hourly Rate of Recovery for Fixed Overhead = Total Fixed Overheads/Base Capacity Hours.

(i) 5,84,000/2,928 = Rs. 199.45
(ii) 5,84,000/2,100 = 278.10
(iii) 5,84,000/2,000 = 292.00
(iv) 5,84,000/1,825 = 320.00

(c) Statement of Idle Capacity

Base Capacity	Overhead Absorption	Applied Fixed Overhead		Idle Capacity Cost	
	Rate per hour Rs.	Hours	Amount Rs.	Hours	Amount Rs.
(i) Maximum	199.45	1,825	3,64,003	1,103	2,19,993
(ii) Practical	278.10	1,825	5,07,532	275	76,476
(iii) Normal	292.00	1,825	5,32,900	175	51,100
(iv) Actual	320.00	1,825	5,84,000	—	—

Example 6.29

In an engineering company, the factory overheads are recovered on a fixed percentage basis on direct wages and the administrative overheads are absorbed on a fixed percentage basis on factory cost.

The company has furnished the following data relating to the two jobs undertaken by it in a month.

Particulars	Job 101 Rs.	Job 102 Rs.
Direct Materials	54,000	37,500
Direct Wages	42,000	30,000
Selling Price	1,66,650	1,28,250
Profit Percentage on Total Cost	10%	20%

Required:

(i) Computation of percentage recovery rates of factory overheads and administrative overheads:

(ii) Calculation of the amount of factory overheads, administrative overheads and profit for each of the two jobs.

(iii) Using the above recovery rates fix the selling price of Job 103. The additional data being:

Direct Materials	Rs. 24,000
Direct Wages	Rs. 20,000
Profit Percentage on Selling Price	12 ½ %

(CA Inter, May 1995)

Solution:

(i) Computation of Overhead Recovery Rate

Let the Factory Overhead Rate be x and Office Overhead Rate be y.

Total Cost of Job 101 = 1,66,650 x 100/110 = Rs. 1,51,500

Total Cost of Job 102 = 1,28,250 x 100/120 = Rs. 1,06,875

Factory Cost of Job 101

$$96{,}000 + 42{,}000 \times x/100 = \text{Rs. } 96{,}000 + 420x$$

Factory Cost of Job 102

$$67{,}500 + 30{,}000 \times x/100 = 67{,}500 + 300x$$

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Total Cost of Production of Job 101

$$96{,}000 + 420x + y/100\ (96{,}000 + 420x)$$
$$= 96{,}000 + 420x + 960y + 4.20xy$$

Total Cost of Production of Job 102

$$67{,}500 + 300x + y/100\ (67{,}500 + 300x)$$
$$= 67{,}500 + 300x + 675y + 3xy$$

Thus,

$$96{,}000 + 420x + 960y + 4.20xy = \text{Rs. } 1{,}51{,}500$$

or $$420x + 960y + 4.20xy = \text{Rs. } 55{,}500 \quad (1)$$

$$67{,}500 + 300x + 675y + 3xy = 106875$$

or $$300x + 675y + 3xy = \text{Rs. } 39{,}375 \quad (2)$$

On multiplying Eq. (2) by 1.4 and subtracting it from Eq. (1)

$$420x + 960y + 4.20xy = 55{,}500$$
$$420x + 945y + 4.20xy = 55{,}125$$
$$15y = 375$$

or $$y = 25$$

That is, Administrative overheads is 25% of factory cost.

On substituting the value of y in Eq. (1)

$$420x + 960 \times 25 + 4.20x \times 25 = \text{Rs. } 55{,}500$$

or $$420x + 24{,}000 + 105x = 55{,}500$$

or $$525x = 31{,}500$$

or $$x = 60$$

That is, factory overheads is 60% of direct wages.

(ii) Computation of Cost and Profit on Jobs

Particulars	*Job 101* Rs.	*Job 102* Rs.
Direct Materials	54,000	37,500
Direct Wages	42,000	30,000
Prime Cost	96,000	67,500
Factory Overheads		
60% of Direct Wages	25,200	18,000
Factory Cost	1,21,200	85,500
Administrative Overheads		
25% of Factory Cost	30,300	21,375
Total Cost	1,51,500	1,06,875
Profit (Balancing figure)	15,150	21,375
Selling Price	1,66,650	1,28,250

(iii) Statement of Selling Price of Job 103

Particulars	*Rs.*
Direct Materials	24,000
Direct Wages	20,000
Prime Cost	44,000
Factory Overheads (60% of Direct Wages)	12,000
Factory Cost	56,000
Administrative Overheads (25% of Factory Cost)	14,000
Total Cost	70,000
Profit (Balancing figure)	10,000
Selling Price [Total Cost/87.5%]	80,000

OVERHEAD RATES: ACTUAL vs PREDETERMINED (STANDARD)

The basic purpose of overhead absorption rates is to absorb total factory overhead in products or jobs manufactured. This objective can be achieved through actual overhead rate or predetermined overhead rate.

Actual Overhead Rate

When the absorption is based on actual overhead, it is known as actual absorption rate. This can be calculated only after the end of the accounting period when all cost and production figures have been collected. This method has the following disadvantages:

1. Product cost cannot be determined until some considerable time after the end of the accounting period. This may not help in controlling cost and in fixing selling prices.
2. There are likely to be variations in the overhead incurred because of the seasonal nature of some overhead costs, change in the volume of production and efficiency of the factory for different periods.
3. Some overhead costs are of fixed nature, such as depreciation, supervision, property taxes, etc. These overhead costs being constant give a different per unit cost when divided by differing production volumes. Also, some overheads like fire insurance premium are paid in advance but this should be charged to all work done/products manufactured during the year. How should the absorption be done? It creates an inequitable situation.

Predetermined Overhead Rate or Standard Rate

Because of the limitations of the actual overhead rate stated above, a predetermined or standard overhead rate is generally used by companies. This is a rate calculated in advance of the period in which it is to be used, by dividing the estimated period overhead to be absorbed by the estimated period production. Production may be measured on any of the absorption bases, such as prime cost, labour hours, etc.

The primary objective of predetermined overhead rate is to provide a reasonably constant unit cost and to avoid unit cost fluctuations caused by seasonal overhead cost fluctuations, changes in volume, or accounting methods.

Secondly, predetermined overhead rates also make possible the immediate costing of job or products completed during the month. When a job is finished, the absorption rate is multiplied by the absorption base to find out the total amount to be charged to the product or job. Under a process costing system, predetermined overhead rate is used to charge overhead to the output of the process in question.

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Thirdly, predetermined rates contribute effectively to standard costing and budgetary control programmes as these programmes use estimated costs and standard cost to measure production activities.

Under- or Over-absorption of Overhead

The use of a predetermined or standard rate may, therefore, result in under-absorption or over-absorption. When the amount absorbed is less than the actual overhead, there is under-absorption. Over-absorption arises when the amount absorbed is more than the actual overhead. Since actual overheads are not recorded in cost accounts, under-absorption and over-absorption can be treated in any one of the following ways:

1. In a seasonal business firm, the balance (due to under or over-absorption) may be carried forward to the subsequent period with the expectation that it will be counterbalanced at the end of accounting period. This is clear from the following example.

Months	*Production units*	*Overhead absorbed Rs 2 per unit*	*Actual overhead*	*Under or over-absorption*
July	1000	2000	3,000	– 1,000
August	1500	3000	4,200	– 1,200
September	3000	6000	3,800	+ 2,200

2. A supplementary rate can be used to adjust the amount of under- or over-absorption. The supplementary rate is determined by dividing the amount of under-or over-absorption by the actual absorption base. Under-absorption is adjusted by using a plus supplementary rate while a minus supplementary rate is used to correct over-absorption. For instance, in the above example, a plus supplementary rate of Re. 1 per unit (Rs. 1000/1000 units) can be used to increase the recorded overhead by Rs. 1,000 for the month of July. Similarly, a minus supplementary rate of Rs. 0.733 $\left(\frac{2200}{3000}\right)$ can be used to decrease the recorded overhead by Rs. 2,200.

Example 6.30

The actual total expenditure of a light engineering factory was Rs. 6,75,912. Overheads were recorded at the rate of Rs. 2 per hour at normal capacity of the factory. Out of 10,000 units produced, only 8,000 units were sold. 500 units were in work in progress. Actual hours worked were 2,84,756. Sixty per cent of the difference between the actual and applied overheads was due to fluctuations in material prices and labour rates. There was a fire in the factory during this accounting period and the company lost Rs. 50,000 of which the buildings accounted for Rs. 30,000 and the balance represented loss of materials stored in the godown. A sum of Rs. 10,000 was paid as wages to workmen during the strike period. The balance amount represented the difference between the actual and applied overheads due to operational efficiency or inefficiency.

Calculate the under/over absorption of production overheads for the period and state the appropriate treatment in cost accounts.*(B. Com. (Hons), Delhi 1999)*

Solution:

Unabsorbed Overheads	
Overheads recovered from production 2,84,756 × 2 =	5,69,512
Actual Overheads	6,75,912
Under Recovery	1,06,400

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Out of the total amount of unabsorbed overheads Rs. 1,06,400, 60% was due to fluctuations in the prices of material and labour rates. The amount of Rs. 63,840 (that is, 60% of Rs. 1,06,400) should therefore be charged to units produced by means of supplementary rate.

$$\text{Supplementary Rate} = \left(\frac{63{,}840}{10{,}500}\right) = \text{Rs. } 6.08$$

Apportionment of Overheads

The amount of Rs. 63,840 will be apportioned between Cost of Sales, Finished Goods and Work-in-progress as follows:

			Rs.
Cost of Sales A/c	(8,000 × 6.08)	=	48,640
Finished Goods A/c	(2,000 × 6.08)	=	12,160
Work-in-progress A/c	(500 × 6.08)	=	3,040
			63,840

The balance of Rs. 42,560 (40% of Rs. 1,06,400) which represents unabsorbed overheads on account of abnormal factors such as strike, operational inefficiency etc. should be charged to Costing Profit & Loss Account.

Example 6.31

Sweet Dreams Ltd. uses a historical cost system and absorbs overhead on the basis of predetermined rate. The following data are available for the year ended 31st March, 1997:

	Rs.
Manufacturing overheads:	
Amount actually spent	1,70,000
Amount absorbed	1,50,000
Cost of goods sold	3,36,000
Stock of finished goods	96,000
Works-in-progress	48,000

Using two methods of disposal of under-absorbed overheads show the implication on the profits of the company under each method. *(CA Inter, Nov. 1997, B. Com. (Hons.), Delhi, 1996)*

Solution:

The following are the two methods for disposal of under-absorbed overheads:

The total unabsorbed overhead of Rs. 20,000 can be written off in Costing Profit and Loss Account. In case of this method, the profits of the concern will get reduced by Rs. 20,000 for the period.

Supplementary: A supplementary rate may be used to adjust the overhead cost of each cost unit. The total under-absorbed amount may, at the end of accounting period, be apportioned on proportionate basis over cost of goods sold; stock of finished goods and work-in-progress. This can be done as shown below:

Apportionment of Under-Absorbed Overhead

	Rs.	Rs.	Rs.
Cost of goods sold (WN 1)	3,36,000	14,000	3,50,000
Stock of finished goods (WN 2)	96,000	4,000	1,00,000
Work-in-progress (WN 3)	48,000	2,000	50,000
	4,80,000	20,000	5,00,000

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Working Notes:

(1) Under-absorbed overheads absorbed by cost of goods sold $= \frac{\text{Rs. } 3{,}36{,}000}{\text{Rs. } 4{,}80{,}000} \times \text{Rs. } 20{,}000 = \text{Rs. } 14{,}000$

(2) Under-absorbed overheads absorbed by stock of finished goods $= \frac{\text{Rs. } 96{,}000}{\text{Rs. } 4{,}80{,}000} \times \text{Rs. } 20{,}000 = \text{Rs. } 4{,}000$

(3) Under-absorbed overhead absorbed by WIP $= \frac{\text{Rs. } 48{,}000}{\text{Rs. } 4{,}80{,}000} \times \text{Rs. } 20{,}000 = \text{Rs. } 2{,}000$

Example 6.32

In a manufacturing unit overhead was recoverd at a predetermined rate of Rs. 20 per labour-hour. The total factory overhead incurred and the labour-hours actually worked were Rs. 45,00,000 and 2,00,000 labour-hours respectively. During this period 30,000 units were sold. At the end of the period 5,000 units were held in stock while there was no opening stock of finished goods. Similarly, though there was no stock of uncompleted units at the beginning of the period, at the end of the period there were 10,000 uncompleted units which may be reckoned at 50% complete.

On analysing the reasons, it was found that 60% of the unabsorbed overheads were due to defective planning and rest were attributable to increase in overhead costs.

How would unabsorbed overheads be treated in cost accounts? *(CA Inter, Nov. 1995)*

Solution:

Computation of Unabsorbed Overheads

Labour Hours actually worked	2,00,000
Overhead Rate per Hour	Rs. 20
Overheads absorbed at Rs. 20 per labour hour (*A*) (20,00,000 hours × Rs. 20)	40,00,000
Overheads actually incurred (*B*)	45,00,000
Unabsorbed Overheads (*B*) – (*A*)	5,00,000
Unabsorbed Overheads	
(a) due to defective planning (that is, 60% of Rs. 5,00,000)	3,00,000
(b) Balance of unabsorbed overheads due to increase in overhead costs	2,00,000
	5,00,000

Disposition of unabsorbed overhead

(i) The unabsorbed overheads of Rs. 3,00,000 due to defective planning may be treated as abnormal and should therefore be charged to Costing Profit and Loss Account.

(ii) Balance of unabsorbed overheads of Rs. 2,00,000 may be treated as normal and, therefore, should be charged by a supplementary overhead absorption rate computed as under:

Total Production during the year:	
Units produced	35,000
Add: Equivalent units of work-in-progress 10,000 units, 50% complete	5,000
Total Units	40,000

Supplementary Overhead Absorption Rate comes to:

$$= \left(\frac{Rs.\ 2,00,000}{40,000} \right) = \text{Rs. 5 per unit}$$

Disposition of Normal Unabsorbed Overheads of Rs. 2,00,000

		Rs.
(i)	Charged to Costing Profit & Loss A/c (as part of cost of units sold 30,000 units × Rs. 5)	1,50,000
(ii)	Charged to Closing Stock of Finished Goods: 5,000 finished goods in stock @ Rs. 5 per unit	25,000
(iii)	Charged to work-in-progress: 10,000 units, 50% complete, that is, 5,000 equivalent units @ Rs. 5 per unit	25,000
	Total	2,00,000

Example 6.33

The budgeted activity and cost data for each half year of S.V. Ltd. were as follows:

Direct labour hours	68,000
Direct wages	Rs. 42,500
Overhead:	
Fixed	Rs. 37,400
Variable	Rs. 64,600

During the 6 months January to June the following actual results were achieved:

Direct labour hours incurred	65,000
Direct wages	Rs. 45,500
Overhead:	
Fixed	Rs. 38,700
Variable	Rs. 65,800

The existing method of absorbing overhead is by a direct wages percentage rate. A proposal has been made to change the overhead absorption to a direct labour hour rate analyzed into fixed and variable overhead.

You are required for the period January to June to calculate under the new proposal (that is, using direct labour hour rates of absorption):

(i) the budgeted direct labour hour rates of overhead absorption for fixed and variable overheads;

(ii) the absorbed overhead;

(iii) the over- or under-absorbed overhead. *(B.Com. (Hons), Delhi, 2002)*

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Solution:

Fixed Overhead Rates on the basis of direct wages percent rate

$$= \frac{37,400}{42,000} \times 100 = \text{Rs. } 88\%$$

Variable overhead on the basis of direct wage percentage rate

$$= \frac{64,600}{42,500} \times 100 = 152\%$$

(i) Fixed Overhead rates on the basis of direct labour

$$= \frac{\text{Fixed overhead}}{\text{Direct labour hours}} \times 100$$

$$= \frac{37,400}{68,000} \times 100 = 55\%$$

Variable overhead rate on the basis of direct labour hours

$$= \frac{\text{Variable overhead}}{\text{Direct labour hours}}$$

$$= \frac{64,600}{68,000} \times 100 = 95\%$$

(ii) Absorbed overhead in actual result

$$\text{Fixed overhead} = \text{Actual labour hours} \times \text{Fixed overhead rate}$$

$$= \frac{65,000 \times 55}{100} = \text{Rs. } 35,750$$

$$\text{Variable overhead} = \text{Actual labour hours} \times \text{Variable overhead}$$

$$\frac{65,000 \times 95}{100} = \text{Rs. } 61,750$$

(iii) Fixed overhead = Rs. 35,700 – 38,700 = – 3,000

Fixed overheads are under absorbed

Variable overhead = Rs. 61, 750 – 65,800 = – 4,050

Variable overheads are under-absorbed.

Example 6.34

A company absorbs production overheads on the basis of predetermined machine hour rate. For the month of March 2004 the budgeted machine hours were 8,500. During the month the actual machine hours worked were 7,928 actual overheads were Rs. 1,46,200 and there was under absorption of Rs. 7,460.

Ascertain the budgeted level of overheads for the month. *(B.Com. (Hons), Delhi, 2004)*

Solution:

Budgeted Machine hours	8500
Actual Machine hours worked	7928

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Over-absorption of Machine Hour	572
Actual Overhead	Rs. 1,46,200
Less under-absorption	Rs. 7,460
Budgeted overhead for month of March	Rs. 1,38,740

Example 6.35

The following particulars are available in respect of a department of a concern for a month.

Actual overhead expenses Rs. 1,00,000 (including Rs. 20,000 paid one time on account of an old claim).

Actual machine hours worked 10,000 hrs.

Predetermined overhead recovery rate— Rs. 6 machine hour.

On analysis of under-absorbed overheads it was noted that 70% of under-absorption is due to defective planning and 30% is due to increase in expenditure. The department produced 20,000 units in the month, out of which 15,000 units were sold and 5,000 units remained in stock.

You are required to show treatment of under or over-absorbed overheads in cost accounts.

(B.Com. (Hons), Delhi, 2006)

Solution:

	Rs.
Actual overhead (1,00,000 – 20,000)	80,000
Pre determined overhead (10,000 × Rs. 6)	60,000
Under absorption of overhead	20,000

Reasons for under absorption of overhead:

$$\text{Defective Planning } \left(20{,}000 \times \frac{70}{100}\right) = \text{Rs. } 14{,}000$$

$$\text{Increase in Expenditure } \left(20{,}000 \times \frac{30}{100}\right) = \text{Rs. } 6{,}000$$

→ Under recovery of Rs. 14,000 is due to defective planning being abnormal, should be transferred to costing profit and loss A/c.

→ Under recovery of Rs. 6,000 is due to increase in expenditure will be recovered from cost of sales A/c and finished goods stock A/c in the ratio of 15,000 : 500 that is, 3 : 1.

$$\text{So, Amount charged to cost of sales} = 6{,}000 \times \frac{15{,}000}{20{,}000} = \text{Rs. } 4{,}500$$

$$\text{Finished goods stock A/c} = 6{,}000 \times \frac{5{,}000}{20{,}000} = \text{Rs. } 1{,}500$$

Example 6.36

Jones Ltd. has a budgeted activity level of 50,000 direct labour hours and budgeted production overheads of Rs. 100,000. You are required to calculate the underabsorbed and overabsorbed overheads, giving reasons, if,

(a) 50,000 direct labour hours are worked and the actual overheads were Rs. 94,000.

(b) 43,000 direct labour hours are worked and the actual overheads were Rs. 100,000.

(c) 43,000 direct labour hours are worked and the actual overheads were Rs. 94,000.

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Solution:

$$\text{Recovery rate} = \frac{\text{Rs. } 100,000}{50,000 \text{ hours}} = \text{Rs. } 2/\text{hour}$$

(a)	Recovered overheads (50,000 hours × Rs. 2)	Rs. 100,000
	Actual overheads incurred;	Rs. 94,000
	Over-absorbed	Rs. 6,000

The reason for this over-absorption is expenditure, that is, actual cost are less than anticipated.

(b)	Recovered overheads (43,000 hours × Rs. 2)	Rs. 86,000
	Actual overheads incurred:	Rs. 100,000
	Under-absorbed	Rs. 14,000

The reason for this under-absorption is a production volume variance, that is, 7,000 less hours were worked than expected at Rs. 2/hour = Rs. 14,000.

(c)	Recovered overheads (43,000 hours × Rs. 2)	Rs. 86,000
	Actual overheads incurred:	Rs. 94,000
	Under-absorbed	Rs. 8,000

The reason for this under-absorption is two fold:

(i) production volume variance of (50,000 hours – 43,000 hours) × Rs. 2/hour = Rs. 14,000 adverse

(ii) expenditure variance of (Rs. 100,000 – Rs. 94,000) = Rs. 6,000 favourable. In total Rs. 8000 is adverse (under-absorbed)

Over-absorbed and under-absorbed overheads are charged to the profit and loss account via an under-absorbed/over-absorbed overhead account. Over-absorbed overheads will be credited to the profit and loss account, and under-absorbed overheads will be debited to it.

Example 6.37

The total overhead expenses of a factory are Rs. 4,46,380. Taking into account the normal working of the factory, overhead was recovered in production at Rs. 1.25 per hour. The actual hours worked were 2,93,104. How would you proceed to close the books of accounts, assuming that besides 7,800 units produced of which 7,000 were sold, there were 200 equivalent units in work-in-progress?

On investigation, it was found that 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour and the remaining 50% was due to factory inefficiency. Also give the profit implication of the method suggested. *(CA Inter, Nov. 2000)*

Solution:

	Rs.
Actual factory overhead expenses incurred	4,46,380
Less: Overheads recovered from production (2,93,104 hours × Rs. 1.25)	3,66,380
Unabsorbed overheads	80,000
Reasons for unabsorbed overheads	
(i) 50% of the unabsorbed overhead was on account of increase in the cost of indirect materials and indirect labour.	40,000
(ii) 50% of the unabsorbed overhead was due to factory inefficiency.	40,000

Treatment of unabsorbed overheads in Cost Accounting

1. Unabsorbed overhead amount of Rs. 40,000, which was due to increase in the cost of indirect material and labour should be charged to units produced by using a supplementary rate.

$$\text{Supplementary rate} = \frac{\text{Rs. } 40{,}000}{(7{,}800 + 200)\text{ units}} = \text{Rs. } 5 \text{ per unit}$$

The sum of Rs. 40,000 (unabsorbed overhead) should be distributed by using a supplementary rate among cost of sales, finished goods and work-in-progress as below:

	Rs.
Cost of sales (7,000 units × Rs. 5)	35,000
Finished goods (800 units × Rs. 5)	4,000
Work-in-progress (200 units × Rs. 5)	1,000
	40,000

The use of cost of sales figure, would reduce the profit for the period by Rs. 35,000 and will increase the value of stock of finished goods and work-in-progress by Rs 4,000 and Rs. 1,000 respectively.

2. The balance amount of unabsorbed overheads that is, Rs. 40,000 due to factory unefficiency should be charged to costing profit and loss account, as this is an abnormal loss.

Example 6.38

A factory has three production departments. The policy of the factory is to recover production overheads of the entire factory by adopting a single blanket rate based on the percentage of total factory overheads to total factory wages. The relevant data for a month are given below:

Department	*Direct materials (Rs.)*	*Direct wages (Rs.)*	*Factory over heads (Rs.)*	*Direct labour hour*	*Machine hours*
Budget					
Machining	6,50,000	80,000	3,60,000	20,000	80,000
Assembly	1,70,000	3,50,000	1,40,000	1,00,000	10,000
Packing	1,00,000	70,000	1,25,000	50,000	–
Actuals					
Machining	7,80,000	96,000	3,90,000	24,000	96,000
Assembly	1,36,000	2,70,000	84,000	90,000	11,000
Packing	1,20,000	90,000	1,35,000	60,000	–

The details of one of the representative jobs produced during the month are as under:

Job No. CW 7083

Department	*Direct materials*	*Direct wages*	*Direct labour hours*	*Machine hours*
Machining	Rs. 1,200	Rs. 240	60	180
Assembly	600	360	120	30
Packing	300	60	40	–

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The factory adds 30% on the factory cost to cover administration and selling overheads and profit.
Required:

(i) Calculate the overhead absorption rate as per the current policy of the company and determine the selling price of job (No. CW 7083).

(ii) Suggest any suitable alternative method(s) of absorption of factory overheads and calculate the overhead recovery rates based on the method(s) so recommended by you.

(iii) Determine the selling price of job (No. CW 7083) based on the overhead application rates calculated in (ii) above.

(iv) Calculate the department-wise and total under- or over-recovery of overheads based on the company's current policy and the method(s) recommended by you. *(CA, Inter)*

Solution:

Computation of Overhead Absorption Rate as Per Current Policy

(i) Total budgeted overheads: (Rs. 3,60,000 + 1,40,000 + 1,25,000) = Rs. 6,25,000

(ii) Total budgeted factory wages: (Rs. 80,000 + 3,50,000 + 70,000) = Rs. 5,00,000

(iii) Overhead absorption rate = (Rs. 6,25,000/Rs. 5,00,000) × 100 = 125% of direct wages.

Selling price of the job (No. CW 7083)

Direct material		Rs. 2,100.00
Direct wages		660.00
Factory overheads	125% × Rs. 660	825.00
Total factory cost		Rs. 3,585.00
Add mark-up	0.30 × Rs. 3,585	1,075.00
	Selling price	Rs. 4,660.00

Alternative Methods for Absorbing Factory Overheads

Machining department: The appropriate rate is the machine-hour rate.
Machine-hour rate = Rs. 3,60,000/80,000 = Rs. 4.50 per hour

Assembly department: The labour-hour rate is appropriate, because labour is predominant.
Labour-hour rate = Rs. 1,40,000/1,00,000 = Rs. 1.40 per hour

Packing department: The labour-hour rate is appropriate because labour is predominant.
Labour-hour rate = Rs. 1,25,000/50,000 = Rs. 2.50 per hour

Selling price of the job (No. CW 7083)

Direct material				Rs. 2,100.00
Direct wages				660.00
Factory overheads	Machining	180 × Rs. 4.50	Rs. 810.00	
	Assembly	120 × Rs. 1.40	168.00	
	Packing	40 × Rs. 2.50	100.00	1,078.00
Factory cost				Rs. 3,838.00
Add mark-up: 0.30 × Rs. 3838.00				1,151.40
Selling price				Rs. 4,989.40

Departmentwise Under/Over Recovery of Overheads

Under existing policy		*Rs.*
Machining:	Overheads recovered 125% × Rs. 96,000	1,20,000
Actual overheads		3,90,000
	Under recovery (Rs. 3,90,000 – 1,20,000)	2,70,000
Assembly:	Overheads recovered 125% × Rs. 2,70,000	3,37,500
	Actual overheads	84,000
	Over-recovery (Rs. 3,37,500 – 84,000)	2,53,500
Packing:	Overheads recovered 125% × Rs. 90,000	1,12,500
	Actual overheads	1,35,000
	Under-recovery (Rs. 1,35,000 – 1,12,500)	22,500
Total (under-recovery)		39,000
As per methods suggested		
Machining:	Overheads recovered 96,000 × Rs. 4.50	4,32,000
	Actual overheads	3,90,000
	Over-recovery (Rs. 4,32,000 – 3,90,000)	42,000
Assembly:	Overheads recovered 90,000 × Rs. 1.40	1,26,000
	Actual overheads	84,000
	Over-recovery (Rs. 1,26,000 – 84,000)	42,000
Packing:	Overheads recovered 60,000 × Rs. 2.50	1,50,000
	Actual overheads	1,35,000
	Over recovery (Rs. 1,50,000 – 1,35,000)	15,000
Total (over-recovery)		99,000

THEORY QUESTIONS

1. Explain the general principles to be kept in mind while considering whether item of expenditure is to be treated as overhead.

(B.Com. (Hons) Delhi, 2002)

2. Differentiate between apportionment and absorption of overhead.

(B.Com. (Hons), Delhi, 2003)

3. What is the importance of machine hour as a basis for the absorption of factory overheads?

(B.Com. (Hons), Delhi, 2004)

4. Explain briefly various methods of absorption of factory overheads.

(B.Com. (Hons), Delhi, 2004)

5. What do you mean by over-absorption and under-absorption of overheads? How would you treat such over and under absorbed factory-overheads in cost accounts? *(ICWA Inter, Stage1, June 2005, Dec.2006)*
B.Com. (Hons), Delhi, 2007, CA, PE, Exam II, May 2004)

6. Distinguish between allocation, apportionment and absorption of overheads.

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(B.Com. (Hons), Delhi, 2006, 2007)

7. What are the requisites of a good method of absorption of factory overhead?
8. Explain how would you treat under/overabsorption of overheads in cost accounts. *(B. Com. (Hons), Delhi 1997)*
9. Discuss the secondary distribution of overheads. *(B .Com. (Hons), Delhi 1997)*
10. Describe the different bases on which factory expenses can be apportioned. Describe the merits and suitability of each of them.
11. Write a detailed critical note on the direct labour cost method of absorption of factory overheads. *(B. Com. (Hons), Delhi)*
12. What information is necessary to calculate a machine hour rate for overhead absorption? State the conditions in which the method is most effective. *(B. Com. (Hons), Delhi)*
13. Explain the concept of absorption of factory overheads. *(B. Com. (Hons), Delhi)*
14. What do you understand by classification, allocation and apportionment in relation to overhead expenses? Explain fully. *(ICWA Inter)*
15. Briefly describe two ways of dealing with apportioning service department costs among departments which, in addition to doing work for the main operation departments, also serve one another. *(ICWA Inter)*
16. Discuss the statement that the impact of overheads under varying conditions of production and sales is of greater interest to the management than its method of apportionment and allocation. *(ICWA Inter)*
17. Overhead costs are usually classified according to variability. What are the necessities for such classification and what purpose do such classifications serve. *(ICWA Inter)*
18. State in short the reasons for the use of predetermined rates for factory overhead absorption. *(B. Com. (Hons), Delhi)*
19. Describe the "prime cost" method of absorption of factory overheads. Explain fully and illustrate the basic conditions necessary for its application. *(B. Com. (Hons), Delhi)*
20. Why do you consider departmentalisation of overheads necessary? *(B. Com. (Hons), Delhi)*
21. Factory *A* has a lower rate of overhead absorption than Factory *B*. Both factories produce the same type of goods. Discuss whether this can be taken as a sign that Factory *A* is more efficient than Factory *B*.
22. Explain the different methods for apportionment of Service Department's cost over Production Departments. *(B. Com. (Hons), Delhi)*
23. Explain why predetermined overhead absorption rates are preferred to overhead absorption rates calculated from factual information after the end of a financial period. *(B. Com. (Hons), Delhi)*
24. What are the causes of under/over absorption of factory overheads? How will you deal with them in cost accounts? *(B. Com. (Hons), Delhi)*

SELF-EVALUATION QUESTIONS

Select the correct answer for the following multiple choice questions:

(i) Factory overhead includes
  (a) All manufacturing costs
  (b) All manufacturing costs except direct materials and direct labour
  (c) Indirect materials but not indirect labour
  (d) Indirect labour but not indirect materials

(ii) In order to identify costs that relate to a specific product, an allocation base should be chosen that
  (a) does not have a cause and effect relationship
  (b) has a cause and effect relationship
  (c) considers variable costs but not fixed costs
  (d) considers direct materials and direct labour but not factory overhead.

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(iii) Which method of inventory pricing best approximates specific identification of the actual flow of costs and units in most manufacturing situations
  (a) Average cost
  (b) First-in, First-out
  (c) Last-in, First-out
  (d) Base stock

(iv) Prime cost means
  (a) Direct materials
  (b) Direct labour
  (c) Direct materials and direct labour
  (d) Factory overhead and direct materials

(v) Added cost of a new product will be
  (a) Materials and labour
  (b) Materials, labour and factory overhead
  (c) Materials, labour, factory and administrative overhead
  (d) Materials, labour and administrative overhead.

(vi) The budgeted fixed overheads amounted to Rs. 84,000. The budgeted and actual production amounted to 20,000 units and 24,000 units respectively. This means that there will be:
  (a) an under-absorption of Rs. 16,800
  (b) an under-absorption of Rs. 14,000
  (c) an over-absorption of Rs. 16,800
  (d) an over-absorption of Rs. 14,000

(vii) The rent of business premises should be shared out between cost centres according to:
  (a) floor area or cubic capacity
  (b) the number of employees
  (c) the replacement value of machinery and equipment
  (d) the number of kilowatt hours

(viii) The insurance of buildings is best apportioned to cost centres using:
  (a) floor area or cubic capacity
  (b) the number of employees
  (c) the replacement value of machinery and equipment
  (d) the number of kilowatt hours

(ix) The canteen expenses should be apportioned to cost centres by:
  (a) floor area or cubic capacity
  (b) the number of employees
  (c) the replacement value of machinery and equipment
  (d) the number of kilowatt hours

(x) In the absence of more realistic information, supervision should be split up according to:
  (a) floor area or cubic capacity
  (b) the number of employees
  (c) the replacement value of machinery and equipment
  (d) the number of kilowatt hours

(xi) Which of the following bases of apportionment is most suited to sharing up the lighting costs between departments and cost centres?
  (a) floor area or cubic capacity
  (b) the number of employees
  (c) the replacement value of machinery and equipment
  (d) the number of kilowatt hours

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(xii) Indirect costs can also be described as:
- (a) overhead costs
- (b) prime costs
- (c) variable costs
- (d) total costs

(xiii) Indirect costs which cannot be identified with a particular cost centre are shared out between cost centres using:
- (a) a recovery rate
- (b) an absorption rate
- (c) a method of apportionment
- (d) a method of allocation

(xiv) Which of the following is not an indirect cost?
- (a) wages of production department machine operator
- (b) wages of a production department cleaner
- (c) materials used for machine maintenance in the production department
- (d) materials used to clean the production department floor

PROBLEMS

1. A manufacturing company has 2 production departments—*X* and *Y* and 3 service departments—Time keeping, Stores and Maintenance. The departmental summary showed the following expenses for October 2001.

	Rs.	Rs.
Production Departments:		
X	16,000	
Y	10,000	26,000
Service Departments:		
Time-keeping	4,000	
Stores	5,000	
Maintenance	3,000	12,000
		38,000

The other information are:

Particulars	*Production departments*		*Service departments*		
	X	*Y*	Time-keeping	Stores	Maintenance
No. of employees	40	30	20	16	10
No. of stores requisitions	24	20	–	–	6
Machine-hours	2,400	16,000	–	–	–

You are required to make departmental allocation of expenses.

Ans: Total overhead costs
Deptt. *X* Rs. 22,845
Deptt. *Y* Rs. 15,155

2. Deccan Manufacturing Ltd. have three departments which are regarded as production departments. Service department's, costs are distributed to these production departments using the "Step Ladder Method" of distribution. Estimates of factory overhead costs to be incurred by each department in the forthcoming year are as follows. Data required for distribution is also shown against each department:

Department	*Factory overhead Rs.*	*Direct labour hours*	*No. of employees*	*Area in sq. m.*
Production:				
X	1,93,000	4,000	100	3,000
Y	64,000	3,000	125	1,500
Z	83,000	4,000	85	1,500
Service:				
P	45,000	1,000	10	500
Q	75,000	5,000	50	1,500
R	1,05,000	6,000	40	1,000
S	30,000	3,000	50	1,000

The overhead costs of the four service departments are distributed in the same order, viz., *P*, *Q*, *R*, and *S* respectively on the following basis:

Department	*Basis*
P	Number of Employees
Q	Direct Labour Hours
R	Area in Square Metres
S	Direct Labour Hours

You are required to:

(a) prepare a schedule showing the distribution of overhead costs of the four service departments to the three production departments; and

(b) calculate the overhead recovery rate per direct labour hour for each of the three production departments.

(CA Inter)

Ans: (a) Total overheads: Production Departments *X* Rs. 3,00,000, *Y* Rs. 1,35,000, *Z* Rs. 1,60,000

(b) Recovery rate: *X* Rs. 75, *Y* Rs. 45, *Z* Rs. 40.

3. Modern Manufacturers Ltd. has three Production Departments P_1, P_2, P_3 and two Service Departments S_1 and S_2 the details pertaining to which are as under:

	P_1	P_2	P_3	S_1	S_2
Direct wages (Rs.)	3,000	2,000	3,000	1,500	195
Working hours	3,070	4,475	2,419	—	—
Value of machines (Rs.)	60,000	80,000	1,00,000	5,000	5,000
H.P. of machines	60	30	50	10	—
Light points	10	15	20	10	5
Floor space (sq. ft)	2,000	2,500	3,000	2,000	500

The following figures extracted from accounting records are relevant:

Rent and rates	Rs. 5,000
General lighting	600
Indirect wages	1,939
Power	1,500
Depreciation on machines	10,000
Sundries	9,695

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The expenses of the Services Departments are allocated as under:

	P_1	P_2	P_3	S_1	S_2
S_1	20%	30%	40%	–	10%
S_2	40%	20%	30%	10%	–

Find out the total cost of Product X which is processed for manufacture in Departments P_1 P_2 and P_3 for 4, 5 and 3 hours respectively, given that its Direct Material Cost is Rs. 50 and Direct Labour Cost Rs. 30. *(CA Inter)*

Ans: Total Cost of Product *X* Rs. 117.25.

4. The New Enterprises Ltd. has Production Deptts. *A*, *B* and *C* and two Service Deptts. *D* and *E*. The following figures are extracted from the records of the company.

	Rs.
Rent and rates	5,000
General lighting	600
Indirect wages	1,500
Power	1,500
Depreciation of machinery	10,000
Sundries	10,000

The following further details are available:

	Total	*A*	*B*	*C*	*D*	*E*
Floor space (sq. ft)	10,000	2,000	2,500	3,000	2,000	500
Light points	60	10	15	20	10	5
Direct wages (Rs.)	10,000	3,000	2,000	3,000	1,500	500
H.P. of machines	150	60	30	50	10	–
Value of machinery (Rs.)	2,50,000	60,000	80,000	1,00,000	5,000	5,000
Working hours	–	6,226	4,028	4,056	–	–

The expenses of *D* and *E* are allocated as follows:

	A	*B*	*C*	*D*	*E*
D	20%	30%	40%	–	10%
E	40%	20%	30%	10%	–

What is the total cost of an article if its raw materials' cost Rs 50, labour costs Rs 30, and it processes through Departments *A*, *B* and *C* for 4, 5 and 3 hours respectively. *(CA Inter)*

Ans: Total overhead of service deptt. *D* Rs. 4,625 and *E* Rs. 1,575. Overhead rates Deptt. *A* Rs. 1.50; Year? 2.25; and *C* Rs. 3.00.

5. You are supplied with the following information and required to work out the production hour rate of recovery of overheads in Departments *A*, *B* and *C*.

Particulars	*Total*	*Production Departments*			*Service Deptt.*	
		A	*B*	*C*	*P*	*Q*
Rent	12,000	2,400	4,800	2,000	2,000	800
Electricity	4,000	800	2,000	500	400	300
Indirect labour	6,000	1,200	2,000	1,000	800	1,000
Depreciation of machinery	5,000	2,500	1,600	200	500	200
Sundries	4,500	910	2,143	847	300	300
Working hour	–	1,000	2,500	1,400	–	–

Expenses of Service Department *P* and *Q* are apportioned as under:

	A	*B*	*C*	*P*	*Q*
P	30%	40%	20%	–	10%
Q	10%	20%	50%	20%	–

(CA Inter)

Ans: Deptts. *A* Rs 9.50; *B* Rs 6; *C* Rs 5.

6. Modern Machines Ltd. have three Production Departments (*A*, *B* and *C*) and two Service Departments (*D* and *E*). From the following figures extracted from the records of the company, calculate the overhead rate per labour hour:

	Rs.
Indirect materials	15,000
Indirect wages	10,000
Depreciation on machinery	25,000
Depreciation on building	5,000
Rent, rates and taxes	10,000
Electric power for machinery	15,000
Electric power for lighting	500
General expenses	15,000
Total	95,500

Items	*Total*	*A*	*B*	*C*	*D*	*E*
Direct materials	60,000	20,000	10,000	19,000	6,000	5,000
Direct wages	40,000	15,000	15,000	4,000	2,000	4,000
Value of machinery	2,50,000	60,000	1,00,000	40,000	25,000	25,000
Floor area (sq. ft)	50,000	15,000	10,000	10,000	5,000	10,000
Horse power of machines	150	50	60	30	5	5
No. of light points	50	15	10	10	5	10
Labour hours	15,000	5,000	5,000	2,000	1,000	2,000

The expenses of Service Department *D* and *E* are to be apportioned as follows:

	A	*B*	*C*	*D*	*E*
D	40	20	30	–	10
E	30	30	40	–	–

(ICWA Inter)

Ans: Overhead rate per direct labour hour

Deptt. *A* Rs. 8.38
Deptt. *B* Rs. 7.95
Deptt. *C* Rs. 15.44

7. A company has two production departments and two service departments. The data relating to a period are as under:

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Particulars		*Production Departments*		*Service Departments*	
		PD_1	PD_2	SD_1	SD_2
Direct Materials	(Rs)	80,000	40,000	10,000	20,000
Direct Wages	(Rs)	95,000	50,000	20,000	10,000
Overheads	(Rs)	80,000	50,000	30,000	20,000
Power Requirement at normal capacity operations	(kWh)	20,000	35,000	12,500	17,500
Actual Power Consumption during the period	(kWh)	13,000	23,000	10,250	10,000

The power requirement of these departments are met by a power generation plant. The said plant incurred an expenditure, which is not included above, of Rs. 1,21,875 out of which a sum of Rs. 84,375 was variable and the rest fixed.

After apportionment of power generation plant costs to the four departments, the service department overheads are to be redistributed on the following basis:

Service Deptts.	PD_1	PD_2	SD_1	SD_2
SD_1	50%	40%	—	10%
SD_2	60%	20%	20%	—

You are required to:

(i) Apportion the power generation plant costs to the four departments.

(ii) Re-apportion service department cost to production departments.

(iii) Calculate the overhead rate per direct labour hour of production departments, given that the direct wages rates of PD_1 and PD_2 are Rs. 5 and Rs 4 per hour respectively.

(CA Inter, Nov. 1996)

Ans: Overhead rate per direct labour hour Deptt. PD_1 Rs. 10.87, PD_2 Rs. 12.43

8. The production department of a factory furnishes the following information for the month of October:

Materials used	Rs. 54,000	
Direct wages	Rs. 45,000	
Overhead	Rs. 36,000	
Labour hours worked		36,000
Hours of machine operation		30,000

For an order executed by the department during the period, the relevant information was as under:

Materials used	Rs. 6,00,000	
Direct wages	Rs. 3,20,000	
Labour hours worked		3,200
Hours of machine operation		2,400

Calculate the overhead charges chargeable to the job by the following methods; (i) Direct materials cost percentage rate, (ii) Labour hour rate, and (iii) Machine hours rate. *(CA Inter)*

Ans: (i) Rs. 4,00,000 (ii) Rs. 3,200 (iii) Rs. 2880

9. Meerut Manufacturing Company makes several product lines which are processed through three production departments—*X*, *Y* and *Z*.

The information concerning the relevant data for a year is as follows:

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	Factory overhead (including share of service department)	*Direct labour hours*	*Direct labour cost*
	Rs.		Rs.
Department *X*	1,24,000	80,000	1,60,000
Department *Y*	2,30,000	1,15,000	2,41,500
Department *Z*	5,46,000	1,05,000	1,99,500

Production records at the end of the year indicated the following for the product line 'Krish':

Unit Produced		20,000	
	Deptt. *X*	Deptt. *Y*	Deptt. *Z*
	Rs.	Rs.	Rs.
Prime cost	45,000	10,500	59,500
Direct labour hours	10,000	5,000	30,000

You are required to—

(a) calculate the departmental and plant-wide, overhead rate based on direct labour hours;
(b) compute the cost of 'Krish' line for the year by using (i) plant-wide rate and (ii) departmental rates; and
(c) comment on the results. *(B. Com. (Hons), Delhi, 1994)*

Ans: (a) Deptt. rate, Deptt *X* = Rs. 1.55, Deptt. *Y* Rs. 2.00, Deptt. *Z* Rs. 5.20 Plant wide rate Rs. 3
(b) Cost Plantwide Rs. 2,50,000; Deptt. rates *X*, Rs. 60,500; *Y*, Rs. 20,500; *Z* Rs. 2,15,500.

10. Superclass Co. Ltd. has three production departments, *X*, *Y* and *Z*, and two service departments, *A* and *B*. The following estimated figures for a certain period have been made available:

	Rs.
Rent and rates	10,000
Lighting and electricity	1,200
Indirect wages	3,000
Power	3,000
Depreciation of machinery	20,000
Other expenses and sundries	20,000

The following details are provided by the firm:

	Total	*X*	*Y*	*Z*	*A*	*B*
Floor space (sq. mt.)	10,000	2,000	2,500	3,000	2,000	500
Lighting point (nos.)	120	20	30	40	20	10
Direct wages (Rs.)	20,000	6,000	4,000	6,000	3,000	1,000
Horsepower of machines	300	120	60	100	20	–
Cost of machinery (Rs.)	1,00,000	24,000	32,000	40,000	2,000	2,000
Working hours	–	4,670	3,020	3,050	–	–

The expenses of the service departments *A* and *B* are to be allocated as follows:

	X	*Y*	*Z*	*A*	*B*
A	20%	30%	40%	–	10%
B	40%	20%	30%	10%	–

You are required to calculate the overhead absorption rate per hour in respect of the three production departments. What will be the total cost of an article with material cost of Rs. 80 and direct labour cost of Rs. 40 which passes through *X*, *Y* and *Z* for 2, 3 and 4 hours respectively. *(ICWA, Inter)*

Ans: Total cost Rs. 178.09

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11. A company has three production centres, *A*, *B* and *C* and two service cost centres, *X* and *Y*. Costs allocated to service centres are required to be apportioned to the production centres to find our cost of production of different products. It is found that benefit of service cost centres is also received by each other along with the production cost centres.

Overhead costs as allocated to the five cost centres and estimates of benefit of service cost centres received by each of them are as under:

Cost centres	*Overhead costs as allocated*	*Estimates of benefits received from service centres (%)*	
	(Rs.)	*X*	*Y*
A	80,000	20	20
B	40,000	30	25
C	20,000	40	50
X	20,000	–	5
Y	10,000	10	–

Required: Work out final overhead costs of each of the production departments including reapportioned cost of service centres using (a) continuous distribution method and (b) simultaneous equation method. *(ICWA, Inter)*

Ans: Total overhead costs, Deptt. *A* Rs. 86,533, Deptt. *B* Rs. 49,196, Deptt *C* Rs. 34271.

12. Following particulars have been extracted from the books of Reliable Co.:

Indirect materials		
Shop no. 1	Rs. 12,000	
Shop no. 2	18,000	
Shop no. 3	6,000	
Tool room	3,600	
Stores	4,800	
Factory office	1,800	Rs. 46,200
Indirect wages		
Shop no. 1	12,600	
Shop no. 2	17,600	
Shop no. 3	16,000	
Tool Room	11,100	
Stores	4,500	
Factory office	6,600	68,400
Factory rent		30,000
Insurance		6,000
Depreciation 10%		30,000
Power		27,000
Light and heat		12,000
Total		Rs. 2,19,600

Further information regarding the operations is given below:

Departments	Area (sq. m)	Book value of machinery (Rs.)	Effective HP	Direct labour		Machinery hours
				Hours	Cost (Rs.)	
Production:						
Shop no. 1	1,000	75,000	90	3,00,000	90,000	1,60,000
Shop no. 2	750	1,35,000	90	3,00,000	60,000	2,40,000
Shop no. 3	1,500	30,000	–	2,00,000	50,000	
Service:						
Tool room	500	45,000	20	–	50,000	–
Stores	750	7,500	–	–	–	–
Factory office	500	7,500	–	–	–	–
	5,000	3,00,000	200	8,00,000	2,50,000	4,00,000

You are required to prepare an 'overhead analysis sheet' for the departments of Reliable Co. for the year showing the basis for apportionment. *(ICWA, Inter)*

Ans: Total Cost Shop 1 Rs. 73,760, Shop 2 Rs. 98,540, Shop 3 Rs. 47,300

13. Atlas Engineering Ltd. accepts a variety of jobs which require both manual and machine operations. The budgeted Profit and Loss Account for the period 1996–97 is as follows:

		(Rs. in lakhs)
Sales		75
Less: Cost of Sales		
Direct Materials	10	
Direct Labour	5	
Prime Cost	15	
Production Overhead	30	
Production Cost	45	
Administrative, Selling and Distribution Overhead	15	60
Profit		15

Other Budgeted Data

Labour hours for the period	2,500
Machine hours for the period	1,500
No. of jobs for the period	300

An enquiry has been received recently from a customer and the production department has prepared the following estimate of the prime cost required for the job:

	Rs.
Direct material	2,500
Direct labour	2,000
Prime cost	4,500

Labour hours required = 80
Machine hours required = 50
You are required to:

(a) Calculate by different methods, six overhead absorption rates for absorption of production overhead and comment on the suitability of each.

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(b) Calculate the production overhead cost of the order based on each of the above rates.
(c) Give your recommendation to the company. *(ICWA Inter, Dec. 1997)*

Ans: Production overhead cost for the job

Direct labour hour rate	Rs. 9,600
Machine hour rate	Rs. 10,000
Direct material cost percentage	Rs. 7,500
Direct labour cost percentage	Rs. 12,000
Prime cost percentage	Rs. 9,000
Job Rate	Rs. 10,000

14. An engineering company, engaged in the manufacture of various heavy engineering products, has installed one Pegard Numerical Control Horizontal Borer for specialised manufacturing operations. Calculate the machine hour rate on the basis of the following particulars:

(i) F.O.B. cost of machine, Rs. 24 lakhs. (ii) Customs duty, insurance, freight, etc. Rs. 11 lakhs. (iii) Installation expenses Rs. 3 lakhs. (iv) Cost of tools adequate for 2 years only Rs. 4 lakhs. (v) Cost of machine room Rs. 3 lakhs. (vi) Cost of air-conditioning for machine room Rs. 2 lakhs. (vii) Rate of interest on term loan to finance the above capital expenditure 12% per annum. (viii) Salaries, etc. for operators and supervisory staff Rs. 2 lakhs per year. (ix) Cost of electricity Rs. 11 per hour. (x) Consumption of stores Rs. 5,000 per month. (xi) Other expenses Rs. 5 lakhs per annum. (xii) Assume rate of depreciation as 10% per annum on fixed assets. (xiii) Total working hour in the machine room is 200 hours in a month. (xiv) Loading and unloading time is 10% of machine time. (xv) You can make suitable assumptions, if necessary, for the purpose of your computation. *(ICWA Inter)*

Ans: Rs. 915.66

15. Compute the machine hour rate from the following data:

(i)	Total machine cost to be depreciated	Rs. 2,30,000
(ii)	Life 10 years.	
(iii)	Depreciation on straight line	
(iv)	Departmental overheads (annual)	
	Rent	Rs. 50,000
	Heat and lighting	Rs. 20,000
	Supervision	Rs. 1,30,000
(v)	Department area	70,000 sq ft
	Machine area	2,500 sq ft
(vi)	26 machines in the department	
(vii)	Annual cost of reserve equipment for the machines	1,500
(viii)	Hours run on production	1,800
(ix)	Hours for setting and adjusting	200
(x)	Power cost Re. 0.50 per hour of running time	
(xi)	Labour (a) when setting and adjusting, full time attention; (b) when machine is producing; one man can look after 3 machines.	
(xii)	Labour rate Rs. 6 per hour	

(CA Inter)

Ans: Machine hour rate Rs. 20.14

16. In a light engineering factory, the machine shop consists of three cost centres (A, B and C) each having three distinct sets of machines. The following are the details of estimates for the year 2001:

	Total	*A*	*B*	*C*
1. No. of workers	800	200	200	400
2. No. of machine hours	1,00,000	30,000	30,000	40,000
3. % of horse power	100	40	25	35
		(Amount in lakhs of Rs.)		

(Countd.)

	Total	A	B	C
4. Value of assets	40.00	10.00	16.00	14.00
5. Direct wages	30.00	8.00	10.00	12.00
6. Depreciation	4.00			
7. Indirect labour	9.00			
8. Insurance charges	2.00			
9. Electricity	3.00			
10. Supervisory salaries	1.60			
11. Staff welfare expenses	3.00			
12. Other expenses	6.00			

Work out a composite machine hour rate for each of the three cost centres and indicate clearly the basis of apportionment of expenses between the cost centres. *(ICWA Inter)*

Ans: Machine hour rate:
Deptt. *A* = Rs. 53.50; *B* = 63.67; *C* = Rs. 58.63.

17. From the following data, work out the predetermined machine-hour rates for departments *A* and *B* of a factory:

Preliminary Estimates of Expenses

	Total (Rs.)	Deptt. A (Rs.)	Deptt. B (Rs.)
Power	15,000	–	–
Spare parts	8,000	3,000	5,000
Consumable stores	5,000	2,000	3,000
Depreciation on machinery	30,000	10,000	20,000
Insurance on machinery	3,000	–	–
Indirect labour	40,000	–	–
Building maintenance	7,000	–	–

The final estimates are to be prepared on the basis of above figures after taking into consideration the following factors:

(a) An increase of 10 per cent in the price of spare parts;

(b) An increase of 20 per cent in the consumption of spare parts for department *B* only;

(c) Increase in straight line method of depreciation from 10 per cent on the original value of machinery to 12 per cent;

(d) 15 per cent general increase in wage rates.

The following information is available:

	Deptt. A	Deptt. B
Estimated direct labour-hours	80,000	1,20,000
Ratio of kW ratings	3	2
Estimated machine-hours	25,000	30,000
Floor space (sq. ft)	15,000	20,000

(ICWA, Inter)

Ans: Machine hour rate, Deptt. *A* Rs. 1.948, Deptt-*B* Rs. 2.440

18. Sankalp Industries absorbs factory overhead costs at Rs. 2.50 per direct labour hour. Both opening and closing balance of work-in progress and finished goods inventories are zero.

The following data are available for the year 2002:

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Direct labour hours used	50,000
Direct labour cost	Rs 1,00,000
Indirect labour cost	25,000
Indirect materials cost	10,000
Depreciation of plant and equipment	50,000
Miscellaneous factory overheads	50,000

Assuming that all goods produced have been sold:

(i) Calculate factory overheads incurred and factory overheads absorbed; and

(ii) Pass a journal entry for disposing of overhead or under-absorbed factory overheads. *(B. Com. (Hons), Delhi)*

Ans: Factory overhead incurred Rs. 1,35,000
Factory overhead absorbed Rs. 1,25,000

Plus supplementary overhead rate Rs. $\frac{10000}{50000 \text{ hrs}}$

= Re. 0.20 per hour

19. During the year ended 31st March 1993, the factory overhead costs of three production departments of an organisation are as under:

Department *X*	Rs. 48,950
Y	Rs. 89,200
Z	Rs. 64,500

The basis of apportionment of overhead is given below:

Department *X*	Rs. 5.00 per machine hour for 10,000 hours
Y	75% of direct labour cost of Rs. 1,20,000
Z	Rs. 4.00 per piece for 15,000 pieces

Calculate department-wise under or over-absorption of overheads and present the data in a tabular Form?)

(ICWA, Inter)

Ans: Deptt. *X* Rs. 1050 (Over), Deptt. *Y*, Rs. 800 (Over), Deptt. *Z* Rs. 4,500 (under)

20. In a factory, overheads of a particular department are recovered on the basis of Rs. 5 per machine hour. The total expenses incurred and the actual machine hours for the department for the month of August were Rs. 80,000 and 10,000 hours, respectively. Of the amount of Rs. 80,000, Rs. 15,000 became payable due to an award of the labour court Rs. 5,000 was in respect of expenses of the previous year booked in the current month (August). Actual production was 40,000 units, of which 30,000 units were sold. On analysing the reasons, it was found that 60 per cent of the under-absorbed overhead was due to defective planning and the rest was attributed to normal cost increase. How would you treat the under-absorbed overhead in the cost accounts? *(CA, Inter Year)*

Ans: Rs. 6000 (under-absorption) should be transferred to costing profit and loss A/c as it is abnormal in nature. The other Rs. 4,000 will be treated as: Cost of sales Rs. 3,000; Finished goods Rs. 1,000.

21. A manufacturing company has four production departments. Overhead is absorbed to its production departments by means of departmental rates per direct labour hour. In a particular year there was a large difference between the overhead incurred and overhead absorbed. On analysis, you get the following information:

				(in Rs.)
	Departments			
	1	*2*	*3*	*4*
Overhead incurred	12,320	44,385	18,180	16,720
Actual direct labour-hours worked	30,800	80,700	40,400	30,400
Overhead absorbtion rate per direct labour hour	0.50	0.45	0.40	0.50
Total overhead absorbed	15,400	36,315	16,160	15,200
Direct labour-hours contained in:				
Work-in-progress	3,000	10,400	1,900	7,200
Finished goods	4,300	8,300	4,000	2,900

You are required to:

(a) calculate for each department the direct labour-hour rates of overhead incurred.

(b) calculate the extent to which the value of work-in-progress and finished goods be increased or decreased for each department for the year in view of corrected rates.

(c) what will be the impact on total profit of the company in view of the correction in above?

Ans:

(a)

	Departments			
Direct labour hour rate Re.	(1)	(2)	(3)	(4)
	0.40	0.55	0.45	0.55

(c) Impact on profit (Increase) Rs. 1,940

22. A manufacturing unit has predetermined the overhead recovery rates as 400% on direct wages, 20% on works cost and 25% on cost of production for works expenses, management expenses and commercial expenses respectively. At the end of the year, it has been found that the works overhead stand under-absorbed to the extent of 30% of the total productive wages, management overheads show under-recovery of one-eight of the absorbed amount, the recovery of commercial expenses results in an over-absorption of one-third of the total amount absorbed. If the prime costs of the three jobs are as under, find the profit/loss on the respective selling prices (both on the basis of standard cost and on the basis of full absorption overheads).

	Job *A*	Job *B*	Job *C*
Direct materials	Rs. 45.50	Rs. 32.60	Rs. 26.80
Direct wages	15.20	8.60	7.20
	Rs. 60.70	Rs. 41.20	Rs. 34.00
Selling price	Rs. 200.00	Rs. 130.00	Rs. 90.00

(ICWA, Inter)

Ans:	Job *A*	Job *B*	Job *C*
Profit (loss) at standard cost	Rs. 17.75	16.60	(4.20)
Profit (loss) at full absorption	Rs. 22.30	19.69	(1.65)

23. The Pipe Company manufactures two products, *A* and *B* during the first year of its operations. For the purpose of product costing, an overhead rate of application of Rs. 1.70 per direct-labour was used, based on budgeted factory overhead of Rs. 3,40,000 and budgeted direct-labour hours of 2,00,000 as follows:

	Budgeted overhead	Budgeted hours
Department 1	Rs. 2,40,000	1,00,000
Department 2	1,00,000	1,00,000
Total	Rs. 3,40,000	Rs. 2,00,000

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The number of labour-hours required to manufacture each of these products was:

	Product *A*	Product *B*
Department 1	4	1
Department 2	1	4
	5	5

At the end of the year, there was no work in process. There were, however, 2,000 and 6,000 finished units, respectively, of products *A* and *B* on hand. Assume that budgeted activity was attained.

(a) What was the effect on the company's income of using a plant-wise overhead rate instead of departmental overheads rates?

(b) Assume that material and labour costs per unit of Product-*A* were Rs. 10 and that the selling price was established by adding 40 per cent to cover profit and selling and administrative expenses. What difference in selling price would result from the use of departmental against plant-wise overhead rates? *(ICWA, Inter)*

Ans: (a) Overstatement of company's income by Rs. 8,400

(b) Difference in selling price Rs. 2.94

24. The factory overhead costs of four production departments of a company engaged in executing job orders, for an accounting year, are as follows:

	Rs.
A	19,300
B	4,200
C	4,000
D	2,000

Overhead has been applied as under:

Deptt.	*A*	Rs. 1.50 per Machine Hour for 14,000 hours
Deptt.	*B*	Rs. 1.30 per Direct Labour Hour for 3,000 hours
Deptt.	*C*	80% of Direct Labour Cost of Rs. 6,000/–
Deptt.	*D*	Rs. 2/– per piece, for 950 pieces.

Find out the amount of department-wise under or over-absorbed factory overheads. *(ICWA Inter)*

Ans: Deptt *A* Rs. 1,700 (over-absorbed)
Deptt *B* Rs. 300 (under-absorbed)
Deptt *C* Rs. 800 (over-absorbed)
Deptt *D* Rs. 100 (under absorbed)

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Percentage on Direct Materials

An absorption rate based on materials cost is obtained by dividing total estimated factory overhead by total direct materials cost expected to be used in the manufacturing process. If factory overhead is Rs. 3,00,000 and materials cost is Rs. 2,50,000, the absorption rate will be:

$$\frac{3,00,000}{2,50,000} \times 100 = 120\%$$

Each job or product would be charged on the basis of 120% absorption rate. For example, if the materials cost of product is Rs. 50,000, the factory overhead to be charged for their product would be Rs. 60,000 (50,000 × 120%).

Advantages The "percentage on direct material cost" method is simple and easy to understand and apply. This method will give correct overhead cost figure where the prices of raw materials do not differ significantly, where quantity and cost of materials in each product are uniform, and where processing for the different products is also uniform. It is useful in very simple types of small business firms.

Disadvantages This method has the following disadvantages:

1. There is no logical relationship between material cost of a product and factory overhead used in production.
2. Materials prices are subject to fluctuations quite often and this phenomenon leads to high or low overhead costs, even though overhead figures remain unchanged.
3. Most of the overhead expenses vary with time. For example, a product or job using cheap materials but a longer period of processing should bear more for overhead as compared to a job or product which uses expensive materials but a shorter period of processing. But the use of direct material cost totally ignores the time factor which is an important factor in allocation/apportionment of overhead costs.
4. This method is not proper where part of the materials passes through all processes, and part through only some processes.
5. The mere fact that a job consumes material of a very expensive nature does not imply that the overhead incurred on that job will also be heavier. If the materials cost basis is used to charge overhead, the product using expensive materials will, in this case, be charged with more than its share of overhead.

Percentage on Direct Wages

Percentage on Direct Wages is computed in the following manner:

$$\frac{\text{Factory overhead}}{\text{Direct labour cost}} \times 100$$

If factory overhead is Rs. 2,00,000 and the direct labour cost is also Rs. 2,00,000 then absorption rate based on direct wages will be 100%.

A job or a product with a direct labour cost of Rs. 30,000 would be charged with Rs 30,000 for factory overhead.

Advantages This method has the following advantages:

1. It is simple to operate and understand.
2. It considers the time factor, as labour cost is computed by multiplying number of hours spent on work by an hourly labour rate. The more hours worked, the higher the labour-cost and the greater the use and therefore the charge for factory overhead.
3. Labour rates fluctuate, but less frequently than that of prices of materials.

Disadvantages The disadvantages are:

1. It depends on cost of direct labour which may not reflect accurately the contribution of factory overhead in the cost of product. Many expenses such as taxes, property insurance, depreciation are functions of time.
2. It does not take into account variations, if any, in the rates of remuneration for different types of labour and therefore, the wages incurred on different jobs are not necessarily in the same ratio as the hours spent. This fact would be clear where workers are paid on a piece-rate basis as in this system wages depend on output and not upon time. This limitation is clear from the following example.

	Job A (16 hr)	*Job B (20 hr)*
Direct materials	600	600
Direct labour	400	400
Prime cost	1000	1000
Factory overhead (75% on direct wages)	300	300
Factory cost	1300	1300

As job *B* has taken 25% extra time to complete work than *A*, the job carried out by *B* must have occupied the factory for a longer period than *A*'s, but as is clear from the above statement, the charge for factory overhead is the same in each case.

4. Total direct labour cost represents the sum of high and low-wage production workers. By applying overhead on the basis of direct labour cost, a job or product is charged with more overhead when a high rate operator performs work instead of a low-rate worker leading to incorrect distribution of factory overhead.

Prime Cost Percentage

The prime cost basis combines the total of direct materials cost and direct labour cost and uses this total as a basis for charging overhead. The formula used in determining the rate is:

$$\frac{\text{Factory overhead}}{\text{Prime cost}} \times 100$$

If in a case the factory overhead is Rs. 4,56,000 and prime cost is Rs. 6,00,000, then prime cost percentage rate will be

$$\frac{4,56,000}{6,00,000} \times 100 = \ 76\% \text{ of prime cost}$$

Advantages This method is simple to operate. It considers both materials and labour in charging overhead to each job or product. The prime cost data is easily available without any additional problem of accumulation.

Disadvantages The disadvantages are:

1. Two items, that is, materials and labour both of which possess many disadvantages influence the charging of factory overhead to jobs and products.
2. Where the cost of materials is a larger part of the prime cost, the time factor (direct labour costs) will be ignored which is more related to the factory overhead.

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3. It ignores time factor in absorbing factory overhead.
4. It can be useful to only a few departments where the type of labour and value of materials used are constant.

The following example illustrates the demerits of this method.

	Job A	*Job B*
Direct materials	Rs. 30,000	Rs. 4,000
Direct wages (Job *A* 50 hours @ Rs. 4 per hour and Job *B* 200 hours @ Rs. 4 per hour)	200	800
Prime cost	Rs. 30,200	Rs. 4800
Factory overhead (50% on prime cost)	15,100	2400
Factory cost	45,300	7200

The above example indicates that the labour expended on job B is four times that of job *A*. But this fact is not reflected in the factory overhead charged to these two jobs.

Unit of Production Basis

The unit of production method is the simplest and most direct method of charging factory overhead. The unit might be a kilo, foot, a machine, a hundred pieces or whatever unit of measure is used for the product. As a formula, the computation is as follows:

$$\frac{\text{Factory overhead}}{\text{Units of production}}$$

If factory overhead is Rs. 3,00,000 and the company intends to produce 2,50,000 units during the next period, each unit completed would be charged with Rs. 1.20 (Rs. 3,00,000 ÷ 2,50,000 units) as its share of factory overhead. Thus, an order with 1,000 completed units would be charged Rs 1,200 (1,000 units × Rs. 1.20) for factory overhead.

The usefulness of this method is limited normally to those situations where only one product is produced. It is used most satisfactorily in small manufacturing concerns having relatively simple manufacturing processes or in large concerns manufacturing few articles in large quantities. If several products manufactured are alike or closely related, absorption of factory overhead can be made on a weight or a point basis, such as in the following example:

Points value of Product *A* — 5 points
Points value of Product *B* — 7 points
Production units *A* 4000, *B* 5000.
Overhead to be absorbed Rs. 5,50,000

$$\text{Rate per unit} = \frac{5{,}50{,}000}{(4000 \times 5) + (5{,}000 \times 7)} = \text{Rs. } 10$$

Rate per unit of $A = 5 \times$ Rs. 10 = Rs. 50

Rate per unit of $B = 7 \times$ Rs. 10 = Rs. 70

Labour Hour/Production Hour Rate

One of the most widely used methods for overhead application is the labour hour basis. Since many companies require direct labour workers to record their time spent on each job, or in each department of a

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process cost factory, the data for absorption of overhead on this basis is readily available. The equation for determining the overhead rate under this method is:

$$\frac{\text{Factory overhead}}{\text{Direct labour hours}}$$

If factory overhead is Rs. 4,00,000 and direct labour hours are 2,00,000, then overhead rate based on direct labour hours would be Rs. 2 per hour of direct labour (Rs. 4,00,000 ÷ 2,00,000 hours). A product that requires 5,000 direct labour hours would be charged with Rs. 10,000 (5,000 hours × Rs. 2) for factory overhead.

Advantages The following are the advantages:

1. As long as direct labour is the chief factor in manufacturing processes, the direct labour hours method is useful as the most equitable basis for charging overhead.
2. This method uses the time factor and production taking the same time is charged with the same amount of overhead, though the direct labourer may be getting different wage rates.

Disadvantages The disadvantages are:

1. The method requires accumulation of direct labour hours by job, product or department. Time-keeping should be adequate to provide this information.
2. This method cannot be used where machines are used extensively for production.

Machine Hour Rate

The machine hour rate is used where the work is performed primarily on machines. The formula used in computing the rate is:

$$\frac{\text{Factory overhead}}{\text{Machine hours}}$$

If factory overhead is Rs. 3,00,000 and total machine hours are 1,50,000, the machine hour rate is Rs. 2 per machine hour (Rs. 3,00,000 ÷ 1,50,000 hours).

Advantages This method can be used advantageously where the machine is the major factor in production. In capital-intensive industries, plans and machines are used in large quantities and one operator may attend to several machines or several operators may attend to a single machine. By making the machine the basis, overhead costs can be equitably absorbed among different products.

Disadvantages The disadvantages are:

1. Machine hour data has to be collected and therefore it requires additional clerical work. The cost of collection and accounting activities goes up and therefore, is not workable for small business firms.
2. The method cannot be used universally by all business concerns. It can be used where production is mainly through machines.

Types of Machine Hour Rate

Two types of machine hour rate may be calculated such as:

1. *Ordinary machine hour rate*—This rate takes into account only those overhead expenses which are directly attributed to the running of a machine. Such expenses are power, fuel, repair, maintenance and depreciation. The total of all these expenses is divided by the total machine hours.
2. *Composite machine hour rate*—This method takes into account not only expenses directly connected with the machine as mentioned above, but also other expenses which are known as standing or fixed

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charges. Such expenses are rent and rates, supervisory, labour, lighting and heating, etc. These expenses being fixed in nature are determined for a particular period and then apportioned among different departments on some equitable bases. The overhead expenses thus apportioned to each department are further apportioned among the machines (machine cost centres) in that department, on an equitable basis. Generally composite machine hour rate is calculated.

The following are bases used for the apportionment of expenses for computing machine hour rate.

Overhead expenses	*Basis*
1. Standing Charges	
(i) Supervision	Estimated time devoted to each machine
(ii) Rent and rates	Floor area occupied by each machine
(iii) Heating and lighting	Number of points or floor occupied by each machine
(iv) Lubricating oil and consumable stores	Capital values, machine hours or past experience
(v) Insurance	Insured value of each machine
(vi) Miscellaneous expenses	Equitable basis depending on facts
2. Machine or Variable Expenses	
(i) Depreciation	Machine hours
(ii) Repairs	Machine hours or capital values or cost of repairs spread over the working life of machine
(iii) Power	Horse power of machines or machine hours or meter readings

SELECTING AN ABSORPTION RATE

The above absorption rates have their own merits and demerits. The method to be used depends on the factors and circumstances prevailing in a manufacturing firm. Whatever method is selected by a firm, it must achieve the following objectives:

1. The basic objective is to select an absorption rate which helps in determining the accurate amount of factory overhead to be charged to individual products, jobs, processes, etc.
2. A secondary objective in selecting a method of absorption is to minimise clerical effort and cost. When two or more absorption rates tend to charge the same amount of overhead, the simplest base could be used.
3. The selection of an absorption rate is also influenced by other factors, such as type of industry, legal requirements, if any, policy of management, etc. in addition to the suitability of a method under specific circumstances.

Arguments in Favour of Apportionment and Absorption of Overheads

The following are the arguments generally advanced in favour of apportionment and absorption of overheads:

1. Product Costing The process of apportionment and absorption helps in determining the total or full cost of a product and in turn assists in making product profitability analysis by comparing selling prices of different products with related full costs. Also, product cost can be used as a floor when fixing the price of a product.

2. Stock Valuation Apportionment and absorption facilitates inclusion of productions overhead in the valuation of work-in-progress and closing stock. For work-in-progress, the amount of production overhead

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included indicates the degrees of completion of the products. Closing stock also rightly bears a share of manufacturing overhead. It is also clear that a proportion of manufacturing overhead is transferred to the next accounting period via work-in-progress and closing stock. Valuation of closing stock and work in progress in terms of full cost including production overhead is accepted for the purpose of financial reporting and by taxation and other regulatory authorities.

3. Production Overheads as Product Costs Apportionment and absorption of overheads achieves the objectives of recognising production overheads as product costs. It ensures the rationality that manufacturing of product requires incurrence of production overheads, and if manufacturing overhead is not incurred, production is not possible.

4. Cost Control Apportionment and absorption of overhead makes the centres or department managers aware about the costs they are considered to by accountable. Therefore, it develops a sense of responsibility among the production and service cost centre managers. These managers can relook at these costs which are being charged to their departments through budgeting process. Consequently, managers can take steps to control costs assigned to their departments.

5. Full costs used for government projects and activities In all government projects and govt-funded activities, full costs are considered including manufacturing overhead. Governments and development agencies also provide grants to cover the full costs. Audit process to verify full costs implies apportionment and absorption of overheads.

Limitations of Apportionment and Absorption

Apportionment and absorption of overheads are criticised on the following grounds:

(1) Different methods of apportionment and absorption tend to charge varying amounts of manufacturing overheads to products and thus making the resulting product costs doubtful. Also, distribution of overheads based on different methods leads to inconsistencies and arbitrariness.
(2) Since product costs themselves become unreliable and inaccurate, due to more or less arbitrary cost apportionment process, it cannot be used to set product price.
(3) Those business firms which use one overall rate or a single plant wide rate instead of multiple rates of absorption may not find product cost data useful for planning, control and decision making.
(4) Apportionment and absorption of overheads due to their underlying arbitrary methods may give product under-costing or product overcosting. In undercosting a product uses a relatively larger quantity of resources but is found to have a relatively low total cost. On the other hand, overcosting implies that a product consumes smaller quantity of resources but is shown to have higher costs.

Example 6.15

The machine shop of a manufacturing concern has 6 identical machines manned by 6 operators. The total cost of the machines is Rs. 8,00,000. The following information relates to six monthly period ended 30 September 2000:

Normal available hours per month	208
Absenteeism (without pay) hours per month	18
Leave (with pay) hours per month	20
Normal ideal time hours per month	10
Average rate of wages per hour per operator	Rs. 2.50
Production bonus	15% on wages
Power and fuel consumption	Rs. 9,000
Supervision and indirect labour	Rs. 3,300

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Electricity, lighting	Rs. 1,200
Repairs and maintenance (per annum)	3% of value of machine
Insurance (per annum)	Rs. 42,000
Depreciation (per annum)	10% of original cost
Allocated factory overheads (per annum)	Rs. 75,670

Calculate machine hour rate

(B. Com. (Hons), Delhi 2001)

Solution:

Before computing the comprehensive machine hour rate, it is necessary to find out the total machine hours utilized and total wages paid to the operators.

COMPUTATION OF TOTAL MACHINE HOURS UTILISED

Normal available hours p.m. per operator =			208 hours
Less:	Unutilised hours due to:		
	Absenteeism	18 hours	
	Leave	20 hours	
	Idle time	10 hours	48 hours
Total hours utilized p.m. per operator			160 hours

Total hours utilised for six months for 6 operators

$$= 160 \times 6 \times 6 = 5760$$

It is given in the question that these 6 machines were manned by 6 operators. Therefore, hours utilised for 6 operators i.e. 5760 hours represent the total machine hours.

Total wages to 6 operators for 6 months

Average rate of wages per hour is given = Rs. 2.50

Normal hours for which wages are to be paid

$$= 208 - 18 = 190 \text{ hrs.}$$

Wages for 6 months for 6 operators @ Rs. 2.50 per hr.

$$= 190 \times 6 \times 6 \times 2.50 = 17{,}100$$

Computation of Machine hours rate	Rs.
Operator wages (as calculated above)	17,100
Production Bonus (15% of wages) $\frac{17100 \times 15}{100}$ =	2,565
Power Consumed	9,000
Supervision and Indirect labour	3,300
Electricity and Lighting	1,200
Repair and Maintenance	12,000
(3% of value of machine p.a.) $\frac{8{,}00{,}000 \times 3 \times 6}{100 \times 12}$	
Insurance (per annum given) $\frac{42{,}000 \times 50}{100}$	21,000
Depreciation for six months $\frac{8{,}00{,}000 \times 10 \times 6}{100 \times 12}$	40,000

Allocated factory overheads given per annum $\frac{75,670 \times 6}{12}$ =	37,835
Total overhead for 6 months	1,44,000

Machine hour rate = $\frac{1,44,000}{5,760 \text{ Hrs}}$ = Rs. 25 per hour

Example 6.16

The following information is made available from the costing records of a factory:

(i)	The original cost of the machine	Rs. 1,00,000
	Estimated life	10 years
	Residual value	Rs. 5,000

Factory operates for 48 hours per week—52 weeks in a year. Allow 15% towards machine maintenance downtime. 5% may be allowed as setting up time.

(ii) Electricity used by the machine is 10 units per hour at a cost of 50 paise per unit.

(iii) Repairs and maintenance cost is Rs. 500 per month.

(iv) Two operators attend the machine during operation along with two other machines. Their total wages, including fringe benefits, amount to Rs. 5,000 per month.

(v) Other overheads attributable to the machine are Rs. 10,431 per year.

Using the above data, calculate machine hour rate.

(B. Com. (Hons), Delhi 2000)

Solution:

Calculation of Machine Hour rate.			*Rs.*
Annual Working Hours 48 × 52		=	2,496
Less: Machine maintenance and setting up time.			
(15% + 5%) = 20%		=	499
Normal Working Hours per annum		=	1,997
		Rs.	Rs.
Standing Charges per annum:			
Two operators wages along with two other machine = $\frac{5000 \times 12 \times 1}{3}$		20,000	
Other overheads		10,431	
Total Standing Charges		30,431	
Hourly Rate of Standing Charges			
Rs. 30431/1997			15.238
Variable expenses per hour:			
Depreciation: $\frac{1,00,000 - 5,000}{10 \times 1997}$			4.757
Repairs and Maintenance = $\frac{500 \times 12}{1997}$			3.004
Power 10 unit × .50			5.000
Machine hour rate			27.999

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Example 6.17

X Ltd. having fifteen different types of automatic machines furnishes information as under:

(i) Overhead expenses: Factory rent Rs. 96,000 (Floor area 80,000 sq. ft.). Heat and gas Rs. 45,000 and supervision Rs. 1,20,000.

(ii) Wages of the operator are Rs. 48 per day of 8 hours. He attends to one machine when it is under set up and two machines while they are under operation.

In respect of machine *B* (one of the above machines) the following particulars are furnished:

(i) Cost of machine Rs. 45,000, life of machine-10 years and scrap value at the end of its life Rs. 5,000.

(ii) Annual expenses on special equipment attached to the machine are estimated at Rs. 3,000.

(iii) Estimated operation time of the machine is 3,600 hours while set up time is 400 hours per annum.

(iv) The machine occupies 5,000 sq. ft. of floor area.

(v) Power costs Rs. 2 per hour while machine is in operation.

Find out the comprehensive machine hour rate of machine *B*. Also find out machine costs to be absorbed in respect of use of machine *B* on the following two work-orders:

	Work-order 31	*Work-order 32*
Machine set up time (Hours)	10	20
Machine operation time (Hours)	90	180

(CA Inter)

Solution:

X Ltd. Computation of Comprehensive Machine Hour Rate of Machine B

	Amount
	Rs.
Standing Charges:	
Factory Rent (Rs. 96,000/80,000 sq. ft.) × 5,000 sq. ft.)	6,000
Heat and Gas (Rs. 45,000/15 machines)	3,000
Supervision (Rs. 1,20,000/15 machines)	8,000
Depreciation $\left(\frac{\text{Rs. } 45{,}000 - \text{Rs. } 5{,}000}{10 \text{ Years}}\right)$	4,000
Annual Expenses on special equipment	3,000
	24,000
Fixed Cost per hour (Rs. 24,000/4,000 hrs.)	Rs. 6

Particulars	*Set up rate per hour Rs.*	*Operation rate per hour Rs.*
Fixed Cost	6	6
Power	—	2
Wages	6	3
Total	12	11
Comprehensive Machine Hour Rate Rs. 12 + Rs. 11 = Rs. 23		

Note: Depreciation has been taken as a fixed cost.

Statement of 'B' Machine Costs
(to be absorbed on the two work orders)

Particulars	*Work order 31*			*Work order 32*		
	Hours	*Rate Rs.*	*Amount Rs.*	*Hours Rs.*	*Rate Rs.*	*Amount*
Set up time cost	10	12	120	20	12	240
Operation time cost	90	11	990	180	11	1,980
Total Cost:			1,110			2,220

Example 6.18

(a) Calculate the machine hour rate of a machine with information given below:

Operating date:

Total number of weeks per quarter	=	13
Total number of hours per week	=	48
Stoppage due to maintenance	=	8 hrs. p.m.
Time taken for set-up	=	2 hrs/week

Cost details:

Cost of machine	=	Rs. 2,00,000
Repair and maintenance	=	Rs. 24,000 p.a.
Consumable stores	=	Rs. 30,000 p.a.
Rent, rates and taxes	=	Rs. 8,000 per quarter
Operator's wages	=	Rs. 3,000 p.m.
Supervisor's salary	=	Rs. 5,000 p.m.
Cost of power	=	15 units per hour at Rs. 3 per unit

Notes:

(i) Life of the machine is 10 years. Depreciation is provided on straight line basis and is treated as variable cost.
(ii) Repairs and maintenance and consumable stores are variable costs.
(iii) Power is consumed for production runs only and for set-up maintenance. But cost of power is to be borne by the total time excluding maintenance stoppages.
(iv) The supervisor is supervising work on five identical machines including the one now considered.

(b) The company hires out excess capacity in the machine shop for outside jobs. Assuming that hire charges are fixed at variable cost plus 20% what rate should be quoted by the company?

(ICWA Inter, June 1999)

Solution:

(a) Computation of Machine Hour Rate

Particulars	*Amount p.a. Rs.*	*Amount per quarter Rs.*	*Total per quarter Rs.*
Machine Expenses			
Repairs and Maintenance	24,000	6,000	
Consumable Stores	30,000	7,500	
Depreciation (Rs. 2,00,000 × 1/10)	20,000	5,000	

(*Contd.*)

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(*Contd.*)

Particulars	*Amount p.a. Rs.*	*Amount per quarter Rs.*	*Total per quarter Rs.*
Power			
15 Units @ Rs. 3 for 600 hours (for a quarter)		27,000	45,500
Standing Charges:			
Rent, Rates and Taxes (@ Rs. 8,000 per quarter)		8,000	
Operator's Wages (@ Rs. 3,000 p.m.)		9,000	
Supervisor's Salary (1/5 of Rs. 5,000 p.m. or Rs. 1,000 p.m.)		3,000	20,000
Total Cost			65,500
Total Machine Hours for a quarter			600
Machine Hour Rate			= Rs. 65,500 / 600 = 109.16

Working Notes:

1. Total Effective Machine Hrs. in a quarter = 13 × 48 = 624
   Less: Maintenance Stoppage = 8 × 3 = 24
   600
2. Power is being consumed during set-up also. Hence, power has been assumed for 600 hours.
3. Set up time has been taken as productive time.

(b) *Computation of Rate to be quoted*

Variable Cost per hour	=Rs. 45,500/600 hrs	= Rs. 75.83
Add: 20% Margin		= Rs. 15.17
		Rs. 91.00

Example 6.19

A machine was purchased on 1st January 1998 for Rs. 5 lakhs. The total cost of all machinery inclusive of the new machine was Rs. 75 lakhs. The following further particulars are available:

Expected life of the machine 10 years.
Scrap value at the end of 10 years Rs 5,000.
Repairs and Maintenance for the machine during the year Rs. 2,000.
Expected number of working hours of the machine per year 4,000 hours.
Insurance premium annually for all machines Rs. 4,500.
Power consumption for the machine per hour @ 75 paise per unit – 25 units.
Area occupied by the machine 100 sq. ft.
Area occupied by other machines 1,500 sq. ft.

Rent per month of the department Rs. 800.
Lighting charges for 20 points for the whole department out of which three points are for the new machine—Rs. 120 per month.
Compute the machine hour rate for the new machine.

(B. Com. (Hons), Delhi 1999)

Solution:

Computation of Machine Hour Rate

Standing Charges	*Rs. per annum*	*Re per hour*
Insurance (WN 2)	300	
Repairs & Maintenance	2,000	
Rent (WN 3)	600	
Light Charges	216	
	3,116	
Hourly. Rate of Standing Charges	3,116/4,000 hrs	0.779
Machine Expenses		
Depreciation (WN 1)*		12.375
Electricity Consumption: 25 units per hour @ Re 0.75 per unit		18.750
Machine Hour Rate		31.904

* Depreciation may also be taken as a standing charge.

Woring Notes:

1. *Depreciation of machine*

	Rs.
Cost of New Machine	5,00,000
Less: Scrap Value	5,000
Net Cost of the Machine	4,95,000
Life of the Machine	10 years

Depreciation per hour: $\frac{4,95,000}{10\ \text{Year} \times 4,000} = \text{Rs. } 12.375$

2. *Insurance for the Machine*

Total cost of all Machines	Rs. 75,00,000
Total insurance premium paid for all machines	Rs. 4,500

Total annual insurance premium of the new machine: $\frac{4,500 \times 5,00,000}{75,00,000} = \text{Rs. } 300$

3. *Rent for the Machine*

Rent paid per annum	Rs. 9,600
Total area occupied	1600 sq. ft.

Rent for the area occupied by the machine (100 sq. ft.) $\frac{9,600 \times 100}{1,600} = \text{Rs. } 600$

4. *Lighting Charges for the Machine*

Total annual lighting charges of 20 points for the whole department Rs. 1,440

Lighting charges of the machine p.a.: $\frac{\text{Rs. } 1,440 \times 3\ \text{points}}{20\ \text{points}} = \text{Rs. } 216$

7 ADMINISTRATIVE AND SELLING AND DISTRIBUTION OVERHEADS

Learning Objectives:

After reading this chapter, you should be able to:

1. describe administrative overheads—meaning, items and distribution;
2. describe selling and distribution overheads—meaning, items and apportionment; and
3. explain the treatment of some items of expenses such as interest on capital, depreciation.

The previous Chapter 6 has discussed factory overhead and its distribution among products and jobs. This chapter focuses on administrative overheads, selling and distribution overheads and treatment of some items of expenses in cost accounting.

ADMINISTRATIVE OVERHEADS

Administrative overheads are those expenses which are incurred for formulating the policy, directing the organisation and controlling the operations of an undertaking. In other words, administrative overheads are incurred for general management and control of the organisation. Administrative overheads include the following items of overheads:

A. *Indirect material:*

1. Printing and stationery used in the office.
2. Cost of brushes, dusters and other office supplies.

B. *Indirect labour*

1. Salaries, allowances, fees of board of directors, managing director, chairman, board staff, cost accountant, accounts manager and his staff, secretary and his staff, treasurer and his staff.
2. Salaries, allowances, fees of legal adviser and his staff, public relations officer and his staff, remuneration of internal auditors and statutory auditors.

C. *Indirect expenses:*

1. Office rent, rates and insurance
2. Office lighting, heating and cleaning
3. Depreciation and repairs of office buildings, furniture and fittings
4. Legal charges

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5. Bank charges
6. Trade subscriptions and donations
7. Miscellaneous office expenses

There is lesser fluctuations in the amounts of administrative overheads as compared to factory overheads which may change largely in relation to changes in output.

Distribution of Administrative Overheads

The method of distributing administrative overheads is more or less the same as in the case of factory overheads. All items of administrative overheads are collected and grouped under proper classification heads. The overheads are then apportioned among the various administrative departments (cost centres). Some examples of administrative departments are office department, accounts department, personnel department, secretarial department, law department. Those administrative overheads which can be identified with specific departments are directly allocated to them. The remaining administrative overheads are apportioned among those administrative departments for which they have been incurred, on an equitable basis.

A single rate for the total administrative overheads may be obtained without going into details of these overheads incurred for various departments. The Administrative Overhead Rate may be computed using any one of the following bases:

(1) As a percentage of Factory Cost: $\frac{\text{Total Administrative Overhead}}{\text{Total Factory Cost}} \times 100$

(2) As a percentage of Factory Overheads: $\frac{\text{Total Administrative Overhead}}{\text{Total Factory Overhead}} \times 100$

(3) As a percentage of Sales: $\frac{\text{Total Administrative Overhead}}{\text{Total Sales}} \times 100$

(4) As a percentage of Gross Profit: $\frac{\text{Total Administrative Overhead}}{\text{Gross Profit}} \times 100$

(5) As a percentage of Conversion Costs: $\frac{\text{Total Administrative Overhead}}{\text{Total Conversion Costs}} \times 100$

Conversion cost include the cost of direct labour, direct expanses and factory overheads.

The above treatment, that is, calculating an administrative overhead rate for charging administrative overheads, is based on the assumption that administrative overheads are an additional and separate element of cost of a product or job.

Besides the above treatment, the following two procedures are also suggested to deal with the administrative overheads:

1. *Apportionment between production and selling divisions* Under this method administrative overheads are divided between production and selling divisions on some suitable basis. After such distribution, administrative overheads lose their identity. This method follows the logic that an organisation has only two functions to perform, namely production and selling.
2. *Transfer to costing profit and loss account* Under this method, administrative overheads are transferred to Costing Profit and Loss Account. This method is based on the assumption that administrative overheads are not directly concerned with the production function of the organisation and therefore should not be included in the cost of production. This method reduces the cost of product or job.

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SELLING AND DISTRIBUTION OVERHEADS

Selling overheads include the costs incurred in promoting sales and retaining customers. Distribution overheads include the costs of the process which begins with making the packed product available for despatch and ends with making the reconditioned returned empty packages available for reuse. Distribution overheads strictly begin when an order has been obtained and generally ends when goods are to be despatched.

Broadly, selling overheads include the following items.

(a) *Indirect materials* They include cost of printing and stationery, mailing literature, catalogue, price lists etc.

(b) *Indirect labour* This includes salaries, commission, allowances etc. of salesman, representative, sales manager, marketing manager etc.

(c) *Indirect expenses* Advertising, bad debts, rent of showroom, insurance of showroom, collection charges, travelling and entertainment expenses, expenses of branch establishment, sales office expenses, fees of directors who devote time to sales function, are some examples of indirect expenses.

Broadly, distribution overheads include the following items:

(a) *Indirect materials* Cost of packing cases; oil, grease, spare parts used in maintenance of delivery vehicles.

(b) *Indirect labour* Wages of packers, van drivers, despatch clerks, etc.

(c) *Indirect expenses* Godown expenses including rent, insurance, freight, carriage outwards and other transport charges, depreciation and running expenses of delivery vans.

Apportionment of Selling and Distribution Overheads

Although, selling and distribution overheads differ in nature with each other, for the purpose of apportionment and absorption, both the overheads can be taken together. Selling and distribution overheads should be classified into two groups in order to charge them finally to products:

(a) *Direct overheads* Direct overheads are the overheads which can be directly indentified with a particular product or products. For example, sales promotion expenses or transport charges incurred for a product should be charged directly to that product only.

(b) *Indirect overheads* These are such selling and distribution overheads which can not be identified with particular product or products. Such indirect overheads are apportioned using the following steps:

(1) *Collection and classification of overheads*—All selling and distribution overheads should be collected and classified according to their nature into certain groups such as advertising, exhibition, bad debts, depreciation of vehicles used for sale, discount, freight, heating, insurance, lighting, packing, postage, commission, rent, repairs, etc.

(2) *Apportionment of overheads*—After collecting and classifying overheads, they should be further allocated to one or more cost centres or departments or functions to which they relate. If any item (items) of overheads cannot be totally transferred to a particular department or functions it should be apportioned among the departments or functions on an equitable basis for which they have been incurred. Some examples of apportionment of overheads in terms of functions (or departments) are the following:

(i) *Direct selling*—This includes overheads such as expenses incurred on sales executive, sales staff, sales office expenses, etc.

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(ii) *Advertisement and sales promotion*—This includes expenses incurred on exhibition, posters, cinema slides, distribution of samples, etc.

(iii) *Credit and collection*—This includes costs incurred on debt collection, bad debts, legal costs.

(iv) *Transportation*—Costs such as insurance for goods in transit, demurrage, maintenance staff, depreciation of transport vehicles are included in this group.

(v) *Warehousing and storage costs*—This includes expenses incurred on secondary packing for storage, warehouse rent, internal transport, insurance, etc.

(vi) *General administration*—This includes costs such as royalty on sales, sales invoicing, maintenance of accounts, cost of investment in stocks.

The above costs which belong to different cost centres are subsequently apportioned to various areas or territories or zones on an equitable basis as shown in Fig. 7.1.

Function	*Basis of apportionment*	*Total Rs.*	*Territories*			
			I East zone	*II West zone*	*III North zone*	*IV South zone*
1. Direct selling	Allocation					
2. Advertising and sales promotion	Sales value					
3. Credit & Collection	No. of orders or Cash collected					
4. Transportation	Sales value					
5. Warehousing	Sales value					
6. General administration	No. of orders or No. of invoices or Sales value					

Fig. 7.1

(3) *Absorption of overheads* After apportionment of overheads, selling and distribution overheads of each territory, or zone or area are charged to different products sold in that area or territory on a suitable basis. This may be done by one or more of the following methods:

(i) *Rate per article*—If this method is adopted, the overhead costs are divided by the number of products sold in that territory during a certain period.

(ii) *A percentage of sales*—This is suitable for apportionment of direct selling costs, general administration, finance costs, etc. If selling overhead of a sales zone is Rs. 50,000 and the sales of that zone are Rs. 2,00,000, an addition should be made to the cost of products by 25% of the selling price of that product.

(iii) *A percentage of works cost*—Where selling overheads are small, this method can be adopted, even though various articles are produced, as little advantage would be gained by using a more complicated system.

(iv) A percentage of cash collected—This method may be used for apportionment of credit and collection costs such as bad debts, legal expenses, etc.

Example 7.1

Following data is available relating to a company for a certain month:

	Territory		
	I	*II*	*III*
Selling expenses	Rs. 7,600	Rs. 4,200	Rs. 6,240
Distribution costs	Rs. 4,000	Rs. 1,800	Rs. 2,000
No. of units sold	16,000	6,000	10,000
Sales	Rs. 76,000	Rs. 28,000	Rs. 52,000

The company adopts sales basis and quantity basis for application of selling and distribution costs, respectively. Compute (a) The territory-wise overhead recovery rates separately for selling and distribution costs, and (b) the amounts of selling and distribution costs chargeable to a consignment of 2,000 units of a product, sold in each territory at Rs. 4.50 per unit. *(ICWA Inter)*

Solution:

(a) Computation of Overhead Recovery Rates

1. Selling Cost Recovery Rate $= \dfrac{\text{Selling Expenses}}{\text{Sales}} \times 100$

2. Distribution Cost Recovery Rate $= \dfrac{\text{Distribution Costs}}{\text{No. of Units Sold}}$

Territory	*Selling Cost Recovery Rate*	*Distribution Cost Recovery Rate*
I	$\dfrac{\text{Rs. } 7,600}{\text{Rs. } 76,000} \times 100 = 10\%$ on sales	Rs. $\dfrac{4,000}{16,000} = 25$ paise per unit
II	$\dfrac{\text{Rs. } 4,200}{\text{Rs. } 28,000} \times 100 = 15\%$ on sales	Rs. $\dfrac{1,800}{6,000} = 30$ paise per unit
III	$\dfrac{\text{Rs. } 6,240}{\text{Rs. } 52,000} \times 100 = 12\%$ on sales	Rs. $\dfrac{2,000}{10,000} = 20$ paise per unit

(b) Computation of Selling and Distribution Costs Chargeable to Consignment

Territory	*I*	*II*	*III*
No. of units sold	2,000	2,000	2,000
Sales at Rs. 4.50 per unit	9,000	Rs. 9,000	Rs. 9,000
Selling cost chargeable	900.00	Rs. 1,350.00	Rs. 1,080.00
Distribution cost chargeable	500.00	Rs. 600.00	Rs. 400.00
Total	Rs. 1,400.00	Rs. 1,950.00	Rs. 1,480.00

Example 7.2

XYZ Ltd. a manufacturing company, having an extensive marketing network throughout the country, sells its products throughout four zonal sales offices, viz. *A*, *B*, *C*, and *D*. The budgeted expenditure for January 2008 are given below:

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			Rs.
Sales Manager's salary			1,20,000
Expenses relating to Sales Manager's office			80,000
Travelling salesman's salaries			3,20,000
Travelling expenses			36,000
Advertisements			30,000
Godown Rent: Zone	*A*	15,000	
	B	25,200	
	C	9,800	
	D	18,000	68,000
Insurance on inventories			20,000
Commission on sales @ 5% on Sales			6,00,000

The following further particulars are also available:

Zone	*Sales in Rs. lakhs*	*No. of salesmen*	*Total mileage covered*	*Allocation of advertisement*	*Average stock in Rs. lakhs*
A	36	5	6,000	30%	6
B	48	6	14,000	30%	8
C	16	2	4,500	20%	4
D	20	3	5,500	20%	2

Based on the above details, compute zonewise selling overheads, as a percentage to sales.

(ICWA Inter)

Solution:

Books of XYZ Ltd.
Computation of Zonewise Selling Overhead Rates

Items of expense	*Basis of charge*	*Total Rs.*	*Zones*			
			A Rs.	*B* Rs.	*C* Rs.	*D* Rs.
Sales Manager's salary	Sales	1,20,000	36,000	48,000	16,000	20,000
Sales manager's office exp.	Sales	80,000	24,000	32,000	10,667	13,333
Salesmen's salaries	No. of Salesmen	3,20,000	1,00,000	1,20,000	40,000	60,000
Travelling expenses	Mileage covered	36,000	7,200	16,800	5,400	6,600
Advertisement	Budgeted ratio	30,000	9,000	9,000	6,000	6,000
Godown rent	Actuals	68,000	15,000	25,200	9,800	18,000
Insurance	Average inventory	20,000	6,000	8,000	4,000	2,000
Commission on sales	Sales	6,00,000	1,80,000	2,40,000	80,000	1,00,000
Total overheads		12,74,400	3,77,200	4,99,000	1,71,867	2,25,933
Amount of sales		1,20,00,000	36,00,000	48,00,000	16,00,000	20,00,000
Overheads as a percentage of sales = $\frac{\text{Overhead}}{\text{Sales}} \times 100$		10.62%	10.48%	10.40%	10.74%	11.30%

Example 7.3

The *XYZ* Co. operates a standard cost system in connection with its manufacturing operations. It produces products *A*, *B* and *C* whose standard manufacturing costs per unit are as follows:

	A	*B*	*C*
	Rs.	Rs.	Rs.
Fixed	1.00	0.50	2.00
Variable	1.00	2.50	1.00
Total	2.00	3.00	3.00

The company's selling and distribution costs are high and the company's profit have been declining. Selling and distribution costs for the period just ended are summarised below:

	Rs.
Advertising	4,000
Direct selling	12,000
General office expenses (related to sales)	3,480
Ordering and billing	2,450
Packing	3,600
Storage	5,060
	30,590

Additional data concerning the company's operations are:

	A	*B*	*C*
Advertising space	30%	40%	30%
Average time in storage	10 days	20 days	12 days
No. of invoice line	80	40	160
Sales volume	Rs. 24,000	18,000	18,000
Space occupied per unit of product	1 cu. ft	2 cu. ft	1/2 cu. ft
Salesmen's time	40%	30%	30%
Time required for packing		3/4 *A*	1/4 *A*
Units sold	4000	2000	2000

You are required to:

(a) Prepare an analysis of selling and distribution cost by Products *A*, *B* and *C*.

(b) Prepare an income statement for each product based on standard manufacturing costs and the analysis just completed. *(ICWA Inter)*

Solution:

(a) Statement of Analysis of Selling and Distribution Costs

Particulars	*Basis of apportionment*	*Total* Rs.	*A* Rs.	*B* Rs.	*C* Rs.
Advertising	As per % given in the question	4,000	1,200	1,600	1,200
Direct selling	Salesmen's time	12,000	4,800	3,600	3,600
General office exp.	Sales	3,480	1,392	1,044	1,044
Ordering and billing	No. of invoice lines	2,450	700	350	1,400
Packing	Composite ratio of				

(*Contd.*)

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Particulars	*Basis of apportionment*	*Total* Rs.	*A* Rs.	*B* Rs.	*C* Rs.
	space occupied × units sold × Time required for Packing 4000 : 3000 : 250	3,600	1,986	1,490	124
Storage	See note below	5,060	1,533	3,067	460
Total		30,590	11,611	11,151	7,828

Note: Storage :
Time × space × units sold
A 10 × 1 × 4000 = 40,000
B 20 × 2 × 2000 = 80,000
C 12 × 1/2 × 2000 = 12,000, that is, 40: 80: 12 ratio

(b) Income Statement

Particulars	*A* Rs.	*B* Rs.	*C* Rs.	*Total* Rs.
Units sold	4,000	2,000	2,000	8,000
A. Sales	24,000	18,000	18,000	60,000
B. Manufacturing Cost:				
Fixed	4,000	1,000	4,000	9,000
Variable	4,000	5,000	2,000	11,000
Total: B	8,000	6,000	6,000	20,000
C. Gross profit (A–B)	16,000	12,000	12,000	40,000
D. *Less:* Selling & Distribution cost	11,611	11,151	7,828	30,590
E. Income	4,389	849	4,172	9,410

Example 7.4

A company manufacturing a sole product sells it through three salesmen, *A*, *B* and *C* stationed in three regions. Besides, sales are also effected through a sales depot situated at the company's headquarters. The following information is obtained from the books of the company for December 2007.

Sales	Rs. 4	lakhs
Cost of sales	2.50	lakhs
Gross profit	1.50	lakhs, 37.5% of sales
Selling expenses:		
Salesmen's salaries	Rs. 3,500	
Commission	22,000	
Travelling expenses	9,000	
Advertisement expenses	60,000	
Other selling expenses	35,500	
	Rs. 1,30,000	
Net profit	Rs. 20,000,	5% of sales

The management is not satisfied with the net profit and asks you to investigate. You find that salesman *B* and *C* are paid salaries at Rs. 1,500 and Rs. 2,000 per month respectively besides a commission of 5% on

sales. The salesman, *A*, however, receives a commission of 10% on sales but no salary. Travelling expenses paid were Rs. 2,000, Rs. 4,000 and Rs. 3,000 respectively for *A*, *B* and *C*. Advertising expenses were apportioned equally to *A*, *B* and *C*, after deducting a sum of Rs. 3,000 spent in headquarters. Other selling expenses for headquarters amounted to Rs. 17,500, the rest being apportioned to *A*, *B* and *C*, on the basis of sales. The break-up of the sales was as follows:

Headquarters		Rs. 40,000
Salesman	*A*	80,000
	B	1,20,000
	C	1,60,000

Prepare a statement showing the individual profit or loss from each salesman. Comment on the results indicating your suggestions for improving the position. *(ICWA Inter)*

Solution:

Statement of Profit and Loss

Items	*Total*	*Headquarters*	*Salesman*		
			A	*B*	*C*
Sales	Rs. 4,00,000	Rs. 40,000	Rs. 80,000	Rs. 1,20,000	Rs. 1,60,000
Less: Cost of sales (62.5% of sales)	2,50,000	25,000	50,000	75,000	1,00,00
Gross Profit	1,50,000	15,000	30,000	45,000	60,000
Salaries	3,500	—	—	1,500	2,000
Commission	22,000	—	8,000	6,000	8,000
Travelling	9,000	—	2,000	4,000	3,000
Advertising	60,000	3,000	19,000	19,000	19,000
Other selling expenses	35,500	17,500	4,000	6,000	8,000
	1,30,000	20,500	33,000	36,500	40,000
Net Profit	20,000	– 5,500	– 3,000	8,500	20,000

According to the statement, the headquarters and the salesman *A* are showing a net loss of Rs. 5,500 and Rs. 3,000 respectively. In the case of headquarters, for a gross profit of Rs. 15,000 the selling expenses are Rs. 20,500, besides the sales being only Rs. 40,000. In spite of Rs. 19,000 being spent on advertisement, the sales of the salesman A are only Rs. 80,000. The existing state of affairs at the headquarters may be corrected by cutting down selling costs or stopping it from selling anything at all. In the case of the salesman *A*, attempt should be made to push up or change the salesman himself. If possible, the sales territory in charge of *A* may be closed down and attempts may be made to push up the sales of the other two territories.

Example 7.5

A company is supplying its products to the ultimate consumers through the wholesalers to retailers. The Managing Director thinks that if they sell through the retailers or to the consumers direct, they can increase their sales, earn better prices, and make more profit. As a cost accountant of the company, you are required to advise the Managing Director in selecting the channels of distribution from the following information:

Channels of distribution	*1*	*2*	*3*
	To consumer direct	*To retailer direct*	*To wholesaler*
Sale price per unit (Rs.)	9.50	8.50	7.25
Estimated sales per year (Nos.)	6,00,000	5,70,000	5,40,000

(*Contd.*)

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Selling and distribution cost per unit (Rs.)	3	1.60	0.90

Cost of product:
Variable cost @ Rs. 4 per unit
Fixed cost Rs. 5,00,000
In selecting the channels of distribution, what factor besides cost would you consider?

Solution:

Profit and Loss Statement

	Channels of Distribution		
	1 *To consumer*	*2* *To retailer*	*3* *To wholesaler*
Cost of production:	Rs.	Rs.	Rs.
Variable	4.00	4.00	4.00
Fixed	0.83	0.88	0.93
	4.83	4.88	4.93
Selling and distribution cost:	3.00	1.60	0.90
Cost of sales	7.83	6.48	5.83
Sales	9.50	8.50	7.25
Net profit	1.67	2.02	1.42

Channel 2 gives the highest profit. In selecting the channels, besides cost, factors such as, the nature of the product, the demand for it, the type of customers and the possibility for expansion, etc. should also be considered.

Example 7.6

A company is making a study of the relative profitability of the two products—*A* and *B*. In addition to direct costs, indirect selling and distribution costs to be allocated between the two products are as under:

Particulars	*Rs*
Insurance Charges for Inventory (finished)	78,000
Storage Costs	1,40,000
Packing and Forwarding Charges	7,20,000
Salesman Salaries	8,50,000
Invoicing Costs	4,50,000

Other details are:

Particulars		*Product A*	*Product B*
Selling Price per unit	(Rs.)	500	1,000
Cost per unit (exclusive of indirect selling and Distribution Costs)	(Rs.)	300	600
Annual Sales in units		10,000	8,000
Average Inventory	(Units)	1,000	800
Number of Invoices		2,500	2,000

One unit of product *A* requires a storage space twice as much as product *B*. The cost of packing and forwarding one unit is the same for both the products. Salesmen are paid salary plus commission @ 5% on sales and equal amount of efforts are put forth on the sales of each of the products.

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Required:

(i) Set up a schedule showing the apportionment of the indirect selling and distribution costs between the two products.

(ii) Prepare a statement showing the relative profitability of the two products.

(CA Inter, May 1996)

Solution:

(i) Statement of Apportionment of Indirect Selling and Distribution Costs

Items	*Basis of Apportionment*	*Total*	*Products*	
			A	*B*
		Rs.	*Rs.*	*Rs.*
Insurance Charges	Average Inventory Value (1,000 × Rs. 500) : (800 × Rs. 100)	78,000	30,000	48,000
Storage Cost	Average Inventory Storage Space (1000 × 2) : (800 × 1)	1,40,000	1,00,000	40,000
Packing & Forwarding Charges	Annual Sales in units (10 : 8)	7,20,000	4,00,000	3,20,000
Salesmen Salaries	Efforts of Salesmen (1 : 1)	8,50,000	4,25,000	4,25,000
Salesmen Commission	(Annual Sales Value) (5 : 8)	6,50,000	2,50,000	4,00,000
Invoicing Costs	No. of Invoices (25 : 20)	4,50,000	2,50,000	2,00,000
		28,88,000	14,55,000	14,33,000

(ii) Statement Showing the Relative Profitability of the Products

Products	*A*	*B*
	Rs.	*Rs.*
Annual Sales Value	50,00,000 (10,000 units × Rs. 500)	80,00,000 (8,000 units × Rs. 1,000)
Less: Cost of Sales	30,00,000 (10,000 units × Rs. 300)	48,00,000 (8,000 units × Rs. 600)
Gross Profit:	20,00,000	32,00,000
Less: Indirect Selling & Distribution Cost [*Refer to* (i) *above*]	14,55,000	14,33,000
Profit	5,45,000	17,67,000
Profitability as Percentage of Sales	10.9%	22.8%
	$\left(\frac{\text{Rs. } 5,45,000}{\text{Rs. } 50,00,000} \times 100\right)$	$\left(\frac{\text{Rs. } 17,67,000}{\text{Rs. } 80,00,000} \times 100\right)$

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TREATMENT OF SOME ITEMS OF EXPENSES

Interest on Capital

There is a difference of opinion as to whether interest on capital employed in manufacture should be treated as an item of cost.

The following arguments are advanced in support of treating interest as an item of costs:

1. Interest is the reward of capital just as wages are the reward of labour. Profit, in the true sense, cannot be computed without considering interest.
2. The comparison of operations, different processes, etc. without due consideration of the interest factor, may lead to unreliable conclusions.
3. Interest considers time factors as it is computed on the basis of time and time is regarded as an important factor in production.
4. The inclusion of interest is of particular importance where articles of different values are produced and the capital invested in each product line differs considerably.
5. The cost of carrying inventory cannot be determined without giving due recognition to the interest on capital employed in it.

The following arguments are against including interest in the cost accounts:

1. Cost accounting considers only actual expenditures and can include only interest paid.
2. The interest factor is in no way connected with cost of manufacture. Whatever may be the method of raising finances—owned capital, loans, debentures, etc. does not affect manufacturing cost. It only affects the profits of the period.
3. Inclusion of interest in product costing will inflate the values of inventory and work-in-progress and therefore will tend to increase the profit unreasonably.
4. Interest is calculated on capital and the term "capital" has many concepts such as total capital employed in business, both equity capital and borrowed capital.
5. A reliable and correct rate of interest is difficult to determine and is likely to be influenced by naked fluctuations.
6. The cost accounting and product costing systems get complicated unnecessarily by inclusion of interest on capital and financial statements also become misleading.

There is one point upon which opinion is not divided. If interest is to be considered at all, it must not be confined merely to such interest as may actually have been paid by the business. In other words, interest should be ignored entirely or else included in respect of the whole capital employed, whether such capital requires the payment of interest or not. Therefore, if it is decided to exclude interest from the cost accounts, interest which has been paid, must also be ignored.

Of late, cost accountants in India tend to agree that interest on capital or funds borrowed from outside and paid or to be paid in cash should be included in product cost. This has been supported on the grounds that it implies cash outflow and affects the operating results of a business firm. The Bureau of Industrial Costs and Prices in India includes actual interest on borrowed funds as an element of cost in cost price studies. However, the Bureau does not consider the notional type of interest (interest on owned capital) as an element of cost.

Depreciation

Depreciation is the diminution in the value of fixed assets due to use and/or the lapse of time. The following are the methods of depreciation.

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1. *Straight line method* This method provides for depreciation by means of equal periodic charges over the life of the asset. For example, suppose the cost of a plant is Rs. 1,00,000 and its life is 10 years. Then the charge of depreciation per annum will be Rs. 10,000.
2. *Diminishing balance method* This method tends to write-off higher amounts in the beginning and comparatively lower amounts in subsequent parts of the life of an asset. The amount of depreciation is calculated at a constant rate at the balance of the value of the asset after deducting the amounts of depreciation previously provided. For example, taking the above illustration, the amounts of depreciation at the rate of 10% p.a. would be Rs. 10,000 for the first year, Rs. 9,000 for the second year, Rs. 8,100 for the third year, and so on.
3. *Production unit method* This method charges the amount of depreciation by means of fixed rate per unit of production calculated by dividing the value of the asset by the estimated number of units to be produced during its life. The formula for calculating depreciation under this method is as follows:

$$\text{Depreciation (per unit)} = \frac{\text{Original cost-residual value}}{\text{Estimated output during its life}}$$

4. *Annuity method* This method assumes that the capital used in the purchase of plant should have earned interest if invested somewhere else. The amount of depreciation in this method is calculated by dividing the aggregate of the cost of the asset depreciated and interest at a given rate, at a constant rate, on the written down value of the asset.
5. *Sinking fund method* Under the annuity method, expected interest on the investment (equivalent to the cost of the asset) is assumed. However, no actual investment is made. But under the sinking fund method, the amount of depreciation written off every year is invested in some securities, which would accumulate at compound interest to provide, at the end of the life of the asset, a sum equal to its cost. This method provides for depreciation of fixed periodic charges.
6. *Endowment policy method* This method is similar to the sinking fund method. It provides for depreciation by means of fixed periodic charges equivalent to the premium on an endowment policy for the amount required to provide, at the end of the life of the asset, a sum equal to its cost. The amount of depreciation is equivalent to the premium payable on the policy.
7. *Production hour method* This method provides for depreciation by means of a fixed rate per hour of production by using the following formula:

$$\text{Depreciation (per unit)} = \frac{\text{Cost of the asset}}{\text{Estimated number of working hours of its life}}$$

8. *Sum-of-the year digits method* This method provides for depreciation by means of differing periodic rates computed according to the following formula. If n is the estimated life of the asset, the rate is calculated for each period as a fraction in which the denominator is always the sum of the series 1, 2, 3,…n and the numerator for the first period is n, for the second period is n–1, and so on.

Rent

The rent payable by a manufacturer or businessman who does not have his own building is undoubtedly an expense which must be charged to production. In many cases, however, the premises are owned by the businessman and no rent is paid. In such circumstances, a charge in lieu of rent should be made in the cost accounts in order that the true cost of production may be ascertained.

Capacity

The term "capacity" signifies volume capacity of a business enterprise. It can be measured in the following manner:

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1. *Maximum theoretical capacity* It is that capacity of a plant or department which will be achieved under 100% operating time. It assumes round-the-clock operation of all plants with no allowance for machine downtime, waits and delays or holidays. It cannot be achieved in reality.
2. *Practical capacity* The practical capacity of a plant is the theoretical maximum capacity less normal and unavoidable operating interruption, such as repairs, wait, breaks, machine failure, etc.
3. *Normal activity or capacity* Normal capacity involves consideration of both the ability to produce and the ability to sell. For this, a sales budget is prepared which determines normal activity. This is a long-term measure that represents the practical plant capacity less the estimated idle capacity.
4. *Expected activity or capacity* This capacity indicates the activity budgeted for the current year. It can be more or less than the normal activity level, but will never be more than the practical capacity. It is similar to normal capacity but for a short period of time.

The normal capacity concept is generally the most suitable for product cost determinations which further help in determining selling prices and valuation of inventories for purposes of financial statements. Expected capacity level tends to increase product unit costs when lower output than normal capacity output is achieved.

Idle Capacity

Idle capacity denotes that plant, machinery and equipments are available for manufacturing or other purposes, but are not being used totally. The Institute of Cost and Management Accountants (U.K.) defines idle capacity cost as "the cost of abnormal idleness of fixed assets or available services." Idle capacity is the difference between the normal capacity and capacity utilised based on expected sales. For example, if the normal capacity of a plant is to produce 50,000 units a month, but the plant is being used to manufacture only 40,000 units per month due to some reason (say, a low market demand of the product), then, in such a situation 10,000 units will be treated as the idle capacity of the plant. The idle capacity may arise due to lack of product demand, non-availability of raw materials, shortage of skilled labour, absenteeism, shortage of power, fuel or supplies, seasonal nature of the product, etc.

Idle capacity costs are mostly fixed in nature and are to be incurred because of unused capacity. Such costs consist of depreciation, maintenance, insurance premium, rent, property taxes, certain utilities, management and supervisory salaries and similar annual expenses. These costs remain unabsorbed or unrecovered due to under-utilisation of plant capacity. Idle capacity cost can be computed in the following manner:

$$\text{Idle capacity cost} = \text{Idle capacity} \times \frac{\text{Total overhead related to a plant}}{\text{Normal plant capacity}}$$

Idle capacity cost can be divided into normal and abnormal idle capacity cost. Under normal circumstances such as servicing of a machine, intermittent use of plant during the processing might cause idle capacity, such costs are treated as an overhead expense. If the idle capacity costs have occured due to abnormal circumstances such as lack of work or jobs, such costs would be transferred to the costing profit and loss account and hence would not be included in the factory overheads. If the idle capacity cost is due to seasonal normal factors, then the cost would be charged to units produced by inflating overhead rates.

Idle Facilities

In a firm, idle facilities may be caused due to not using the facilities provided by fixed assets (such as plant, equipment, building, space etc.) and service functions (such as personnel services, productions services, material services etc.). The term idle facility is therefore broader and includes many factors causing idle facility besides including the factors responsible for idle capacity. The term 'idle facility' is considered different from 'idle capacity' in the sense that the idle capacity generally refers to under utilisation of

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production or plant capacity and idle capacity costs are mostly fixed in nature and cannot be absorbed or recovered due to under-utilisation of plant capacity. If a part of total facilities is not being utilised due to any reason such as lack of power, lack of demand, non-availability of raw material, fuel etc., it is known as idle facilities. Idle facilities is different from idle time and in an organisation idle time may not be found although there exists idle facilities. The treatment of cost of idle facilities is similar to that of idle capacity cost.

Set-up Time

Often, machinery and support equipment must be adjusted before a particular operation or job can be started. The time involved in getting the equipment ready for production is usually traceable to a specific operation or job and therefore, would be regarded as part of the direct cost of the job. Alternatively, setting up cost can be normally treated as a factory overhead and charged to all products, jobs, etc.

Packing Expenses

In almost all business firms manufacturing some product, expenses are incurred on packing materials which are known as packing expenses. Packing materials usually include items such as wrapping paper, bags, boxes, wood, twine, hoops, iron, cartons, glue, etc.

Packing expenses are treated in cost accounts in the following manner:

1. Prime packing materials, i.e., materials which are necessary for the product are charged to the cost of the product as an element of prime cost, e.g., paper required for wrapping in the manufacture of cigarettes.
2. Secondary packing materials are needed while delivering/transporting the products and such expenses are treated as distribution overhead.
3. Special packing material expenses if required by the customer, are charged directly to the job or product.
4. Fancy packing expenses to attract customers are selling overhead.
5. The overhead costs of the packing department should be apportioned to different products on some suitable basis such as labour cost, sale value of the product, if they cannot be charged directly to the product.

Research and Development

The cost of research specifically undertaken for a job or product may be regarded as a direct cost of that job and charged thereto. If costs on research and development are incurred for the general advantage, they may be charged to production overhead. Research directed towards the improvement of methods and current products may be treated as production overhead and should be charged to production generally. But costs incurred for the search of new products, discovery or development of new methods, products or processes are not connected with current production and should be charged directly to the profit and loss account.

Bad Debts

From past experience, the average bad debts incurred may be determined. This figure should be expressed as a percentage of the credit sales of the business and the resulting figure included in the distribution overhead.

Catalogues and Price Lists

The production of catalogues is often costly and takes place at intervals of several years. For costing purposes the expenditure incurred including the cost of staff engaged in collecting the necessary information, is charged

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to a suspense account and a proportion of the costs is allocated to selling and distribution every year. In such a way, the full cost of the publication is recovered from sales by the time a new edition is brought out. In financial accounts the cost of catalogues is usually written off in the year in which it is incurred.

Tools

In most manufacturing concerns, tools are used in the manufacture of articles. Tools include drills, reamers, plugs and dies, go and no-go gauges and general cutting tools for lathes, milling machines, shapers and the like. The accounting treatment of tools is as follows:

1. Tools are treated as indirect materials if they are used for more than one product. The cost associated with such tools would be equitably apportioned among different products.
2. Sometimes tools are requisitioned and acquired for a specific job or product to ensure better quality and lowest cost for the product. When the expenditures can be measured and traced to the product which will receive the exclusive benefit from the use of tool, they are charged directly to the product. In such a case tools are treated as direct expense.
3. Tools received with machines and equipment are capitalised as capital expenditure but tools purchased subsequently are only revenue expenditures.
4. In computing the machine hour rate (for absorption of overhead) the cost of tools, depreciation, repair and maintenance are taken into account.

Patterns

Patterns are used in foundry work, where molten metal, usually cast iron, is poured into moulds. Patterns are generally permanent. Basically, there are two possibilities. First, a foundry may design its own product which may be useful to buyers. Second, the foundry (often) makes castings to a particular design of requirement for its customers. In both the cases, the cost of the patterns is treated as direct expenses like special tools.

Designs

In a company engaged in the manufacture of some complete articles, the design function includes the following functions:

1. Originating and developing new products.
2. Improving and developing the current product lines according to changes in technology and customer's habits.
3. Specifying and communicating the standards of quality.
4. Interpreting the product in the form of product specifications and/or materials and parts lists.
5. Preparing drawings and plans to define and interpret each component for manufacture.

The cost of a design may be charged totally to a specific order from a customer or alternatively, the cost of design may be apportioned over a number of years as part of research and development expenses. In this way it can be treated as a deferred revenue expenditure.

Blue Prints

A drawing office in a manufacturing company prepares drawings and blue prints with respect to products or customer's orders. Blue prints are copies of drawings prepared for immediate use. The following accounting treatments are in practice:

1. The cost of blue prints for immediate use is charged direct to the specific product or customer's order.

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2. The cost of drawings for specific products or jobs is charged directly to the specific products or jobs.
3. The cost of drawings for standard and regular products is depreciated over the period of their life and therefore only depreciated value is considered for the year ending.

Advertising

Normal advertising in trade journals, periodicals and newspapers, by posters, radio or television and the cost of publicity literature and samples are treated as selling and distribution overhead at the time they are incurred and apportioned over the various products. Expenditure on advertising of a more permanent nature without regard to any specific product or article such as extensive compaigning required to launch a new product must be considered as a whole and is apportioned in a more or less arbitrary manner. Alternatively, such advertising costs can be capitalised and written off over a short period of years in the profit and loss account. In such a case advertising depends upon policy and not upon output.

Royalties

Royalties of general nature may be treated as part of selling overhead but those paid for the use of patents or the right to market particular products are normally charged direct.

Example 7.7

Explain how to deal with the following in the cost accounts. Each answer should be in two or three sentences only, showing also the appropriate journal entry, wherever necessary:

(a) A shortage of 10 kg of a store item (book value Rs. 150) was noticed during physical verification. Investigations revealed that it was due to natural causes.
(b) An abnormal gain of Rs. 42,500 was noticed in process A of a chemical factory at the end of a month.
(c) A sum of Rs. 15,000 was realised by sale of saw dust and useless scantlings in a furniture-making business.
(d) In a factory, using historical cost system, there was a under-recovery of fixed factory overheads amounting to Rs. 24,000 at the end of the accounting period.
(e) A company spent Rs. 15 lakhs on advertisement in the national television network before launching a new product.
(f) A sum of Rs. 20,000 was incurred on printing and stationery in connection with the issue of non-convertible debentures by a company.
(g) A sum of Rs. 7,500 was paid as wages to workers in a factory when there was no work due to power failure.
(h) Overtime wages amounting to Rs. 500 was incurred to meet an urgent order of a customer who wanted the delivery date to be advanced. *(ICWA Inter, June 1996)*

Solution

The action to be taken is briefly explained below:

(a) The loss is due to natural causes, hence the loss incurred may be debited to "Factory Overhead" or "Stores Overheads" and credited to the "Stores Control Account". Simultaneously corrections may be carried out in the Bin Card and stores ledger.
(b) Abnormal Gain may be credited to costing profit and loss account and debited to process account.
(c) The amount should be credited to "Miscellaneous Income Account". It should not affect cost of the products.
(d) The amount under recovered as fixed overheads should be transferred by debiting the costing profit and loss account and crediting to overheads control account.

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(e) The impact of the advertisement cost on the sales for each year should be carefully estimated and only the proportionate amount of advertisement should be charged to costs each year. The balance should be treated as a deferred revenue expenditure.
(f) This item is of pure finance and therefore should not be included in cost account.
(g) The idle time wages, if abnormal, should be debited to costing profit and loss account direct, as an extra ordinary expense. In case the power failure is frequent and such costs are incurred often, it may be debited to idle time wages under "factory overheads" as a normal cost.
(h) The overtime wages have to be borne by the customer, since work is rushed at his specific request. The concerned job and WIP will be directly debited by crediting the wages control account.

THEORY QUESTIONS

1. Explain the nature of administrative overheads. How are they apportioned to products?
2. Discuss the methods of absorption of selling and distribution overheads.
(B.Com. (Hons), Delhi, 2007)
3. What problems are faced in applying administrative costs partly to the manufacturing and partly to the selling departments of a concern? How will you control administrative overhead of a concern?
(ICWA Inter)
4. Set out the main arguments for and against inclusion of interest on capital in cost accounts.
(B.Com. (Hons), Delhi, 2006)
5. How do you deal with the following in cost accounts:
(a) Advertising
(b) Research and development cost
(c) Bad debts
(d) Rent of factory buildings
6. "Interest is a factor which cannot be disregarded by management." Comment on this statement.
(ICWA)
7. The level of production activity fluctuates widely in your company from month to month. Because of this the incidence of depreciation on unit cost varies considerably. The management decides that you find out a suitable method to correct this. *(CA Inter Year)*
8. In a manufacturing company where costing is done with a view to fix prices, state whether and, if so, to what extent the following items are included in cost.
(i) Interest on borrowings
(ii) Bonus and gratuity
(iii) Depreciation on plant and machinery *(CA Inter)*
9. Discuss the treatment of the following items in cost accounts:
(i) Capacity cost
(ii) Set-up time
(iii) Packing expenses
(iv) Blue print and design

PROBLEMS

1. A company is producing three types of products, *A*, *B*, *C*. The sales territory of the company is divided into three areas, *X*, *Y* and *Z*. The estimated sales for the year are as under:

	Territories		
Product	*X* *(Rs.)*	*Y* *(Rs.)*	*Z* *(Rs.)*
A	50,000	20,000	—
B	30,000	—	80,000
C	—	70,000	40,000

Budgeted advertising cost is as under:

	Territories			*Total*
	X	*Y*	*Z*	*Rs.*
Local cost	3,200	4,500	4,200	11,900
General	—	—	—	5,800

You are required to find the advertising cost per cent on sales for each product and the territory showing how you will present the statement to management.

(ICWA, Inter)

Ans:

	Products		
	A	*B*	*C*
Advertising as a percentage of sales	6.28%	5.64%	6.45%

2. Domestic Ltd. makes three basic types of household products. Their production statistics for the past year is given as follows:

	Product-I	*Product-2*	*Product-3*
No. of units manufactured	1,20,000	80,000	60,000
Direct material cost (Rs.)	2,76,000	1,38,000	2,64,000
Direct labour cost (Rs.)	96,000	56,000	60,000
Manufacturing overhead (Rs.)	48,000	28,000	30,000
Total cost (Rs.)	4,20,000	2,20,000	3,54,000

The selling and the administration cost for the year were as follows:

	Rs.
Sales salaries	52,000
Sales commission	1,42,700
Advertising	28,400

(*Contd.*)

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Travel and entertainment	15,200
Delivery expenses	8,000
Sales office expenses	21,000
Office salaries	18,500
Office supplies used	3,200
Administration office expenses	6,100
	2,95,100

Products 1 and 2 were sold at 40% above manufactured cost, while product-3 was sold at 50% above its manufactured cost.

Domestic Ltd. has devoted a great deal of time and effort in developing sales of product-3. The management is now questioning the wisdom of this policy and has authorised a study of selling and administrative cost by product lines.

An analysis reveals the following:

		Product lines		
Cost	*Basis of allocation*	*1*	*2*	*3*
Sales salaries, travel and entertainment	Percentage of time devoted to each line	20	30	60
Advertising	Percentage basis	30	20	50
Sales commission	10% of net sales	—	—	—
Sales office expenses	No. of orders	150	30	120
Office salaries	No. of orders			
Office supplies used	No. of orders			
Administrative office expenses	No. of orders			
Delivery expenses	Weight-distance ratios	30	30	40

All products for the year was sold, with no inventory costs carried forward from the beginning of the year and no returns of sales by customers.

Required:

(i) Prepare a profit statement with all costs broken down according to product line.
(ii) Indicate which product line shows the higher rate of profit to sales and which the least.

(ICWA, Final)

Ans:

	Products		
	1	*2*	*3*
Profit (Rs)	60,440	30,800	46,660
Profit to sales ratio	10.28%	10%	8.79%

3. A match factory sells its goods in four district zones—South, North, East and West. You have been given the particulars for January 2008 in respect of each zone mentioned as follows:

Zones	*Net sales (in lakhs)*	*No. of salesmen*	*Average mileage covered*	*Advertising budget*	*Stock held in a time (in lakhs)*	*Transportation charges*
South	500	30	3,000	25%	2.00	25%
North	13.50	50	4,500	30%	5.00	50%
East	3.50	20	2,700	25%	1.50	15%
West	3.00	25	2,400	20%	1.50	10%

The following are the expenses of the previous month:

Sales manager and his establishment		Rs. 62,000
Travelling representatives' salaries		36,000
Travelling representatives' travelling allowance		12,000
Advertising		24,000
Godown rent at out-stations:	Rs.	
South zone	7,500	
North zone	10,500	
East zone	4,800	
West zone	3,600	26,400
Insurance on inventories at out-stations		12,200
Commission on sales @ 2 1/4%		62,500
Transportation charges outward		36,000
You are required to compute selling overhead rates as a percentage of sales.		2,71,100

Ans: Overhead as per cent of sales
South zone 12.2%, North zone 9.6%, East zone 12.2%, West zone 12.5%.

ACTIVITY-BASED COSTING (ABC)

8

Learning Objectives:

After reading this chapter, you should be able to:

1. explain Activity-Based Costing (ABC) — definition, its stages and flow of costs, its advantages and disadvantages and its utility in service organisations;
2. discuss the classification of activities in manufacturing organisations for ABC;
3. discuss the concepts of cost driver, target costing, Kaizen costing, Life cycle costing, Activity-based management (ABM) and the differences between traditional costing system and activity-based costing system.

MEANING OF ACTIVITY-BASED COSTING (ABC)

Activity-based Costing (ABC) is that costing in which costs are first traced to activities and then to products. The ABC is a costing system which focuses on activities performed to produce products. Activities become the focal points for cost accumulation. This costing system assumes that activities are responsible for the incurrence of costs and products create the demands for activities. Costs are charged to products based on individual product's use of each activity. In traditional product costing system, costs are, first, traced not to activities but to an organisational unit, such as department or plant and then to products. It means under both ABC and traditional costing system, the second and final stage consists of tracing costs to the product. By emphasing activities, ABC tries to ascertain the factors that cause each major activity, cost of such activities and the relationship between activities and products produced. The relationship between activities and products has been shown in the Figure 8.1.



Fig. 8.1 **ABC Process**

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STAGES AND FLOW OF COSTS IN ABC

There are two primary stages in ABC—first, tracing costs to activities; second, tracing activities to products. The different steps in the two stages of ABC are explained below:

Step 1 Identify the main activities in the organisation.
Examples include: materials handling, purchasing, receipt, despatch, maching, assembly and so on.

Step 2 Identify the factors which determine the costs of an activity. These are known as *cost drivers*.
Examples include: number of purchase orders, number of orders delivered, number of setups and so on.

Step 3 Collect the costs of each activity. These are known as cost pools and are directly equivalent to conventional cost centres.

Step 4 Charge support overheads to products on the basis of their usage of the activity, expressed in terms of the chosen cost driver(s). For example, if the total costs of purchasing were Rs. 2,00,000 and there were 1,000 Purchase orders (the chosen cost driver), products would be charged Rs. 200 per purchase order. Thus a batch generating 3 purchase orders would be charged 3 × Rs. 200 = Rs. 600 for Purchasing overheads.

COST DRIVERS

A cost driver is an activity which generates cost. A cost driver is a factor, such as the level of activity or volume, that casually affects costs (over a given time span). That is, a cause-and-effect relationship exists between a change in the level of activity or volume and a change in the level of the total costs of that cost object. Thus, cost drivers signify factors, forces or events that determine the costs of activities. Thus, the factors (costdrivers) that influence the cost of a particular activity should be identified. It should be understood that direct costs do not need cost drivers as they can be traced directly to a product. Direct costs are themselves cost drivers. However, all other factory or manufacturing costs need cost drivers. Cost drivers are the links and they can link a pool of costs in an activity centre to the product. Therefore, in order to trace overhead costs to products, appropriate cost drivers should be identified. Figure 8.2 gives examples of some cost drivers in activity based costing system.

In traditional product costing, the number of cost drivers used are few such as direct labour hours, machine hours, direct labour cost, units produced. But ABC may use a multitude of cost drivers that relate costs more closely to the resources consumed and activities occurring.

Costs that are fixed in the short run have no cost drivers in the short run but may have cost drivers in the long run. For instance, costs of testing personal computers (which comprise costs of testing department equipment and staff costs) may not change with changes in the volume of production. Therefore, these costs would be fixed in the short run. In the long run, however, an organisation may need to increase/decrease testing department's equipment and staff to the levels needed to support future production volumes. So, in the long-run, volume of production or activity becomes cost drivers of these testing and staff costs.

Classification of Activities in Manufacturing Organisations

In manufacturing organisations, activities are identified and classified into different categories or segments of the production process. The grouping of activities is preferably done using the different levels at which activities are performed. Broadly, activities are classified into one of four activity categories:

1. Unit level Activities.
2. Batch level Activities.

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Cost Drivers
1. Number of receiving orders for the receiving department.
2. Number of purchase orders for the cost of operating the purchase department.
3. Number of despatch orders for the despatch department.
4. Number of units.
5. Number of setups.
6. Amount of labour cost incurred.
7. Value of materials in a product.
8. Number of materials handling hours.
9. Number of inspections.
10. Number of schedule changes.
11. Number of parts received per month.
12. Number of machine hours used on a product.
13. Number of set up hours.
14. Number of direct labour hours.
15. Number of sub-assemblies.
16. Number of vendors.
17. Number of purchasing and ordering hours.
18. Number of units scrapped.
19. Number of labour transactions.
20. Number of parts.
21. Number of customer orders processed.
22. Number of employees.

Fig. 8.2 **Cost Drivers**

3. Product level Activities.
4. Facility-level Activities.

Unit level activities are those activities which are performed each time a unit is produced. They are repetitive activities. For example, direct labour hours, machine hours, power are used each time a unit is produced. Direct materials and direct labour activities are also unit level activities, although they are not overhead costs. Costs of unit level activities vary with the number of units produced.

Batch level activities are those activities which are performed each time a batch of goods or products is produced. The costs of batch level activities vary with the number of batches but are fixed with respect to the number of units in each batch. Machine setups, inspections, production scheduling, materials handling are examples of batch level activities which are related to batches but not to individual products.

Product level activities are those activities which are performed to support the production of each different type of product. Maintenance of equipment, engineering charges, testing routines, maintaining bills of materials, handling materials are some examples of batch-level activities.

Facility-level activities are those which are needed to sustain a factory's general manufacturing process. These activities are common to a variety of products and are most difficult to link to product specific activities. Examples of facility level activities are factory management, maintenance, security, plant depreciation.

In ABC system, facility level activities and costs are treated as period cost as they are found difficult to assign to different products. The costs associated with the first three categories—unit level, batch level, product level—are assigned to products, using cost drivers that reflect the cause and effect relationship between activity consumption and cost.

Several additional examples of the costs driven by activities at each above level are presented in Fig. 8.3.

Activity Level	*Reason for Activity*	*Examples of Activity Cost*
1. Unit level	Performed for each unit of product produced or sold	• Cost of raw materials • Cost of inserting a component • Utilities cost of operating equipment • Some costs of packaging • Sales commissions
2. Batch level	Performed for each batch of product produced or sold	• Cost of processing sales order • Cost of issuing and tracking work order • Cost of equipment setup • Cost of moving batch between workstations • Cost of inspection (assuming same number of units inspected in each batch)
3. Product level	Performed to support each different product that can be produced	• Cost of product development • Cost of product marketing such as advertising • Cost of specialised equipment • Cost of maintaining specialised equipment
4. Facility level	Performed to maintain general manufacturing capabilities	• Cost of maintaining general facilities such as buildings and grounds • Cost of nonspecialised equipment • Cost of maintaining nonspecialised equipment • Cost of real property taxes • Cost of general advertising • Cost of general administration such as the plant manager's salary

Fig. 8.3 **Activity Levels and Associated Activity costs**

Source: Wayne J. Morse, James R. Davis, Al. L. Hartgraves, Management accounting, A Strategic Approach, South Western College Publishing, 2000, p.54.

Comparing ABC with Traditional Costing System

In traditional costing system, overhead costs are assumed to be influenced by only units produced. It means, in traditional costing system, costs of batch level, product level and facility level activities are fixed costs, that is, costs of these do not vary as production volume changes. Unit-based cost systems apportion fixed overhead to individual products and variable overhead are directly assigned to products using the base of number of units produced.

When fixed overheads are apportioned on the basis of units made, as in traditional costing, such apportionment is likely to be arbitrary and also may not reflect activities and cost actually consumed by the products. ABC improves product costing procedure (as compared to traditional costing) because it recognises that many so-called fixed overhead costs vary in proportional to changes other than production units. It means, under ABC, the other two level activities—batch level and product level—are assumed to influence fixed overhead costs and batch level and product level, thus, are accepted as non unit-based cost drivers. By establishing the link between these cost drivers and fixed overhead costs, they are finally traced to individual products. Figure 8.4 presents an overview of product cost determination under traditional costing and ABC system.

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Traditional Costing and Activity-Based Costing System

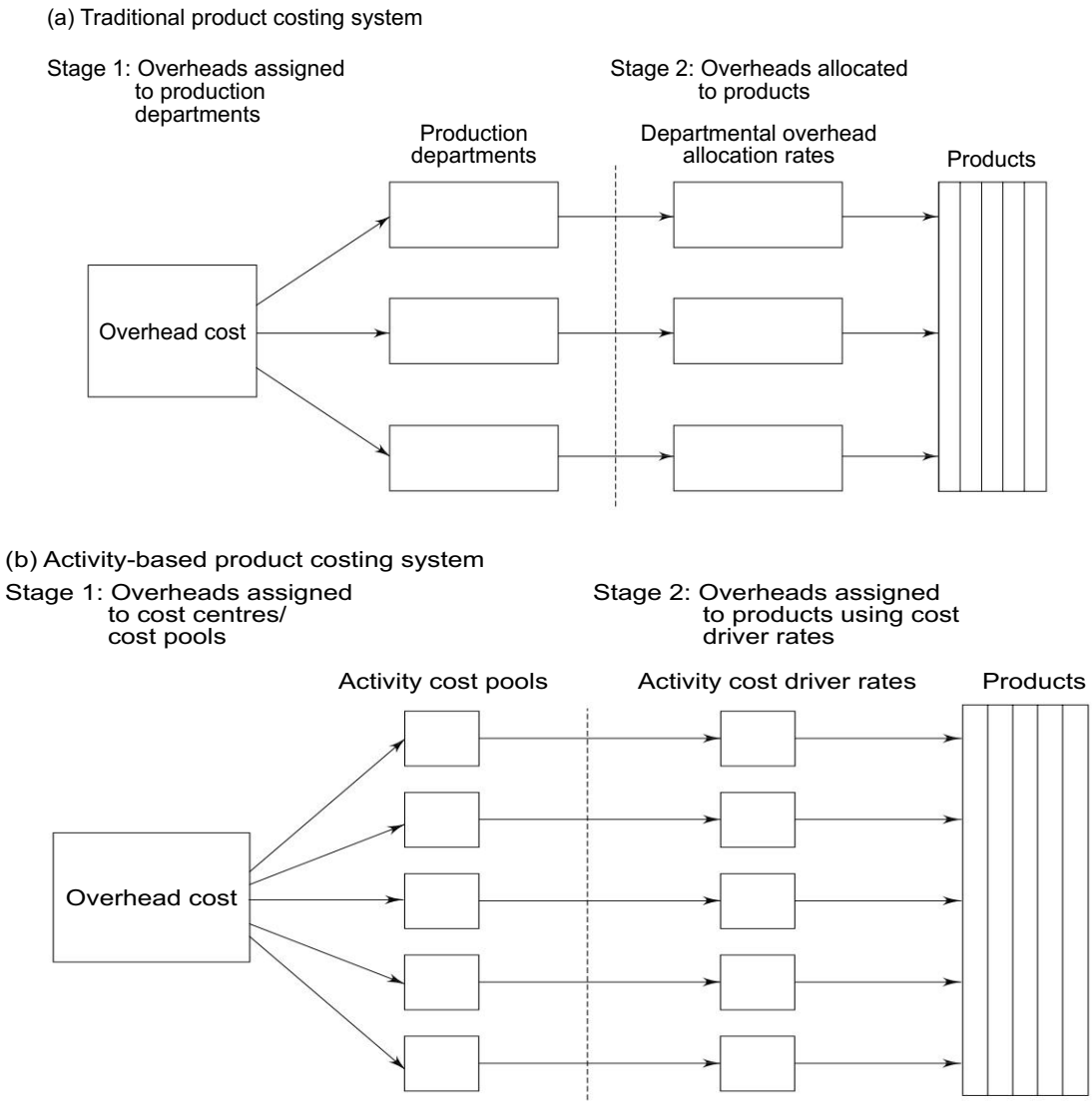


Fig. 8.4 **Comparison of Traditional and Activity-Based Costing System**

Source: J. Innes and F. Mitchell, *Activity-Based Costing: A Review with Case Studies*, 1990, CIMA, U.K.

Figure 8.4 displays that both the costing systems follow a two stage allocation procedure. In traditional costing, in the first stage, overhead costs are allocated to production departments. But in ABC, in the first stage, overhead costs are assigned to each major activity and not to departments. In traditional costing, overheads are pooled/collected department-wise. But, in ABC, many activity-based cost pools or cost centres

are created. In traditional costing, overhead costs of service departments are allocated/reapportioned to production department and therefore in this costing system finally only fewer cost pools exist. But ABC creates separate cost pools for service activities as well and overhead costs of these service activities (service departments) are assigned directly to specific products through applying cost driver rates. Thus, in ABC, there is no need to allocate/reapportion overheads of service departments.

The fundamental differences in the conventional and ABC cost system are summarised in Fig. 8.5.

	Traditional	*ABC*
• Cost pools	• One or a limited number	• Many, to reflect different activities
• Applied rate	• Volume-based, financial	• Activity-based, nonfinancial
• Suited for	• Labour-intensive, Low-overhead companies	• Capital-intensive, product-diverse, high-overhead companies
• Benefits	• Simple, inexpensive	• Accurate product costing, possible elimination of non-value-added activities

Fig. 8.5 Traditional and ABC System

Advantages of ABC

The following are the advantages of ABC.

1. ABC brings accuracy and reliability in product cost determination by focussing on cause and effect relationship in the cost incurrence. It recognises that it is activities which cause costs, not products and it is product which consume activities.
2. In advanced manufacturing environment and technology where support functions overheads constitute a large share of total costs, ABC provides more realistic product costs.
3. ABC identifies the real nature of cost behaviour and helps in reducing costs and identifying activities which do not add value to the product. With ABC, managers are able to control many fixed overhead costs by exercising more control over the activities which have caused these fixed overhead costs. This is possible since behaviour of many fixed overhead costs in relation to activities now become more visible and clear.
4. ABC uses multiple cost drivers, many of which are transaction based rather than product volume. Further, ABC is concerned with all activities within and beyond the factory to trace more overheads to the products.
5. ABC traces costs to areas of managerial responsibility, processes, customers, departments besides the product costs.
6. ABC improves greatly the manager's decision making as they can use more reliable product cost data. ABC helps usefully in fixing selling prices of products as more correct data of product cost is now readily available.
7. ABC produces reliable and correct product cost data in case of greater diversity among the products manufactured such as low-volume products, high-volume products. Traditional costing system is likely to bring errors and approximation in product cost determination due to using arbitrary apportionment and absorption methods.
8. ABC provides cost driver rates and information on transaction volumes which are very useful to management for cost management and performance appraisal of responsibility centres. Cost driver rates can be used advantageously for the design of new products or existing products as they indicate overhead costs that are likely to be applied in costing the product.

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Colin Drury[1] observes:

"ABC provides not only a base for calculating more accurate product costs but also a mechanism for managing costs. An ABC system focuses management attention on the underlying causes of costs. It assumes that resource-consuming activities cause costs and that products incur costs through the activities they require for designing, engineering, manufacturing, marketing, delivery, invoicing and servicing. By collecting and reporting on the significant activities in which a business engages, it is possible to understand and manage costs more effectively.

With an ABC system, costs are managed in the long run by controlling the activities that drive them. In other words, the aim is to manage the activities rather than costs. By managing the forces that cause the activities (that is, cost drivers), costs will be managed in the long-term. The application of activity-based systems may have the greatest potential for contributing to cost management, budgeting, control and performance evaluation."

Demerits of ABC

The following are the demerits of ABC.

1. ABC has numerous cost pools and multiple cost drivers and therefore can be more complex than traditional product costing systems.
2. Some difficulties emerge in the implementation of ABC system, such as selection of cost drivers, assignment of common costs, varying cost driver rates etc.
3. ABC has different levels of utility for different organisation such as large manufacturing firm can use it more usefully than the smaller firms. Also, it is likely that firms depending on cost-plus pricing can take advantages from ABC as it gives accurate product cost. But those firms who use market based prices may not favour ABC. The level of technology and manufacturing environment prevailing in different firms also affect the application of ABC.
4. It can prove costly to manage ABC system.

The decision to use ABC is comparing costs and benefits relating to this system. The advantages to a company of ABC system depends on many factors such as level of competition, number of products manufactured and product diversity. It can be claimed that those companies who operate in a more competitive environment, are in dire need of correct product cost data for taking sound decisions with regard to determination of selling prices and taking better cost management measures. Whether a company manufactures and sells smaller number or large number of products, it influences the operation of ABC system and the degree of sophistication in the system.

ABC in Service Organisations

The discussion of ABC so far has focussed on manufacturing companies where important cost components like direct material and direct labour can be traced to individual products. Therefore indirect costs are likely to be a much smaller proportional of total costs in such manufacturing companies. In service organisations, most of the costs are treated fixed and indirect, and therefore irrelevant for most decisions. No attempt is made to make profitability analysis in service organisations. There is a greater need of using ABC in service companies. Kaplan and Cooper[2] suggest that service companies are ideal candidates for ABC, even more than manufacturing companies. Earlier, service organisations were government-owned or operated in highly

1. Colin Drury, Management and Cost Accounting, Thomas Learning, 2000, p. 285.
2. R.S. Kaplan and R. Cooker, Cost and Effect: Using Integrated Systems to Drive Profitability and Performance, Harvard Business School, Press, 1998.

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regulated, protected and non-competitive environment. Thus, service organisations were not under any pressure to improve profitability by eliminating non-value added or non-profit activities. The prices of services were simply increased to cover cost increases. No efforts was made to design a cost system that accurately measures the costs and profitability of individual services.

However, due to privatisation, deregulation and increasing competition, the service organisations need to have cost and management accounting systems which can help them to accurately measure cost and resulting profitability for their services, customers and markets. Therefore, ABC would prove advantageous to service organisations to understand their cost base and to make decisions on value-added/non-value added activities.

TARGET COSTING

Target costing implies developing product cost in terms of what the market will pay for a product with specific characteristics.

Target costing is a systematic approach to establishing product cost goals based on market driven standards. It is a strategic management process for reducing costs at the early stages of product planning and design. Target costing begins with identifying customer needs and calculating an acceptable target sales price for the product. Working backward from the sales price, companies establish an acceptable target profit and calculate the target cost as follows:

Target Cost = Target Price—Target Profit

Target Costing is different from standard costing. While target costs are determined by market driven standards (target sales price—target profit = target cost), standard costs are determined by design—driven standards with less emphasis on what the market will pay (engineered costs + desired markup = desired sales price).

Since the early 1970s target costing has been used by some companies, especially Japanese companies which aim to ascertain cost in a different manner. Target costing is a common pratice where markets are extremely competitive. The market determines the price of products and there is a little opportunity for the individual organistions to set prices. Therefore, controlling cost is extremely important.

KAIZEN COSTING

Kaizen Costing, also referred as continuous improvement costing, is a mechanism for reducing and managing costs. Kaizen is the Japanese term for making continuous improvements in relatively small activities rather than major innovative improvement. The major difference between target and Kaizen costing is that target costing is applied during the design stage whereas Kaizen costing is applied during the manufacturing stage of the product life cycle.

The objective of Kaizen costing is to reduce actual costs to manufacture a product below the standard cost. Standard cost system generally aim to achieve the cost standards set by management while Kaizen costing systems are more concerned with reducing actual costs below standard costs. The potential cost reductions are smaller with Kaizen costing because the products are already in the manufacturing stage of their life cycles and a significant proportional of costs will have become locked-in.

Barfield, Raiborn and Kinney[3] have stated the following differences between target costing and Kaizen costing.

3. Jesset T. Barfield, Cecily A. Raiborn and Michael R. Kinney, *Cost Accounting, Traditions and Innovations*, 5th Ed; Thomson, 2003, p.721.

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	Target Costing	*Kaizen Costing*
What?	A procedural approach to determining a maximum allowable cost for an identifiable, proposed product assuming a given target profit margin	A mandate to reduce costs, increase product quality, and/or improve production processes through continuous improvement efforts
Used for?	New products	Existing products
When?	Development stage (includes design)	Primary production stages (introduction and growth; possibly, but not probably, maturity)
How?	Works best through aiming at a specified cost reduction objective; used to get original production standards	Works best through aiming at a specified cost reduction objective; reductions are integrated into original production standards to sustain improvements and provide new challenges
Why?	Extremely large potential for cost reduction because 80% to 90% of a product's lifelong costs are embedded in the product during the design and development stages	Limited potential for reducing cost of existing products, but may provide useful information for future target costing efforts
Focus?	All product inputs (material, labour, and overhead elements) as well as production processes and supplier components	Depends on where efforts will be most effective in reducing production costs; generally begins with the most costly component and (in the more mature companies) ends with overhead components

LIFE-CYCLE COSTING

Life-Cycle Costs are all the costs associated with the product for its entire life cycle. They include development (planning, design and testing), production (conversion activities), and logistics support (advertising, distribution, warranty and so on). Identifying costs during the different phases of a product's life cycle helps to develop understanding of costs and subsequently in managing the costs incurred throughout its life cycle. Life-cycle costs provide important information for pricing.

ACTIVITY-BASED MANAGEMENT (ABM)

As stated earlier in this chapter, Activity-Based Costing (ABC) is concerned with ascertainment of costs. In ABC, resources are assigned to activities based upon consumption and activities are assigned to cost objects (products, jobs, services) based on consumption. ABC assumes and gives due importance to causal relationship of cost drivers to activities.

Activity-based management (ABM) emphasises on management of activities with the objectives of improving the value received by the customer and the profit achieved by business enterprise by providing this value. It includes cost driver analysis, activity analysis and performance measurement and depends on ABC for its major source of data. Holst and Savage[4] observe:

"ABC is used to answer the question what do things cost? while ABM, employing a process view, is concerned with what factors cause costs to occur. Using ABC data, ABM focuses on how to redirect and improve the use of resources to increase the value created for customers and other stakeholders".

4. Randolf Holst and Robert J. Savage, Tools and Techniques for Implementing Activity-Based Management" in Steve Player et al (Eds.) Arthur Anderson's Global Lesions on Activity-Based Management, John Wiley and Sons, New York, 1999, p 4.

Through focusing on activity analysis, cost driver analysis and activity-based costing, ABM helps companies to produce more efficiently, determine costs more accurately and control and evaluate performance more effectively. ABM through activity analysis analyses activities, classifies them into value-added and non-value added activities and finally develops means and methods of minimising or eliminating non-value added activities.

Example 8.1

ABC manufacturing Co. has been using a cost system that allocates all factory overhead costs to products based on 350 per cent of direct labour cost. The company has just decided to use Activity-Based Cost System (*ABC*) that traces indirect costs to products based on consumption of major activities as indicated below.

Activity	*Annual cost driver quantity*	*Cost (Rs.)*	*Product' cost Driver consumption*
Labour	Rs. 3,00,000	30,000	Rs. 10,000
Machining	20,000 hours	5,00,000	800 hours
Setup	10,000 hours	1,00,000	100 hours
Production order	2000 orders	2,00,000	12 orders
Material handling	1000 requisitions	20,000	5 requisitions
Parts administration	12,000 parts	4,80,000	18 parts

Required:

Compare the total annual costs of the product using both the traditional volume-based and new ABC system.

Solution:

Cost system	*Pool rate*	*Cost driver Consumption*	*Cost Assignment (Rs.)*
Traditional cost system	*350%*	*Rs. 10,000*	*Rs. 35,000*
ABC System:			
(i) Labour	10%	Rs. 10,000	Rs. 1,000
(ii) Machining	Rs. 25 per hour	800 hours	20,000
(iii) Set up	Rs. 10 per hour	100 hours	1,000
(iv) Production order	Rs. 100 per order	12 orders	1200
(v) Material handling	Rs. 20 per requisition	5 requisitions	100
(vi) Parts administration	Rs. 40 per part	18 parts	720
			Rs. 24,020

Conclusion: The total cost of product under ABC is Rs. 24,020 whereas under traditional cost system it is Rs. 35,000.

Example 8.2

ABC manufacturing company has three accounts clerks responsible for processing purchase invoices. Each clerk is paid a salary of Rs. 3,00,000 p.a. and is capable of processing 5000 invoices per year (working efficiently). In addition to the salary, the company spends Rs. 90,000 per year for forms, postage etc. (assuming that 15,000 invoices are processed). During the year, 12,500 invoices were processed.

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Required:

1. Calculate the activity rate for the purchase order activity. Break the activity into fixed and variable components.
2. Compute the total activity availability and break this into activity usage and unused activity.
3. Calculate the total cost of resources supplied and break this into activity usage and unused activity.

Solution:

1. Activity Rate = [(3 × Rs. 3,00,000) + Rs. 90,000]/15,000
   = Rs. 66 per invoice
   Fixed activity rate = Rs. 9,00,000/15,000
   = Rs. 60 per invoice
   Variable activity rate = Rs. 90,000/15,000
   = Rs. 6 per invoice
2. Activity availability = Activity usage + Unused activity
   15000 invoices = 12,500 invoices + 2500 invoices
3. Cost of resources supplied = Cost of activity used + Cost of unused activity
   Rs. 9,00,000 + (Rs. 6 × 12,500) = (Rs. 66 × 12,500) + (Rs. 60 × 2500)
   Rs. 9,75,000 = Rs. 8,25,000 + 1,50,000

Example 8.3

A company manufacturing two products furnishes the following data for a year:

Product	*Annual output (units)*	*Total machine hours*	*Total number of purchase orders*	*Total number of set-ups*
A	5,000	20,000	160	20
B	60,000	1,20,000	384	44

The annual overheads are as under:

	Rs.
Volume related activity costs:	5,50,000
Set-up related costs	8,20,000
Purchase related costs	6,18,000

You are required to calculate the cost per unit of each product *A* and *B* based on:

(a) Traditional method of charging overheads.
(b) Activity based costing method*(B.Com.(Hons), Delhi, 2006, CA, PE, Exam II, Group II, Nov. 2002)*

Solution:

(a) Traditional method of charging overheads:

	Rs.
Volume related activity costs	5,50,000
Set-up related sots	8,20,000
Purchase related costs	6,18,000
Total costs	Rs. 19,88,000
Total machine hours (20,000 + 1,20,000)	= 1,40,000
Total cost per hour (Rs. 19,88,000/1,40,000)	= Rs. 14.20
Cost per unit of *A* = (20,000 × Rs. 14.20)/5,000	= Rs. 56.80
Cost per unit of *B* = (1,20,000 × Rs. 14.20)/60,000	= Rs. 28.40

(b) Activity based costing method of charging overheads:

Volume related activity cost per machine hour: Rs. 5,50,000/1,40,000 = Rs. 3.9286
Set-up costs per set-up: Rs. 8,20,000/64 = Rs.12,812.50
Purchase related costs per purchase order: Rs. 6,18,000/544 = Rs. 1136.029

Cost per unit of product

Particulars	*Cost driver*	*A*	*B*
Volume related costs	Machine hours	Rs. 78,572	Rs. 4,71,432
Set-up costs	Number of set-ups	2,56,240	5,63,728
Purchase related costs	Number of purchase orders	1,81,765	4,36,235
	Total costs	Rs. 5,16,577	Rs. 14,71,395
Cost per unit		Rs. 103.32	Rs. 24.52

Example 8.4

S. Chand and Co., a leading publisher, publishes two versions of a text book. One is paperback and the other is hard bound. Management is considering publishing only the higher quality book. The firm assigns its Rs. 500,000 of overhead to the two types of books. The overhead is composed of Rs. 2,00,000 of utilities and Rs. 3,00,000 of quality control inspectors's salaries. Some additional data follow:

	Paperback	*Hard Bound*
Revenues	Rs. 16,00,000	Rs. 14,00,000
Direct costs	Rs. 12,50,000	Rs. 6,00,000
Production (units)	5,00,000	3,50,000
Machine hours	42,500	7,500
Inspections	2,500	12,500

Required:

(a) Compute the overhead cost that should be allocated to each type of text book using cost drivers appropriate for each type of overhead cost.

(b) The firm has used machine hours to allocate overhead in the past. Should the publisher stop producing the paperback books? Explain why management was considering this action and what its decision should be.

Solution: (a)

	Paperback	*Hard Bound*	*Total*
Machine hours	42,500	7,500	50,000
Rate per MH (Rs. 2,00,000 × 50,000)	× Rs. 4	× Rs. 4	× Rs. 4
Utility cost	Rs. 1,70,000	Rs. 30,000	Rs. 2,00,000
Number of inspections	2,500	12,500	15,000
Rate per inspection (Rs. 30,00,000 ÷ 15,000)	× Rs. 20	× Rs. 20	× Rs. 20
Quality inspection cost	Rs. 50,000	Rs. 2,50,000	Rs. 3,00,000
Total traceable overhead costs	Rs. 2,20,000	Rs. 2,80,000	Rs. 5,00,000

(b) Income calculation using machine hours to allocate utilities and inspection hours to allocate inspectors' salaries to products:
Using the traditional cost driver (machine hours), the following results had been achieved, given a Rs. 10 charge (Rs. 5,00,000 ÷ 50,000) per MH:

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	Paperback	*Hard Bound*
Revenue	Rs. 16,00,000	Rs. 14,00,000
Direct costs	Rs. 12,50,000	Rs. 6,00,000
Overhead	Rs. 4,25,000	75,000
Total Costs	Rs. 16,75,000	Rs. 6,75,000
Margin	Rs. (75,000)	Rs. 7,25,000

The reason paperbacks were erroneously thought to be unprofitable was caused by the method of allocating overhead. The firm should continue producing paperbacks as shown in the following calculations.

	Paperback	*Hard Bound*
Revenue	Rs. 16,00,000	Rs. 14,00,000
Direct costs	Rs. 12,50,000	Rs. 6,00,000
Overhead	Rs. 2,20,000	Rs. 2,80,000
Total costs	Rs. 14,70,000	Rs. 8,80,000
Margin	Rs. 1,30,000	Rs. 5,20,000

Example 8.5

FOAMSTAR LTD. makes three main products using broadly the same production method and equipment for each. A conventional product costing system is used at present although an ABC, system is being considered. Details of the three products for a typical period are:

	Hours per Unit		*Material per unit*	*Volume units*
	Labour Hours	Machine Hours	Rs.	
Product *P*	0.50	1.50	20	750
Product *Q*	1.50	1.00	12	1250
Product *R*	1.00	3.00	25	7000

Direct labour costs Rs. 6 per hour and production overheads are absorbed on a machine hour basis. The rate for the period is Rs. 28 per machine hour.

Further analysis shows that the total of production overheads can be divided as follows:

	%
Cost relating to set ups	35
Cost relating to machinery	20
Cost relating to materials handling	15
Cost relating to inspection	30
Total production overhead	100

The following activity volumes are associated with the product line for the period as a whole. Total activities for the period:

	Number of set-ups	Number of movements of materials	Number of inspection
Product *P*	75	12	150
Product *Q*	115	21	180
Product *R*	480	87	670
	670	120	1000

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Required:

(i) Calculate the cost per unit for each product using conventional methods:
(ii) Calculate the cost per unit for each product using *ABC* principles:
(iii) Comment on the reasons for any differences in the costs in your answers to (i) and (ii):

(I.C.W.A. Stage 2, June 2005)

Solution:

FOAMSTAR LTD.

(i) Statement showing product cost per unit (conventional Method):

	Product *P*	Product *Q*	Product *R*
Direct labour @ Rs. 6	3.00	9.00	6.00
Material	20.00	12.00	25.00
Production overhead @ Rs. 28	42.00	28.00	84.00
(Machine hours – 1.5, 1, 3)	65.00	49.00	115.00

(ii) ABC Principles – Total Production overhead based on Machine hours weightage
$(750 \times 1.50 + 1250 \times 1 + 7000 \times 3)$ Rs. 28 = Rs. 6,54,500

		Rs.
Set up costs	35%	2,29,075
Machining	20%	1,30,900
Material handling	15%	98,175
Inspection	30%	1,96,350
		6,54,500

	Total	*Product P*	*Product Q*	*Product R*
	Rs.	Rs.	Rs.	Rs.
Set ups (75 : 115 : 480)	2,29,075	25,643	39,319	1,64,113
Machining (1125 : 1250 : 21000)	1,30,900	6,300	7,000	1,17,600
Materials handling (12 : 21 : 87)	98,175	9,817	17,181	71,177
Inspection (150 : 180 : 670)	1,96,350	29,452	35,343	1,31,555
	6,54,500	71,212	98,843	4,84,445
Number Units		750	1250	7000
Production overhead Per unit (rounded)		95	79	69

Product Cost per Unit—ABC Principles

	Product P	*Product Q*	Product *R*
	Rs.	Rs.	Rs.
Direct Labour	3.00	9.00	6.00
Materials	20.00	12.00	25.00
Production overhead	95.00	79.00	69.00
	118.00	100.00	100.00

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(iii) Reasons for difference:

- Set up cost has been distributed based on number of set ups, it is more logical than conventional approach.
- Material handling cost is logically distributed based on number of movements of materials.
- Inspection cost is also based on inspection activity.

Hence, Product – *P* and Product – *Q* have received proportionally more production overhead under ABC principle than conventional product costing methods.

Working Notes:

Costs of machining have been split in proportion to the total machine hours per product.

Product – *P*	750 × 1.50	= Rs. 1,125
Product – *Q*	1250 × 1.00	= Rs. 1,250
Product – *R*	7000 × 3.00	= Rs. 21,000
		Rs. 23,375

Example 8.6

MST Limited has collected the following data for its two activities. It calculates activity cost rates based on cost driver capacity.

Activity	Cost Driver	Capacity	Cost
Power	Kilowatt hours	50,000 kilowatt hours	Rs. 2,00,000
Quality Inspections	Number of Inspections	10,000 Inspections	Rs. 3,00,000

The company makes three products *M*, *S* and *T*. For the year ended March 31, 2004, the following consumption of cost drivers was reported:

Product	Kilowatt hours	Quality Inspections
M	10,000	3,500
S	20,000	2,500
T	15,000	3,000

Required:

(i) Compute the costs allocated to each product from each activity.
(ii) Calculate the cost of unused capacity for each activity.
(iii) Discuss the factors the management considers in choosing a capacity level to compute the budgeted fixed overhead cost rate. *(CA, PE, Exam II, Group II, May 2004)*

Solution:

(i) Statement of cost allocation to each product from each activity

	Product			
	M	*S*	*T*	*Total*
	Rs.	*Rs.*	*Rs.*	*Rs.*
Power (Refer to Working Note)	40,000 (10,000 kWh × Rs. 4)	80,000 (20,000 kWh × Rs. 4)	60,000 (15,000 kWh × Rs. 4)	1,80,000
Quality Inspections (Refer to Working Note)	1,05,000 (3,500 inspections × Rs. 30)	75,000 (2,500 inspections × Rs. 30)	90,000 (3,000 inspections × Rs. 30)	2,70,000

Working Notes:

Rate per unit of cost driver:

Power : (Rs. 2,00,000/50,000 kwh) = Rs. 4/kwh
Quality Inspection : (Rs. 3,00,000/10,000 inspections) = Rs. 30 per inspection

(ii) Computation of cost of unused capacity for each activity:

	Rs.
Power (Rs. 2,00,000 – Rs. 1,80,000)	20,000
Quality Inspections (Rs. 3,00,000 – Rs. 2,70,000)	30,000
Total cost of unused capacity	50,000

(iii) Factors management consider in choosing a capacity level to compute the budgeted fixed overhead cost rate:

- Effect on product costing and capacity management
- Effect on pricing decisions.
- Effect on performance evaluation
- Effect on financial statements
- Regulatory requirements.
- Difficulties in forecasting chosen capacity level concepts.

Example 8.7

Fasteners Ltd. producers and sells four products *A*, *B*, *C* and *D*. Details of the four products and relevant information are given below for week ended 28th April, 2007.

Product	*A*	*B*	*C*	*D*
Output (units)	120	100	80	120
Cost per unit: (Rs.)				
Direct Material	40	50	30	60
Direct Labour	28	21	14	21
Machine-hours (per unit)	4	3	2	3

The four products are similar and are usually produced in production runs of 20 units and sold in batches of 10 units.

The production overheads during the period are as follows:

	Rs.
Factory works expenses	20,860
Set up costs	10,500
Stores receiving	7,200
Inspection/Quality control	4,200
Material handling and dispatch	9,240

The production overhead is currently absorbed by using a Machine-hour rate and the company wishes to introduce ABC system and has identified major cost pools for production overheads and their associated cost drivers.

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Information in these activity cost pools and their drivers is given below:

Activity Cost Pools	*Cost Drivers*
Factory Works Expenses	Machine-hours
Set up Costs	Number of production runs
Stores receiving	Requisition raised
Inspection/Quality Control	Number of production runs
Material handling and dispatch	Number of orders executed

The number of requisitions raised on the stores was 20 for each product and number of orders executed was 42, each order being for a batch of 10 of a product.

Requirements:

(i) Total cost of each product assuming the absorption of overhead on Machine-hour basis.

(ii) Total cost of each product assuming the absorption of overhead by using ABC.

(iii) Show the differences between (i) and (ii) and comment. *(ICWA, Inter, Stage II, June 2007)*

Solution:

FASTENERS LIMITED

(i) Statement showing Total Cost of different products assuming absorption of overhead on a Machine Hour Rate basis

(Figure in Rs.)

Particulars	*Products*				*Total*
	A	*B*	*C*	*D*	
Output (units)	120	100	80	120	420
Direct Material	40	50	30	60	180
Direct Labour	28	21	14	21	84
Overheads @ Rs. 40 per MH	160	120	80	120	480
Total Cost per Unit	228	191	124	201	
Total Cost	27360	19100	9920	24120	80500

$$\text{Overhead Rate} = \frac{\text{Rs. } 52{,}000}{1300} = \text{Rs. } 40 \text{ per Machine hour}$$

[Total Machine hours = $(120 \times 4 + 100 \times 3 + 80 \times 2 + 120 \times 3) = 1300$]

(ii)

Total Overheads	*(Rs.)*	*Drivers*	*No.*	*Cost/Unit of Drivers*		
Factory Works Expenses	20860	Machine hrs	1300	20860 ÷ 1300	=	Rs. 16.05
Set up Costs	10500	Production runs	21	10500 ÷ 21	=	500.00
Stores receiving	7200	Requisitions	80	7200 ÷ 80	=	90.00
Inspection/Quality Control	4200	Production runs	21	4200 ÷ 21	=	200.00
Material Handling and Despatch	9240	Orders	42	9240 ÷ 2	=	220.00
Total	52000					

Statement Showing Total Cost of each product assuming Activity Based Costing:

Particulars	*Product*			
	A	*B*	*C*	*D*
Output (units)	120	100	80	120
No. of Production runs	6	5	4	6
No. of stores requisitions	20	20	20	20
No. of Sales Orders	12	10	8	12
Machine hours	4	3	2	3
Direct material (Rs.)	40.00	50.00	30.00	60.00
Direct labour (Rs.)	28.00	21.00	14.00	21.00
Factory Works Expenses (Rs.)	64.18	48.14	32.09	48.14
Set ups (Rs.)	25.00	25.00	25.00	25.00
Store receiving (Rs.)	15.00	18.00	22.50	15.00
Inspection/Quality Control (Rs.)	10.00	10.00	10.00	10.00
Handling/dispatch (Rs.)	22.00	22.00	22.00	22.00
Unit Cost (Rs.)	204.18	194.14	155.59	201.14
Total cost (Rs.)	24501.60	19414.00	12447.20	24136.80

(iii) Statement Showing differences (in Rs.)

Particulars	*Product*			
	A	*B*	*C*	*D*
Cost per Unit Under MHR (i)	228.00	191.00	124.00	201.00
Cost per Unit Under ABC (ii)	204.18	194.14	155.59	201.14
Difference	23.82	(3.14)	(31.59)	(0.14)
Total Cost-MHR (i)	27360.00	19100.00	9920.00	24120.00
Total Cost-ABC (ii)	24501.60	19414.00	12447.20	24136.80
Difference	2858.40	(314.00)	(2527.20)	(16.80)

The use of activity based Costing gives different product Costs than what were arrived at by utilising traditional Costing. It can be argued that product Costs using ABC are more precise as overheads have been identified with specific activities.

THEORY QUESTIONS

1. What is Activity-Based Costing? Why is it needed?
2. What is a cost driver? What is the role of cost driver in tracing costs to products?
3. Explain the steps in applying Activity-Based Costing (ABC) in a manufacturing Company.
4. How are activities grouped in a manufacturing company?
5. Distinguish between activity-based costing and traditional costing system.
6. What are the benefits of activity-based costing?
7. Define unit level activities, batch level activities, product level activities and facility level activities.
8. "Overhead costs are source of product cost distortion." Do you agree, Explain.
9. Explain the concept of Activity-Based Costing and Cost Drivers.

(ICWA, Inter, Stage II, Dec. 2003)

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10. Explain briefly each of the following categories in Activity-Based Costing (ABC) by giving at least two examples:

(i) Unit level activities
(ii) Batch level activities
(iii) Product level activities
(iv) Facility level activities

(CA, PE, Exam II, Group II, May 2007)

11. Discuss the different stages in Activity-Based Costing.

(CA, PE, Exam II, Group II, Nov. 2003)

12. Distinguish between target costing and Kaizen costing.
13. What is life cycle costing?
14. Write short notes on:

(i) Target costing
(ii) Kaizen costing

15. Define Activity-Based management (ABM). What is its importance?
16. Distinguish between Activity-Based Costing (ABC) and Activity-Based Management (ABM).

SELF-EVALUATION QUESTIONS

Mr. Ashok Kumar owns a large department store in Delhi. For 10 years, the accountant has applied overheads to the various departments—produce, meat, dairy, canned foods, bakery and floral—based on the basis of employee hours worked. Mr. Ashok Kumar's son who is a commerce student in University of Delhi has suggested his father should consider activity-based costing (ABC): In an attempt to implement ABC, Mr. Ashok Kumar and his son have identified the following activities. They need your help in determining a cost driver for each of the activities.

Cost pool

(a) Placing orders
(b) Checking out customers
(c) Bagging groceries
(d) Delivering groceries
(e) Stocking shelves
(f) Janitorial and Maintenance
(g) Training employees
(h) Administrative
(i) Advertising and Marketing
(j) Accounting and legal service.

Ans: Cost drivers are

(a) Number of orders
(b) Number of customers, sales volume.
(c) Number of customers, sales volume
(d) Number of delivery orders
(e) Hours worked stocking
(f) Square feet occupied
(g) Total number of employees, number of new employees
(h) Sales volume
(i) Number of advertisement campaigns
(j) Sales volume.

PROBLEMS

1. ABC Company produces two types of stereo units. Activity data follows:

Activity Usage Measures	*Product-Costing Data*		
	Deluxe	*Regular*	*Total*
Units produced per year	5,000	50,000	55,000
Prime costs (Rs.)	39,000	369,000	408,000
Direct labour hours	5,000	45,000	50,000
Machine hours	10,000	90,000	100,000
Production runs	10	5	15
Number of moves	120	60	180

Activity Cost Data (overhead activities)

Activity	*Activity Cost (Rs.)*
Setting up equipment	60,000
Material handling	30,000
Using power	50,000
Testing	40,000
Total	180,000

Required:

(i) Calculate the consumption ratios for each activity.
(ii) Group activities based on the consumption ratios and activity level.
(iii) Calculate a rate for each pooled group of activities.
(iv) Using the pool rates, calculate unit product costs.

Ans:

	Consumption ratios	*Deluxe*	*Regular*
(i)	Set ups	0.67	0.33
	Material handling	0.67	0.33
	Power	0.10	0.90
	Testing	0.10	0.90

(ii) Batch level: set ups and material handling
Unit level: Power and testing
(iii) Batch level pool Rs. 6000 per run
Unit level Re. 0.90 per machine hour
(iv) Unit costs: ABC
Deluxe Rs. 21.60
Regular Rs. 9.60

2. ABC company has been incurring two types of overhead costs-material handling and quality inspection. The costs expected for these categories for the coming year are as follows:

Material handling	Rs. 10,00,000
Quality inspection	Rs. 30,00,000

The company currently charges overhead using direct labour hours and expected actual capacity. This figure is 50,000 direct labour hours.

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The factory manager has been asked to submit a bid and has assembled the following data concerning proposed job.

	Job
Direct materials	Rs. 37,000
Direct labour (1000 hours)	Rs. 70,000
Number of material moves	10
Number of inspections	5

The manager has been informed that many competitors use an ABC approach to assign overhead to jobs. Before, submitting his bid for the proposed job, he wants to assess the effects of this alternative approach. He estimates that the expected number of material moves for all jobs during the year is 1,000. He also expects 5000 quality inspections to be performed.

Required:

(a) Compute the total cost of the proposed job using direct labour hours to assign overhead. Assume the bid price is full manufacturing cost plus 25%, what would be the manager's bid?
(b) Compute the total cost of the job using the number of material moves to allocate material-handling costs and the number of inspections to allocate the quality inspections costs. Assume bid price is full manufacturing costs plus 25%. What should be his bid using this approach?
(c) Which approach do you think best reflects the actual cost of the job. Explain.

Ans: (a) Bid price Rs. 2,33,750
(b) Bid price Rs. 1,50,000
(c) ABC best reflects the actual cost of the proposed job.

3. Assume that firm makes four products *A*, *B*, *C* and *D*. Data for the past period are as follows:

Product	*Output units*	*No. of production runs in period*	*Direct labour hrs per unit*	*Machine hours per unit*	*Material cost per unit (Rs.)*	*Material components per unit*
A	25	3	2	2	30	8
B	25	4	4	4	75	5
C	250	7	2	2	30	8
D	250	10	4	4	75	6
		24				

Direct labour costs Rs. 7 per hour:

Overhead costs	(Rs.)
Short-run variable costs	8,250
Long-run variable costs:	
Scheduling costs	7,680
Set-up costs	3,600
Material handling costs	7,650
	27,180

Find the unit production cost

(a) Using conventional product costing using a labour hour or machine hour overhead absorption rate.
(b) Using ABC with the following cost drivers:

Short-term variable costs:	Machine hours
Scheduling costs:	No. of production runs
Set-up costs:	No. of production runs
Materials handling costs:	No. of components

(c) Compare the results from the two methods.

Ans:	*A*	*B*	*C*	*D*
(a) Cost per unit (Rs.)	77	169	77	169
(b) Cost per unit (ABC)	126.4	208.2	83.16	153.8

(c) ABC charges more overheads to lower volume production and tends to charge relatively less to higher volume production, especially *D* in this case.

4. *MNP* Suits is a ready-to-wear suit manufacturer. It has four customers: two wholesale-channel customers and two retail-channel customers.

MNP Suits has developed the following activity-based costing system:

Activity	*Cost driver*	*Rate in 2004*
Order processing	Number of purchase orders	Rs. 1,225 per order
Sales visits	Number of customer visits	Rs. 7,150 per visit
Delivery-regular	Number of regular deliveries	Rs. 1,500 per delivery
Delivery-rushed	Number of rushed deliveries	Rs. 4,250 per delivery

List selling price per suit is Rs. 1000 and average cost per suit is Rs. 550. The CEO of *MNP* Suits wants to evaluate the profitability of each of the four customers in 2003 to explore opportunities for increasing profitability of his company in 2004. The following data are available for 2003:

Item	*Wholesale customers*		*Retail customers*	
	W	*H*	*R*	*T*
Total number of orders	44	62	212	250
Total number of sales visits	8	12	22	20
Regular deliveries	41	48	166	190
Rush deliveries	3	14	46	60
Average number of suits per order	400	200	30	25
Average selling price per suit	Rs. 700	Rs. 800	Rs. 850	Rs. 900

Required:

(a) Calculate the customer-level operating income in 2003.

(b) What do you recommend to CEO of *MNP* suits to do to increase the company's operating income in 2004?

(c) Assume *MNP* Suits' distribution channel costs are Rs. 17,50,000 for its wholesale customers and Rs. 10,50,000 for the retail customers. Also, assume that its corporate sustaining costs are Rs. 12,50,000. Prepare Income statement of *MNP* Suits for 2003.

(CA, PE, Exam II, Group II, Nov. 2004)

Ans:	*W*	*H*	*R*	*T*
(a) Customer level operating income	24,54,650	28,06,750	10,46,500	11,98,250

(b) Reduce level of price discounting, especially by *W*, Reduce level of customer level costs, especially by *R* and *T*.

(c) Total operating income Rs. 34,56,150

5. Statusline and Company is a manufacturer of a range of white Goods. Cost structure of its different products is as follows:

Standard Cost of the Products

Particular	*Product P*	*Product Q*	*Product R*
Direct Materials	25.00	20.00	20.00
Direct Labour @ Rs. 5 per hour	15.00	20.00	25.00
Production Overheads	15.00	20.00	25.00
	55.00	60.00	70.00
Quantity produced (units)	10,000	20,000	30,000

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Production overhead is absorbed on the basis of Direct Labour Hours. Statusline and Company wishes to introduce Activity Based Costing (ABC) system and has identified four major cost pools for production overhead and their associated cost drivers. Information on these activity cost pools and their drivers is given below:

Activity cost pool	*Cost Driver*	*Cost Associated with Activity cost pool (Rs.)*
Stores Receiving	Purchase requisition	1,48,000
Inspection/Quality control	Number of production runs	4,47,000
Material handling and dispatch	Orders executed	1,05,000
Production scheduling/Machine set-ups	Number of set-ups	6,00,000

Further relevant information on the three products is also given below:

Particular	*Product P*	*Product Q*	*Product R*
No. of Purchase requisitions	300	450	500
No. of Production runs	750	1050	1200
No. of Orders executed	180	270	300
No. of set-ups	360	390	450

Required:

(i) Calculate the activity based production cost of all the three products.

(ii) Comment of the differences between the original traditionally Calculated Costs and Activity Based Costs (ABC) you calculated.

(ICWA, Stage 2, Dec. 2003)

Ans:

	Products		
	P	*Q*	*R*
(i) Total production costs (ABC)	Rs. 75.25	62.12	61.83

(ii) Product *R* is significantly overcosted in traditional system than in *ABC* while *P* is greatly under costed. Product *R* is a high volume product with a high direct labour content, while *P* is a low-volume product with a low direct labour content.

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PART 3

COSTING METHODS AND ACCOUNTING OF COSTS

Different industries need to follow a method of product costing for determining unit cost and total cost. Part 3 is devoted to discussion of product costing methods—Job Costing and Process Costing and their variants. Cost accounting system and its reconciliation with financial accounting has also been covered in this part.

9. SINGLE OR OUTPUT COSTING
10. JOB, CONTRACT AND BATCH COSTING
11. PROCESS COSTING
12. SERVICE COSTING
13. COST CONTROL ACCOUNTS
14. INTEGRATED ACCOUNTING SYSTEM
15. RECONCILIATION OF COST AND FINANCIAL ACCOUNTS

9 SINGLE OR OUTPUT COSTING

Learning Objectives:

After reading this chapter, you should be able to:

1. explain nature of single or output costing;
2. describe nature of production statement;
3. understand operation costing; and
4. explain the nature of estimated cost sheet.

NATURE

The term "single or output costing" is applied where a single product or only a few grades of similar articles are manufactured, for example, paper, cement, brick, coal, wine, etc. The total cost per unit is obtained by dividing the total cost of production by the number of units manufactured. The total cost of the product is determined in a cost sheet format (as discussed in Chapter 2). Since only one product is usually produced involving a single process, all costs are directly charged to that product. There is no problem of apportionment as to the products. Where several grades of the product are manufactured, it may be necessary to apportion the overhead costs relating to more than one variety of the product.

PRODUCTION STATEMENT

The production or output statement shows sales, stocks, and profit besides the cost in a statement format. The difference between a cost sheet and production statement is that a cost sheet merely records the costs incurred during the period, whereas a production statement records sales, stocks, and profit in addition to the costs incurred. Figure 9.1 gives the specimen of a production account.

OPERATION COSTING

Operation costing is a costing method which determines the unit product cost by each operation constituting the production process. It is different from process costing in the sense that each operation is considered as

separate cost centre and unit product cost is determined for each operation and not for each process as in process costing. All costs of direct material, direct labour, direct expenses, are collected for each operation through direct measurement, and overhead is apportioned equitably among different operations.

Operation costing is generally used in those industries where repetitive manufacturing is done, that is, where production includes large production runs or batches of common processes and/or materials.

Production Account **Output** _____

Particulars	*Amount* Rs.	P	*Particulars*	*Amount* Rs.	P
To direct material			By prime cost c/d		
To direct labour					
To direct expenses					
	_____			_____	
	_____			_____	
To prime cost b/d			By factory cost c/d		
To factory overheads					
	_____			_____	
	_____			_____	
To factory cost b/d			By cost of production c/d		
To office and administrative overheads					
	_____			_____	
	_____			_____	
To opening stock of finished goods			By closing stock of finished goods		
To cost of production b/d			By cost of goods sold c/d		
	_____			_____	
	_____			_____	
To cost of goods sold b/d			By sales		
To selling and distribution exp.					
To profit					
	_____			_____	
	_____			_____	

Fig. 9.1 **Specimen of a Production Account**

ESTIMATED COST SHEET

An estimated cost sheet is prepared before the production is commenced. These estimated costs are subsequently compared with actual costs so that costs can be controlled and be kept within prescribed limits. Besides, the estimated costs can be used by management for fixing selling prices and taking decisions regarding profit planning, production, administration and marketing. Estimation of costs is done on the basis of current situations and future circumstances are likely to have impact on different elements of costs. Estimated costs are always needed for submitting tenders or quotations for a specific order. The price to be quoted in a tender includes a reasonable percentage of profit. Care should be exercised while quoting price of a tender because the tender quoting the lowest price is accepted by the customer.

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The treatment of stock of raw material, work-in-progress and finished goods is the same as explained in Chapter 2 while discussing preparation of Cost Sheet (Statement).

Example 9.1

In respect of a factory, the following particulars have been extracted for the year 2005:

	Rs.
Cost of Materials	6,00,000
Wages	5,00,000
Factory overheads	3,00,000
Administrative charges	3,36,000
Selling charges	2,24,000
Distribution charges	1,40,000
Profit	4,20,000

A work order has to be executed in 2006 and the estimated expenses are: Materials Rs. 8,000, Wages Rs. 5,000.

Assuming that in 2006 the rate of factory overheads has gone up by 20%, distribution charges have gone down by 10% and selling and administration charges have gone each up by 15%, at what price should the product be sold so as to earn the same rate of profit on the selling price as in 2005.

Factory overheads are based on Wages and Administration, selling and distribution overheads on factory cost.

(B.Com, Delhi, 2007)

Solution:

Statement for Cost for the Year 2005	Rs.
Cost of Material	6,00,000
Direct Labour	5,00,000
PRIME COST	11,00,000
Add: Factory Overhead	3,00,000
FACTORY COST	14,00,000
Add: Administrative Overhead	3,36,000
COST OF PRODUCTION	17,36,000
Add: Selling Overhead	2,24,000
Distribution Charges	1,40,000
COST OF SALES	21,00,000
PROFIT	4,20,000
SALES	25,20,000
Factory overhead as % of Direct Labour	60%
Administration overhead as % of Factory Cost	24%
Selling overhead as % of Factory Cost	16%
Distribution charges as % of Factory Cost	10%
Profit as a % of cost	20%

(*Contd.*)

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Statement of Cost for work order	Rs.
Material	8,000
Wages	5,000
PRIME COST	13,000
Add: Factory overhead (gone up by 20%) (60% of wages + 20% thereof) that is, 72% of wages	3,600
FACTORY COST	16,600
Add: Administration charges (gone up by 15%) (24% of Factory cost + 15% thereof) that is, 27.6% of Factory cost	4581.60
COST OF PRODUCTION	21,181.60
Add: Selling charges (gone up by 15%) (16% of Factory overhead + 15% thereof) that is, 18.4 of factory cost	3,054.40
Distribution charges (gone down by 10%) (10% of factory cost – 10% thereof) that is, 9% of factory cost	1494
COST OF SALES	25,730
Add: Profit (20% of cost)	5,146
Selling Price	30,876

Example 9.2

A company presently sells an equipment for Rs. 35,000. Increase in prices of labour and material cost are anticipated to the extent of 15% and 10% respectively, in the coming year. Material cost represent 40% of cost of sales and labour cost 30% of cost of sales. The remaining relate to overheads. If the existing selling price is retained, despite the increase in labour and material prices, the company would face a 20% decrease in the existing amount of profit on the equipment.

You are required to arrive at a selling price so as to give the same percentage of profit on increased cost of sales, as before. Prepare a statement of profit/loss per unit, showing the new selling price and cost per unit in support of your answer. *(ICWA Inter, Dec. 1996)*

Solution:

Selling Price = Rs. 35,000

Let us assume present total cost of sales as x.

Particulars	*Present condition*	*Anticipated condition*
Direct Material	$0.4x$	$0.46x$
Labour	$0.3x$	$0.33x$
Overhead	$0.3x$	$0.30x$
	x	$1.09x$
Profit	Rs. $35,000 - x$	Rs. $35,000 - 1.09x$

From the above the following equation can be made:

$$(35{,}000 - x) - (35{,}000 - 1.09x) = 20\% \text{ of } (35{,}000 - x)$$

or $$-x + 1.09x = 7{,}000 - .2x$$

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or $.29x = 7{,}000$
or $x =$ Rs. 24,137

Hence the present total cost of sales is Rs. 24,137.

Statement of Profit (Loss)

Particulars		*Present* Rs.	*Anticipated* Rs.
Material:			
Present	24,137 × .4	9,654.80	
Anticipated	24,137 × .46		11,103.02
Labour:			
Present	24,137 × .3	7,241.1	
Anticipated	24,137 × .33		7,965.21
Overheads	24,137 × .3	7,241.1	7,241.10
Total Cost of Sales		24,137.0	26,309.33
Profit (45% of cost of sales)		10,863.0	11,839.20
Selling Price		35,000.0	38,148.53

For the present condition, total cost is Rs. 24,137 and sales (as given) is Rs. 35,000. Therefore, profit (balancing figure) would be Rs. 10,863 (Rs. 35,000 – 24,137). This profit of Rs. 10,863 amounts to 45% of cost of sales. Applying 45% for the anticipated condition, the profit comes to Rs. 11,839.20.

Hence, new selling price of the equipment should be (say) Rs. 38,150.

Example 9.3

The following balances have been obtained from the books of Rivatex Limited for the year ending December 31, 2002.

	Rs ('000)
Stock on 1st January, 2002 :	
Manufactured goods	974
Raw materials	300
Depreciation of plant	1,300
Discount allowed	374
Printing and stationery	93
Purchases:	
Manufactured goods	1,274
Raw materials	8,726
Repairs to plant	250
Office rent and rates	650
Coal	579
Carriage inwards	391
Office salaries	940
Carriage outwards	233
General expenses	317
Factory rent and rates	2,271
Manufacturing wages and salaries	11,029
Travelling expenses	279
Sales	29,942
Stocks on 31st December, 2002	
Manufactured goods	2,794
Raw materials	200

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Goods manufactured are to be debited to the sales department at current market prices, namely. Rs. 2,71,50,000.

You are required to prepare accounts in such a form as to disclose; (i) Cost of raw materials consumed, (ii) Prime cost, (iii) Factory cost, (iv) Gross profit on manufacture, (v) Cost of manufactured goods, (vi) Gross profit on sales, and (vii) Net profit that may be considered rational from the accounting point of view.

(B. Com. (Hons), Delhi)

Solution:

Production Account

		(Rs '000)		*(Rs '000)*
To Opening stock of raw materials		300	By Closing stock of raw materials	200
To Purchases of raw materials		8,726	By Cost of raw materials consumed	9,217
To Carriage inwards		391		
		9,417		9,417
To Cost of raw materials consumed		9,217	By prime cost c/d	20,246
To Manufacturing wages and salaries		11,029		
		20,246		20,246
To Prime cost b/d		20,246	By Factory cost c/d	24,646
To Factory overheads:				
Depreciation on plant		1,300		
Repairs to plant		250		
Coal		579		
Factory rent and rates		2,271		
		24,646		24,646
To Factory cost b/d		24,646	By Sales value	27,150
To Office overheads:				
Printing and stationery	93			
Office rent and rates	650			
Office salaries	940			
General expenses	317	2,020		
Cost of production		26,646		
To Gross profit on manufacture		504		
		27,150		27,150
To Opening stock of good manufactured		974	By Closing stock of mfd. goods	2,794
To Goods transferred from mfg. deptt.		27,150	By Cost of goods mfd.	25,330
		28,124		28,124
To Cost of goods mfd.		25,330	By Sales	29,942
To Purchase of manufactured goods		1,274		
To Gross Profit		3,338		
		29,942		29,942
To Selling and Distribution:			By Gross profit	3,338
Travelling expenses	279			
Discount allowed	374			
Carriage outward	233			
		886		
To Net Profit		2,452		
		3,338		3,338

(*Contd.*)

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General Profit and Loss Account

	(Rs. '000)		*(Rs '000)*
To Stock reserve (for unrealised profit on increase in stock of Rs. 1,820)	34	By Gross profit on manufacture	504
To Net Profit	2,922	By Net profit	2,452
	2,956		2,956

Notes:

1. It has been presumed that:
   (i) Stock of manufactured goods consist of only those goods which have been manufactured in the factory and they are at current market price.
   (ii) Office overheads have been incurred only in respect of goods manufactured in the factory.
   (iii) Selling overheads have been incurred for sale of both the types of goods, that is, those manufactured in the factory as well as those purchased from outside.

2. Stock Reserve has been calculated as follows:

$$\frac{504}{27,150} \times 1,820 = 33.78 \text{ or Rs. } 34.$$

Example 9.4

A factory can produce 60,000 units per annum at its optimum (100%) capacity.

The estimated costs of production are as under:

Direct material	Rs. 3 per unit
Direct labour	Rs. 2 per unit
Indirect expenses:	
Fixed	Rs. 1,50,000 per annum
Variable	Rs. 5 per unit
Semi-variable	Rs. 50,000 per annum up to 50% capacity and an extra expense of Rs. 10,000 for every 25% increase in capacity or part thereof.

The factory produces only against orders (and not for own stock).

If the production programme of the factory is as indicated below and the management desires to ensure a profit of Rs. 1,00,000 for the year, work out the average selling price at which each unit should be quoted:

First 3 months of the year: 50% of capacity; remaining 9 months 80% of capacity.

Ignore selling, distribution and administration overheads. *(ICWA Inter, B. Com. (Hons), Delhi)*

Solution:

Statement of Cost

	First 3 months 7,500 units	*Remaining 9 months 36,000 units*	*Total 43,500 units*
Direct material @ Rs. 3 per unit	Rs. 22,500	Rs. 1,08,000	Rs. 1,30,500
Direct labour @ Rs. 2 per unit	Rs. 15,000	Rs. 72,000	Rs. 87,000
Prime cost	37,500	1,80,000	2,17,500

(*Contd.*)

Statement of Cost

		First 3 months 7,500 units	*Remaining 9 months 36,000 units*	*Total 43,500 units*
Add:	Indirect expenses:			
	Fixed (1:3)	37,500	1,12,500	1,50,000
	Variable @ Rs. 5 per unit	37,500	1,80,000	2,17,500
Semi-variable				
	for first 3 months @ Rs. 50,000 per annum	12,500		
	For remaining 9 months @ Rs. 70,000 per annum		52,500	65,000
	Total Cost	1,25,000	5,25,000	6,50,000
	Profit	—	—	1,00,000
	Sales	—	—	7,50,000

Example 9.5

The following budgeted cost information is available from the records of a manufacturing concern:

		(Rs Lakhs)
Direct Materials		61.20
Direct Wages:		
Rolling shop (1,20,000 hours)	6.00	
Milling shop (2,40,000 hours)	14.40	20.40
Work Overheads (Allocation on Labour Hours):		
Rolling shop	9.60	
Milling shop	28.80	38.40
Administrative Overheads		24.00
Selling Overheads		28.80
Distribution Overheads		14.40

The concern follows absorption method of costing. On the basis of above data, prepare a schedule of Overhead Rates. The Sales Division of the concern requires a Cost Estimate for a product for which following information are available:

Direct Material : Material *X* 120 kg @ Rs. 30 per kg
Material *Y* 72 kg @ Rs. 55 per kg
Direct Labour : Rolling shop 40 hours @ Rs. 6 per hour.
Milling shop 70 hours @ Rs. 5 per hour.

You are required to work out the Cost Estimate showing cost per unit using the above information and the overhead rates so computed. *(ICWA Inter)*

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Solution:

Schedule of Predetermined Overhead Recovery Rates for the Year

Type of overhead	*Shop*	*Basis*	*Computation*	*Recovery rate*
1. Work overhead	Rolling	Rolling Labour hrs	$\frac{\text{Budgeted overheads}}{\text{Budgeted labour hrs}}$	
			$\frac{\text{Rs. } 9,60,000}{1,20,000 \text{ hrs}}$	Rs. 8 per rolling labour hr.
	Milling	Milling Labour hrs	$\frac{\text{Budgeted overheads}}{\text{Budgeted labour hours}}$	
			$\frac{28,80,000}{2,40,000 \text{ hrs}}$	Rs. 12 per milling labour hr.
2. Administrative overheads		Percentage on works cost	$\frac{\text{Budgeted admm. overheads}}{\text{Budgeted works cost}} \times 100$	
			$\frac{\text{Rs. } 24 \text{ lakhs}}{\text{Rs. } 120 \text{ lakhs}} \times 100$	20% on works cost
3. Selling Overheads		Percentage on cost of production	$\frac{\text{Budgeted Selling Cost}}{\text{Budgeted Production cost}} \times 100$	
			$\frac{\text{Rs. } 28.80 \text{ lakhs}}{\text{Rs. } 144 \text{ lakhs}} \times 100$	20% on cost of
4. Distribution		Percentage on cost of production	$\frac{\text{Rs. } 14.40 \text{ lakhs}}{\text{Rs. } 144 \text{ lakhs}} \times 100$	10% of production cost

Job Cost Estimate

Elements of Cost		*Computation*				*Amount (Rs.)*
Direct Materials	Material *X*:	120 kg	@	Rs. 30	= Rs. 3,600	
	Y:	72 kg	@	Rs. 55	= Rs. 3,960	7,560
Direct Labour	Rolling shop:	40 hrs	@	Rs. 6	= Rs. 240	
	Milling shop:	70 hrs	@	Rs. 5	= Rs. 350	590.00
			Prime Cost			8,150.00
Works Overhead	Rolling shop:	40 hrs	@	Rs. 8	= Rs. 320	
	Milling shop:	70 hrs	@	Rs. 12	= Rs. 840	1,160.00
			Works Cost			9,310.00
Admn. Overheads 20% on Works Cost (that is, Rs. 9,310)						1,862.00
			Cost of Production			11,172.00
Selling Overheads 20% on Cost of Production (that is, Rs. 11,172)						2,234.40
Distribution 10% on Cost of Production (that is, Rs. 11,172)						1,117.20
			Total Cost			14,523.60

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Example 9.6

The expenses of a machine cost centre for a particular month are as follows:

(i) Power Rs. 50,000
(ii) Maintenance and Repairs: Rs. 10,000
(iii) Machine Operator's Wages: Rs. 2,000
(iv) Supervision: Rs. 6,000
(v) Depreciation: Rs. 40,000

Other particulars are given below:

Products	*Rate of production*	*Production in units*
A	30 Units per hour	1,800
B	10 Units per hour	500
C	6 Units per hour	300
D	4 Units per hour	260

The entire production was to be offered to Government on 'cost Plus 20%' basis. Material costs per units are: *A*: Rs. 40; *B*: Rs. 60; *C*: Rs. 100 and *D*: Rs. 300.

Prepare a statement showing product-wise 'cost' and 'offer price'. *(ICWA Inter)*

Solution:

Cost of Machine Centre

	Rs.
Power	50,000
Maintenance and repairs	10,000
Machine operators wages	2,000
Supervision	6,000
Depreciation	40,000
	1,08,000

Statement Showing Product-wise Cost

Product	*Output*		*Equivalent machine hours*	*Machine centre cost*		*Cost per unit*	*Material cost per unit*	*Total cost per unit*
	Total	*Per hour*		*Per hr.*	*Total allocation*			
A	1,800	30	60		28,800	16	40	56
B	500	10	50		24,000	48	60	108
C	300	6	50		24,000	80	100	180
D	260	4	65		31,200	120	300	420
				4.80*	1,08,000			

*1,08,000 ÷ 225 = Rs. 4.80 per hour

Note:
Rs. 10,8,000 has been allocated in the ratio of machine hours (60 : 50 : 50 : 65).

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Statement of 'Offer Price'

Product	*Cost per unit*	*Profit per unit (@ 20% of cost)*	*Office price per unit*
	Rs.	Rs.	Rs.
A	56	11.20	67.20
B	108	21.60	129.60
C	180	36.00	216.00
D	420	84.00	504.00

Example 9.7

An article passes through three successive operations from the raw materials stage to the finished product stage. The following data are available from the production records of a particular month:

Operation No.	*No. of Pcs. input*	*No. of Pcs. rejected*	*No. of Pcs. output*
1	60,000	20,000	40,000
2	66,000	6,000	60,000
3	48,000	8,000	40,000

(i) Determine the input required to be introduced in the first operation in number of pieces in order to obtain finished output of 100 pieces after the last operation.

(ii) Calculate the cost of raw material required to produce one piece of finished product, given the following information:

Weight of the finished piece is 0.10 kg and the price of raw material is Rs. 20 per kg. *(CA Inter)*

Solution:

(i) Statement of Production (for a Month)

Operation No.	*Input, Total No.*	*Rejections*		*Output, Total No.*
		Total No.	*% Rejection to output*	
1	60,000	20,000	50%	40,000
2	66,000	6,000	10%	60,000
3	48,000	8,000	20%	40,000

Input required for final output of 100 units:

	No. of Pcs.
Output of process 3	100
Loss in process No. 3 20%	20
Input to process 3 or output of process 2	120
Loss in process 2, 10%	12
Input to process 2 or output of process, 1	132
Loss in process 1, 50%	66
Input to process 1	198

(ii) To produce 100 piece of final output 198 pieces of initial input are used. The weight of one piece of finished output is 0.10 kg. Thus, the weight of input to produce one piece of output is 0.198 kg. The rate being Rs. 20, the cost of materials for producing one piece is Rs. 3.96.

Example 9.8

RST Ltd. manufactures plastic moulded chairs. Three models of moulded chairs, all variation of the same design are Standard, Deluxe and Executive. The company uses an operation-costing system.

RST Ltd. has extrusion, form, trim and finish operations. Plastic sheets are produced by the extrusion operation. During the forming operation, the plastic sheets are moulded into chair seats and the legs are added. The standard model is sold after this operation. During the trim operation, the arms are added to the Deluxe and Execute models and the chair edges are smoothed. Only the executive model enters the finish operation, in which padding is added. All of the units produced receive the same steps within each operation. In April, 2003 units of production and direct material cost incurred are as follows:

	Units Produced	*Extrusion Materials (Rs.)*	*Form Materials (Rs.)*	*Trim Materials (Rs.)*	*Finish Materials (Rs.)*
Standard Model	10,500	1,26,000	42,000	0	0
Deluxe Model	5,250	63,000	21,000	15,750	0
Executive Model	3,500	42,000	14,000	10,500	21,000
	19,250	2,31,000	77,000	26,250	21,000

The total conversion costs for the month of April, 2003 are:

	Extrusion Operation	*Form Operation*	*Trim Operations*	*Finish Operation*
Total conversion costs	Rs. 6,06,375	Rs. 2.97,000	Rs. 1,55,250	Rs. 94,500

Required:

(i) For each product produced by RST Ltd. during April. 2003, the determine the unit cost and the total cost

(ii) Now consider the following information for May. All unit costs in May are identical to the April unit costs calculated as above in (i). At the end of May, 1,500 units of the Deluxe model remain in work-in-progress. These units are 100% complete as to materials and 65 % complete in the trim operation. Determine the cost of the Deluxe model work-in-process inventory at the end of May.

(CA, PE, Exam II, Group II, May 2003)

Solution:

Working Notes:

1. Statement of Equivalent Production units of Extrusion, Form, Trim and Finish materials for Standard, Deluxe and Executive Model of Chairs

	Extrusion materials units	*Form materials units*	*Trim materials units*	*Finish materials units*
Equivalent unit of materials required to produce three brands of plastic moulded chairs	19,250	19,250	8,750	3,500

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2. Statement of Material and Conversion Cost per Equivalent Units

	Extrusion	*Form*	*Trim*	*Finish*
Equivalent units: (*A*) (Refer to Working Note 1)	19,250	19,250	8,750	3,500
Material cost (Rs.): (*B*)	2,31,000	77,000	26,250	21,000
Conversion costs of different operations performed on material (Rs): (*C*)	6,06,375	2,97,000	1,55,250	94,500
Material cost per equivalent units (Rs.): (*B*/*A*)	12	4	3	6
Conversion cost per equivalent unit (Rs.): (*C*/*A*)	31.50	15.43	17.74	27

(I) Statement of Unit of Total cost Model-wise (Refer to Working Notes 1 and 2)

	Standard Model Cost	*Deluxe Model Cost*	*Executive Model Cost*
	Rs.	*Rs.*	*Rs.*
Extrusion material	12.00	12.00	12.00
Form material	4.00	4.00	4.00
Trim material	—	3.00	3.00
Finish material	—	—	6.00
Extrusion conversion	31.50	31.50	31.50
Form conversion	15.43	15.43	15.43
Trim conversion	—	17.74	17.74
Finish conversion	—	—	27
Total unit cost	62.93	83.67	116.67
Total Cost	6,60,765 (10,500 units × Rs. 62.93)	4,39,267.5 (5,250 units × Rs. 83.67)	4,08,345 (3,500 units × Rs. 116.67)

(II) Statement of cost of 1,500 units of the Deluxe Model of the chairs lying in Work-in-progress inventory at the end of May 2003

	Equivalent units	*Units cost (Refer to working note 2) Rs.*	*Total Cost*
	(1)	*(2)*	*(3) = (1) × (2)*
Extrusion materials	1,500	12	18,000
Form materials	1,500	4	6,000
Trim materials	1,500	3	4,500
Extrusion materials conversion	1,500	31.50	47,250
Form materials conversion	1,500	15.43	23,145
Trim materials conversation (1,500 units × 65%)	975	17.74	17,296.50
Total cost of 1,500 units of Deluxe Model of chairs lying in WIP			1,16,191.50

THEORY QUESTIONS

1. Explain the nature of single costing.
2. Describe briefly the procedure of presenting costs under single costing. Explain giving an example.
3. Explain the nature of operation costing.

PROBLEMS

1. M/s Indu Industries Ltd. are the manufacturers of moonlight torches. The following data relate to manufacture of torches during the month of March 2007:

Raw material consumed	Rs. 20,000
Direct wages	Rs. 12,000
Machine-hour worked	9,500 hours
Machine-hour rate	Rs. 2
Office overheads	20% of works cost
Selling overheads	Re. 0.50 per unit
Units produced	20,000
Unit sold	18000 @ Rs. 5 per unit

Prepare Cost Sheet showing the cost and the profit per unit and the total profit earned.

Ans: Prime cost Rs. 32,000; Works cost Rs. 51,000; Cost of production Rs. 61,200; Cost of production of goods sold Rs. 55,080; Cost of sales Rs. 64,080; Sales 90,000, Profit Rs. 25,920.

2. The following details have been obtained from the cost records of Comet Paints Limited:

	Rs.
Stock of raw materials on Sept. 1, 2007	75,000
Stock of raw materials on Sept. 30, 2007	91,500
Direct wages	52,500
Indirect wages	2,750
Sales	2,11,000
Work-in-progress on Sept. 1, 2007	28,000
Work-in-progress on Sept. 30, 2007	35,000
Purchases of raw materials	66,000
Factory rent, rates and power	15,000
Depreciation of plant and machinery	3,500
Expenses on purchases	1,500
Carriage outwards	2,500
Advertising	3,500
Office rent and taxes	2,500
Travellers, wages and commission	6,500
Stock of finished goods on Sept. 1, 2007	54,000
Stock of finished good on Sept. 30, 2007	31,000

Prepare a production account giving the maximum possible break-up of costs and profit.

(B. Com. (Hons), Delhi)

Ans: Prime cost Rs. 1,03,500; Works cost Rs. 1,17,750; Cost of production Rs. 1,43,250; Cost of sales Rs. 1,55,750; Profit Rs. 55,250.

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3. The Managing Director of a small manufacturing concern consults you as to the minimum price at which he can sell the output of one of the departments of the company which is intended for mass production in future. The company's records show the following particulars for this department for the past year:

Production and sales	*100 units*
	Rs.
Materials	13,000
Direct labour	7,000
Direct charges	1,000
	Rs.
Works overheads	7,000
Office overheads	2,800
Selling overheads	3,200
Profit	5,000
	39,000

You ascertain that 40% of the works overheads fluctuate directly with production and 70% of the selling overheads fluctuate with sales. It is anticipated that the department would produce 500 units per annum and that direct labour charges per unit will be reduced by 20%, while fixed works overheads charges will increase by Rs. 3,000. Office overheads and fixed selling overheads charges are expected to show an increase of 25% but otherwise no changes are anticipated.

Ans: Prime cost Rs. 98,000; Factory cost Rs. 1,19,200; Total cost 1,35,100; Profit Rs. 19867.60.

4. The following is the summarised Trading and Profit and Loss A/c of *K*. Waterproof Manufactures, Ltd., for the year ending 31st march, 2007 in which year 800 waterproofs were sold by the said company.

Trading and Profit and Loss A/c

To cost of materials	*Rs. 32,000*	*By Sales*	*Rs. 1,60,000*
To Direct wages	48,000		
To Manufacturing charges	20,000		
To Gross profit c/d	60,000		
	1,60,000		1,60,000
To Office salaries	24,000	By Gross profit b/d	60,000
To Rent and taxes	4,000		
To Selling expenses	8,000		
To General expenses	12,000		
To Net profit	12,000		
	60,000		60,000

Following estimates were made by the costing department of the company for the year ending 31st March, 2008:

(a) The output and the sales will be 1,000 waterproofs.

(b) The price of materials will rise by 25% on the previous year's level.

(c) Wages during the year will rise $12\frac{1}{2}$%.

(d) Manufacturing cost will rise in proportion to the combined cost of materials and wages.

(e) Selling cost per unit will remain unchanged.

(f) Other expenses will remain unaffected by the rise in output.

From the above information prepare a cost statement showing the price at which the waterproofs would be marketed so as to show a profit of 10% on the selling price.

Ans: Selling Price per waterproof Rs. 218.75 including 10% profit on sales or 1/9 profit on cost

5. Baluja Shoe Company manufactures two types of shoes *A* and *B*. Production costs for the year ended 31st December 2008 were as follows:

Direct material	Rs. 15,00,000
Direct wages	8,40,000
Production overhead	3,60,000
	27,00,000

There was no work-in-progress at the beginning or at the end of the year. It is ascertained that:

(i) The cost of direct materials in type *A* shoes is twice as much as that in type *B*.
(ii) The direct wages for type *B* shoes were 60% of those of type *A* shoes.
(iii) Production overhead was the same per pair of *A* and *B* type.
(iv) Administrative overhead for each type was 150% of direct wages.
(v) Selling cost was Rs. 1.50 per pair.
(vi) Production during the year:
Type *A* 40,000 pairs of which 36,000 were sold.
Type *B* 1,20,000 pairs of which 1,00,000 were sold.
(vii) Selling price was Rs. 44 for type *A* and Rs. 28 per pair for type *B*.

Prepare a statement showing cost and profit.

		Cost	*Profit*
Ans:	Type *A*	Rs. 13,50,000	Rs. 2,34,000
	Type *B*	Rs. 22,50,000	Rs. 5,50,000

6. Meera Industries Limited is a single product organisation having a manufacturing capacity of 6,000 units per week of 48 hours. The output data vis-à-vis different elements of cost for three consecutive weeks are as follows:

Unit produced	*Direct material (Rs.)*	*Direct labour (Rs.)*	*Total factory overheads (variable and fixed) Rs.*
2,400	4,800	6,000	37,200
2,800	5,600	7,000	38,400
3,600	7,200	9,000	40,800

As a cost accountant, you are asked by the company management to work out the selling price assuming an activity level of 4,000 units per week and a profit of 20% on selling price.

(ICWA, Inter Year?)

Ans: Selling price per unit Rs. 18.75

7. In a chocolate factory raw materials to the extent of 4,000 lbs. at Rs. 5 per lb. have been issued. Three types of confectionery are to be manufactured, consuming material in the proportion of 4 : 3 : 1 respectively. A wastage of 5% is allowed. The wages for three types are respectively, Rs. 6,000, Rs. 4,000 and Rs. 1,800. Factory overhead is taken to be 70% of wages and office overhead 20% of works cost. Prepare a chart to show the total cost per lb. of each type of confectionery.

Ans.

	Type of Confectionary		
	I	II	III
Total cost per lb. (Rs.)	12.76	12.74	14.05

8. In a manufacturing company, a product passes through 5 operations. The output of the 5th operation becomes the finished product. The input, rejection, output and labour and overheads of each operation for a period are as under:

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Operation	*Input (units)*	*Rejection (units)*	*Output (units)*	*Labour and Overhead (Rs.)*
1	21,600	5,400	16,200	1,94,400
2	20,250	1,350	18,900	1,41,750
3	18,900	1,350	17,550	2,45,700
4	23,400	1,800	21,600	1,40,400
5	17,280	2,880	14,400	86,400

You are required to:

(i) Determine the input required in each operation for one unit of final output.
(ii) Calculate the labour and overhead cost at each operation for one unit of final output and the total labour and overhead cost of all operations for one unit of final output.

(CA, Inter Nov. 1996)

Ans:

	Operation				
	1	*2*	*3*	*4*	*5*
(i) Input required	2.00	1.50	1.40	1.30	1.20

(ii) Total labour and overhead cost for one unit of final output Rs. 60.50.

JOB, CONTRACT AND BATCH COSTING

10

Learning Objectives:

After reading this chapter, you should be able to:

1. describe job costing — nature and its advantages and disadvantages;
2. explain the nature of job cost sheet and contract costing as well;
3. explain sub-contract, work-in-progress in contract costing, cost-plus contract and batch costing and economic batch quantity;
4. describe how costs are recorded on jobs and on contract as well and
5. explain the methods of determining profit on incomplete contracts and the procedure of ascertaining value and profit of contract.

NATURE OF JOB COSTING

Job costing is a costing method applied to determine the cost of specific jobs or lots of production generally manufactured according to customers' specifications. The main feature of the job order costing system is that no two orders are necessarily alike and all orders do not pass through the same manufacturing process. Generally, the job order system is used by manufacturing concerns where an order is produced to a customer's specifications, such as building, contracting, machine tool manufacturing, furniture, foundries, job printing and general engineering. A job may be a product, unit, batch, sales order, project, contract, service, specific programme or any other cost objective that is clearly distinguishable and unique in terms of materials and other services used.

Advantages

Job costing has the following advantages:

1. More accurate costing is possible because all costs are compiled and specifically identified with a specific order or product.
2. It is simple as the recording of direct materials, and direct labour hours is done by product or job.
3. Job cost sheets can be used to control efficiency and estimate future work.
4. It provides a basis for comparing one job cost to another or for comparing a job cost sheet to a cost estimate.

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Disadvantages

Job costing has the following disadvantages:

1. It requires detailed record-keeping for different jobs.
2. The record-keeping for different jobs may prove complicated.
3. A job may be charged for inefficiencies (downtime) although it has not caused it.

JOB COST SHEET AND JOB LEDGER

The focal point of a job order cost system is the cost sheet on which charges for direct materials, direct labour, and indirect manufacturing costs can be accumulated as work on a job order progresses. It is in summary form and records the job number and other specifications and descriptive information as given in the production order. The design of the cost sheet and the number of columns to be used must be determined in terms of departmental and manufacturing characteristics of the business operations. Basically, the recorded costs are grouped under three major headings: material costs, labour costs and applied manufacturing overhead costs. Figure 10.1 presents a specimen of a job cost sheet. When a production order is started in process, a cost sheet identified by a job number is set up in the accounting department.

ABC Company
Job Order Cost Sheet

Customer Name _____ Date _____ Job Order No. _____
Product description _____
Selling price _____ Total cost _____
Cost per unit _____

	Department 1	Department 2	Department 3
Materials:			
Date(s)			
Requisition no.			
Amount			
Labour:			
Date(s)			
Job time card no.			
Amount			
Overhead:			
Rate/Basis			
Amount absorbed			

Cost summary:	Deptt. 1	Deptt. 2	Deptt. 3	Total
Material	_____	_____	_____	_____
Labour	_____	_____	_____	_____
Overhead	_____	_____	_____	_____
Total	_____	_____	_____	_____

Units completed _____ Date Completed _____

Fig. 10.1 **Specimen of a Job Sheet**

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When the job order is finished/completed, the cost summary at the bottom of the form is completed and a unit cost for the job order is computed.

RECORDING COSTS ON JOBS

Materials Costs

Materials used in manufacturing and/or completing jobs are known as direct materials which become part of the finished product. Direct materials are directly charged to the job on which they are used and indirect materials or factory supplies are part of manufacturing overhead and are allocated to the various jobs.

Labour Costs

Direct labour costs can be identified with specific jobs with the help of "job time tickets". When a worker begins work on an order, the starting time is noted on the ticket; when the job order is finished, the stopping time is written in and the time spent on a job is noted. Earnings (wages) are then computed using the employee's hourly rate.

Direct Expenses

Generally speaking, direct expenses are directly charged to individual jobs for which they are incurred. The invoices (of direct expenses) as documentary evidence can be marked with the number of the job to which the cost is to be allocated.

Overhead

Overhead costs are usually charged to work-in-progress by means of a predetermined absorption rate calculated in advance of production. This is derived on the basis of budgeted figures.

RECORDING COMPLETED JOBS

When a job is finished, its cost is determined by totalling prime costs and absorbed overhead. The cost sheet is then marked "completed" and removed from the job ledger. An entry is made to the proper account in the finished goods ledger.

When no unit on a job order is completed, the total cost incurred on the job order so far becomes work-in-progress. Under job costing, the value of closing work-in-progress is obtained from the work-in-progress account. The work-in-progress at the end of an accounting period is carried forward to the subsequent accounting period as opening stock. The expenditure incurred on the job in this subsequent period is added to the opening stock.

Example 10.1

The following information for the year ended 31st December, 2008 is obtained from the books and records of a factory:

	Completed Jobs *Rs.*	*W.I.P.* *Rs.*
Raw material supplied from stores	88,000	32,000
Wages	1,00,000	40,000
Chargeable expenses	10,000	4,000
Materials returned to stores	1,000	—

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Factory overheads are 80% of wages. Office overheads are 25% of factory cost and selling distribution overheads are 10% of cost of production.

The complete jobs realised Rs. 4,10,000. Write up:

(i) Work-in-progress Ledger Control Account
(ii) Completed Job Ledger Control Account; and
(iii) Cost of Sales Account *(B. Com. (Hons), Delhi, 2001)*

Solution:

Consolidated Work-in-Progress A/c

Dr. **Cr.**

	Rs.		*Rs.*
To Raw Material consumed	32,000		
To Wages	40,000		
To Chargeable Expenses	4,000		
To Factory Overheads (80% of wages)	32,000		
Factory Cost	1,08,000		
To Administrative overheads (25% of Rs. 1,08,000)	27,000		
	1,35,000		1,35,000

Note: Selling and distribution operhead has not been charged in Work- in-progress A/c.

Consolidated Completed Job A/c

Dr. **Cr.**

		Rs.		*Rs.*
To Raw Material Consumed	88,000	87,000	By Customer's A/c (Amt. of Jobs completed)	4,10,000
Less: Returned to store	(–) 1,000			
To Wages		1,00,000		
To Chargeable Expense		10,000		
To Factory Over heads (80% of Rs. 1,00,00 of wages		80,000		
Factory Cost		2,77,000		
To Admn. Overheads (25% of Rs. 2,77,000)		69,250		
Cost of Production		3,46,250		
To Selling and Distribution Overhead		34,625		
To N.P. transferred to P and L A/c		29,125		
		4,10,000		4,10,000

Cost of Sales Account

Dr.			Cr.
	Rs.		*Rs.*
To Material consumed	87,000	By Balance c/d	3,80,875
To Wages	1,00,000		
To Direct Charges	10,000		
To Factory Overhead (80% of wages)	80,000		
Factory Cost	2,77,000		
To Admn. Overheads (25% of Rs. 2,77,000)	69,250		
	3,46,250		
To Selling and Distribution 10% of Rs. 3,46,250	34,625		
Cost of Sales	3,80,875		3,80,875

Example 10.2

Xavier company manufactures many products. Each product passes through two production departments, which have the following cost structures:

	Department A	*Department B*
Normal monthly volume (based for overhead rate)	5,000 direct labour hours	10,000 pounds of materials
Monthly fixed costs at normal volume	Rs. 10,000	Rs. 40,000
Monthly variable costs at normal volume	15,000	20,000

Two job orders that went through the factory last month had the following results:

	Job I (Product X)		*Job 2 (Product Y)*	
	Quantity	*Cost (Rs.)*	*Quantity*	*Cost (Rs.)*
Direct inputs:				
Direct materials	480 1bs	2,400	1,500 1bs	4,800
Direct labour:				
Department *A*	180 hrs	1,620	100 hrs	900
Department *B*	60 hrs	420	40 hrs	280
Output	600 units		1,000 units	

(a) Calculate the unit cost of each of these jobs on a full costing basis.
(b) Recalculate unit costs on a variable costing basis.
(c) Why are the relative variable costs of these two products so different from their relative full costs?

Solution:

(a) Full-costing overhead rates:
Department *A*: Rs. 25,000/5,000 = Rs. 5 a direct labour-hour
Department *B*: Rs. 60,000/10,000 = Rs. 6 a pound

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Job order costs:

	Job 1	*Job 2*
Direct materials	Rs. 2,400	Rs. 4,800
Direct labour:		
Department *A*	1,620	900
Department *B*	420	280
Overhead: Department *A* at Rs. 5	900	500
Department *B* at Rs. 6	2,880	9.000
Total	Rs. 8,220	Rs. 15,480
Unit cost Job 1, Rs. 8220/600 units,	Rs. 13.70	Rs. 15.48
Job 2, Rs. 15480/1000 units		

(b) Variable costing overhead rates:

Department *A*: Rs. 15,000/5,000 = Rs. 3 a direct labour-hour

Department *B*: Rs. 20,000/10,000 = Rs. 2 a pound

Job order costs:

	Job 1	*Job 2*
Direct materials	Rs. 2,400	Rs. 4,800
Direct labour:		
Department *A*	1,620	900
Department *B*	420	280
Overhead:		
Department *A* at Rs. 3	540	300
Department *B* at Rs. 2	960	3,000
	Rs. 5,940	Rs. 9,280
Unit cost	Rs. 9.90	Rs. 9.28

(c) Variable unit cost of job 2 is less than that of job 1; full cost was greater for job 2 than for job 1. The main reason is that job 2 used much more of department *B*'s capacity than job 1, and department *B* has a much higher proportion of fixed costs than department *A*. Total profit is thus much more sensitive to variations in sales of product *Y* (job 2) than to variations in sales of product *X*.

Example 10.3

In the current quarter, a company has undertaken two jobs. The data relating to these jobs are as under:

	Job 1102	*Job 1108*
Selling price	Rs. 1,07,325	Rs. 1,57,920
Profit as percentage on cost	8%	12%
Direct Materials	Rs. 37,500	Rs. 54,000
Direct Wages	Rs. 30,000	Rs. 42,000

It is the policy of the company to charge Factory overheads as percentage on direct wages and Selling and Administration overheads as percentage on Factory cost.

The company has received a new order for manufacturing of a similar job. The estimate of direct materials and direct wages relating to the new order are Rs. 64,000 and Rs. 50,000 respectively. A profit of 20% on sales is required.

You are required to compute

(i) The rates of Factory overheads and Selling and Administration overheads to be charged.
(ii) The Selling price of the new order. *(CA, PE, Exam II, Group II, Nov. 2002)*

Solution:

Working Notes:

1. Computation of total cost of jobs

Total cost of Job 1102 when 8% is the profit on cost $= \frac{\text{Rs. } 107{,}325}{\text{Rs. } 108} \times 100$

$= \text{Rs. } 99{,}375$

Total cost of Job 1108 when 12% is the profit on cost $= \frac{\text{Rs. } 1{,}57{,}920}{\text{Rs. } 112} \times 100$

$= \text{Rs. } 1{,}41{,}000$

2. Factory overheads $= F$ % of direct wages
   Selling and Administrative overheads $= A$ % of factory cost

(i) Computation of rates of factory overheads and selling and administration overheads to be charged.

Jobs Cost Sheet

	Job 1102	*Job 1108*
	Rs.	Rs.
Direct materials	37,500	54,000
Direct wages	30,000	42,000
Prime cost	67,500	96,000
Add: Factory overheads	30,000*F*	42,000*F*
Factory cost *(Refer to Working Note 2)*	(67,500 + 30,000 *F*)	(96,000 + 42,000 *F*)
Add: Selling and Administration Overheads *(Refer to Working Note 2)*	(67,500 + 30,000 *F*)*A*	(96,000 + 42,000 *F*)*A*
Total cost	(67,500 + 30,000 *F*) (1 + *A*)	(96,000 + 42,000 *F*) (1 + *A*)

Since the total cost of jobs 1102 and 1108 are equal to Rs. 99,375 and Rs. 1,41,000 respectively, therefore we have the following equations *(Refer to Working Note 1)*

(67,500 + 30,000 *F*) (1 + *A*)	=	99,375	(1)
(96,000 + 42,000 *F*) (1 + *A*)	=	1,41,000	(2)
or 67,500 + 30,000 *F* + 67,500 *A* + 30,000 *FA*	=	99,375	
96,000 + 42,000 *F* + 96,000 *A* + 42,000 *FA*	=	1,41,000	
or 30,000 *F* + 67,500 *A* + 30,000 *FA*	=	31,875	(3)
42,000 *F* + 96,000 *A* + 42,000 *FA*	=	45,000	(4)

On solving (3) and (4) we get: $A = 0.25$ and $F = 0.40$
Hence $A = 25\%$ and $F = 40\%$

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(ii) Selling price of the new order:

	Rs.
Direct materials	64,000
Direct wages	50,000
Prime cost	1,14,000
Factory overheads (40% × Rs. 50,000)	20,000
Factory cost	1,34,000
Selling and Admn. Overheads (25% × Rs. 1,34,000)	33,500
Total cost	1,67,500

If selling price of new order is Rs. 100 then Profit is Rs. 20 and Cost is Rs. 80

Hence selling price of the new order = $\frac{\text{Rs. } 1,67,500}{80} \times 100 = \text{Rs. } 2,09,375$

Example 10.4

A pipe company has been in operation for one year. It manufactures concrete pipes in lengths of 4 m has the necessary equipment to produce 18, 24, 30 and 36 mm pipes. The company has one basic machine to produce pipes. Only one size is made during each working day of eight hours. The last hour is used by the crew for clean-up and, as necessary, for changing the machine so that a different size can be made the following day. Production during the first year was limited to sizes from 18 to 30 mm inclusive. The company has prepared the following schedule of profit and loss for the year just ended:

	Rs.	*Rs.*
Sales		58,000
Raw materials purchased	17,657	
Direct labour	13,255	
Freight inward	2,447	
Delivery expenses	3,582	
Depreciation: Factory building	600	
Office building	280	
Factory machinery	3,000	
Office furniture	200	
Electric power—factory	1,519	
Shop supplies	2,550	
Office salaries	1,000	
Office salaries and expenses	5,200	
Telephone and telegraph	375	
Repairs and maintenance—factory	2,175	
Commission of sales	2,700	
Other factory expenses	760	
General office expenses	200	
Raw material inventory—Year-end		1,630
Finished goods inventory—Year-end (as estimated)		5,990
Profit for the year	8,120	
	65,620	65,620

Your review of records discloses the following data as to production and sales:

Pipe diameter	*Metres produced*	*Metres sold*	*Metres unsold*	*Kilograms per metre*	*Total weight (kg)*	*Production per day (metre)*	*Selling price per metre (Rs.)*
18	7,200	6,200	1,000	150	1,50,000	120	2.20
24	10,200	8,120	2,080	250	5,20,000	100	3.00
30	6,320	5,000	1,320	400	5,28,000	80	4.00

You are required to:
(a) Compute the manufacturing cost of each size of pipe during the year on a per metre basis.
(b) Prepare a schedule showing which size of pipe would be most profitable.
(c) Compute the value for the closing inventory of pipe of each size. *(ICWA, Inter)*

Solution:

(a) Material Cost

(i) Materials consumed: Raw-materials purchased	Rs. 17,657	
Freight inward	2,447	Rs. 20,104
Year-end inventory		(1,630)
Consumption during the year		Rs. 18,474

(ii) Production in terms of weight (kg)

Size diameter	*Metres produced*	*Kilograms per metre*	*Production in weight (kg)*
18	7,200	150	10,80,000
24	10,200	250	25,50,000
30	6,320	400	25,28,000
			61,58,000

(iii) Material costs per kg of output = 18,474/61, 58,000 = Re. 0.003 per kg.
(iv) Material costs per metre

Size diameter (in mm)	*Kilograms per metre*	*Rate per kg (Rs.)*	*Cost per metre (Rs.)*
18	150	0.003	0.45
24	250	0.003	0.75
30	400	0.003	1.20

(b) Conversion cost

(i) Conversion cost incurred during the year:		
Direct labour		13,255
Depreciation: Factory building	600	
Factory machinery	3,000	3,600
Electric power—factory		1,519
Shop supplies		2,550
Repairs and maintenance—factory		2,175
Other factory expenses		760
Total		Rs. 23,859

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(ii) Total number of days worked

Size diameter (in mm)	*Metre produced*	*Production per day*	*No. of days (2/3)*
18	7,200	120	60
24	10,200	100	102
30	6,320	80	79
			Total 241

(iii) Conversion cost per day = (Rs. 23,859/241) = Rs. 99 per day

(iv) Conversion cost per metre

Size diameter (in mm)	*Conversion cost (Rs.)*	*Production per day (metre)*	*Conversion cost per metre (Rs.)*
18	99	120	0.8250
24	99	100	0.9900
30	99	80	1.2375

(a) Statement of Manufacturing Cost (Rs.)

	18 mm (7,200 m)		*24 mm (10,200 m)*		*30 mm (6,320 m)*	
	Per metre	*Total*	*Per metre*	*Total*	*Per metre*	*Total*
Material cost	0.4500	3,240	0.7500	7,650	1.2000	7,584
Convention cost	0.8250	5,940	0.9900	10,098	1.2375	7,821
Total	1.2750	9,180	1.7400	17,748	2.4375	15,405

(b) Profitability Statement

	18 mm	*24 mm*	*30 mm*
Selling price per metre (Rs.)	2.2000	3.0000	4.0000
Manufacturing cost per metre (Rs.)	1.2750	1.7400	2.4375
Gross profit (Rs.)	0.9250	1.2600	1.5625

Conclusion: 30 mm diameter pipe is the most profitable product.

(c) Value of the Closing Inventory

Size diameter (in mm)	*Closing inventory (metres)*	*Manufacturing cost per metre*	*Value (Rs.)*
18	1.000	1.2750	1,275.00
24	2.080	1.7400	3,619.20
30	1.320	2.4375	3,217.50
			Rs. 8,111.70

Notes:

(i) Manufacturing cost does not include office expenses.

(ii) Material cost per kg has been worked out for allocating of materials costs to various sizes of pipes.

The reason for this is that it is more logical to assume that material costs vary in direct proportion to the weight of output. This may not always be true. The percentage of 'spoilt jobs' may be different for different sizes of pipes and consequently the output-input ratio may be different for different sizes and this may give misleading results, if material costs are allocated in the ratio of the output weight.

(iii) Conversion costs per day have been used as the basis for apportionment of conversion costs, because most expenses accrue on the basis of time. The question indicates that 'only one size is made during each working day' and, therefore, per day rate provides an equitable basis for apportionment. However, if all the sizes of pipes were made every day, hourly rate would have to be used instead of the 'rate per day'.

CONTRACT COSTING

Contract costing, sometimes known as terminal costing, follows the same principles as job costing and is used by such concerns as firms of builders and public works contractors who undertake work on a contract basis.

Following are the special features of contract costing:

1. The contractor begins work on a small number of large contracts in the course of a year.
2. The contracts are completed away from the contractor's premises.
3. The contracts may continue over more than one accounting period.
4. Materials are purchased and delivered direct to the contract site and/or are drawn from the central stores.
5. The payroll is prepared at either the site or at a central administrative office.
6. Sub-contractors may be employed, for example, ventilation engineers, lift manufacturers, flooring specialists, etc.
7. Plant and equipment may be purchased, or hired for the duration of the contract from another business or from a central plant department.
8. Payment by the customer for various stages of the contract is made only on receipt of architect's certificate for the completed stage. A reduction called retention money is withheld by the customer until a specific period of time, agreed in the original contract, has passed.
9. The contract price is normally estimated in advance of the work. Additional work found necessary may be charged on a cost-plus basis. In addition, clauses may be inserted to allow the contractor to pass on to the customer additional costs incurred as a result of increase in material, labour and other costs.

RECORDING COSTS ON CONTRACT

Under contract costing, a contract is basically the cost unit and for the purpose of control, it can be regarded as a cost centre. Under contract costing only allocation is required directly to the contract. Overhead costs are normally incurred at the head office and are sometimes known only as storage costs. Such overhead costs tend to be of a small figure and are often absorbed on some arbitrary basis such as a percentage on prime cost.

A separate account, the contract account, is opened for each individual contract for the purpose of determining the profit or loss on each contract. In the contract account the following costs are recorded:

Materials

Materials required for a specific contract are debited to the contract account. Materials returned under the materials returned note are credited with the contract.

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Materials transferred from one contract to another are recorded in material transfer notes; the contract receiving the material is debited and the contract giving the material is credited. Materials not required for current use are sometimes sold at the site, and the amount received from sale of materials is credited to the contract account, and any profit or loss, being the difference between the cost and sale value, is transferred to the profit and loss account. This also applies not only to materials, but also to sale of plant, machinery, tools, etc. At the end of the accounting period the value of materials remaining unutilised on site is carried forward as a charge against the next period. In the accounting year, the amount will be debited to the materials or stores at site account and credited to the contract account. Materials stolen or destroyed by fire are transferred to the profit and loss account and also shown on the credit side of the contract account.

The customer or contractee may supply certain materials from own stock to be utilised in construction work. Such materials should not be debited (charged) to the contract account; a separate memorandum record outside the account will be sufficient. Such materials do not affect the contract price.

Wages

Wages of all workers engaged on a particular contract are allocated direct to that contract, regardless of work they perform. Where workers move from one contract to another, time-sheets must be maintained and wages may be distributed on the basis of time spent under each contract. The wages of the head office and central stores are considered as overhead and are charged to contracts on an equitable basis. Wages accrued or outstanding at the end of the period should appear on the debit side of contract.

Expenses

All expenses other than material and wages are charged to individual contracts as and when they are incurred. Examples of such expenses are hire charge of plants obtained from outside, architects' and consultants' fees, electricity, insurance, etc.

Plant and Machinery

For use of plant and machinery in a particular contract, the depreciation may be charged in any one of the following ways:

1. When the plant has been specially purchased for a particular contract and will be exhausted at site, the total cost of the plant is debited to the contract in which it is used. When the contract is completed or the plant is no longer required, it may be sold at site and contract is credited with the sale proceeds. If it is not sold, the contract is credited with the depreciated (revalued amount) value. Thus, the contract account stands debited with the amount of depreciation. This method has the drawback that the debit side is unnecessarily inflated with the plant value, and the cost of contract at first sight appears to be very high. In order to overcome this problem, the difference between the original cost at commencement and the depreciated value at the end of the period is obtained and charged to the contract account concerned as plant depreciation.
2. When the plant is sent to the contract site only for a short period, it is usual to charge the contract for the use on a daily or hourly basis. Depreciation is charged at an hourly rate for the hours the plant has worked. If the plant is taken on hire, only the hire charges are debited to the contract and not depreciation.

Sub-Contract

When a sub-contractor is engaged for a special work connected with the main contract, the work performed by the sub-contractor forms a direct charge to the main contract. The payments made to sub-contractors are

charged in totals to the concerned contract account as direct expense and no detailed record, or break-up of the sub-contract amount is necessary for cost purposes.

Materials issued to the sub-contractor, free of charge, should be charged to the contract account. Heavy tools and equipment may be supplied to sub-contractor on a rental basis. The depreciation on these equipments should be charged to the contract account and the rental received is credited to it or shown as a deduction from the sub-contractor's bill.

VALUE AND PROFIT OF CONTRACT

As the contract work proceeds, the surveyor appointed by the contractee issues certificates to the effect that so much portion has been completed. The contractor will get money according to this certificate and a certain portion thereof shall be retained by the contractee. The money so retained is called retention money. For example, if a certificate has been issued for Rs. 2,00,000 and 70% has been paid, the following entries will be made:

First Method

1. Contractee's account	2,00,000	
To contract A/c		2,00,000
(being value of the work certified)		
2. Bank A/c Dr	1,40,000	
To contractee's A/c		1,40,000
(being amount of cash received)		

Second Method

The amount of work certified will be debited to the work-in-progress account and credited to the contract account. The work-in-progress account is shown as an asset in the balance sheet after deducting the amount received from the contractee. Until the contract is completed, the amount received from the contractee is advance payment and is deducted from work-in-progress in the balance sheet. When the contract is completed, the contractee account is debited with the contract price. In the next year, the work-in-progress account is transferred to the debit side of the contract account. On completion of the contract, the contractee's personal account is debited and the contract account credited. Taking the above example, the journal entries will be as follows:

1. Work-in-progress A/c	Rs. 2,00,000	
To Contract A/c		Rs. 2,00,000
(being work certified)		
2. Bank A/c Dr	Rs. 1,40,000	
To Contractee's A/c		1,40,000
(being amount received)		

Balance Sheet

Asset Side	(Rs.)
Work-in-progress	2,00,000
Less: Amount received	1,40,000
	60,000

Such work which has not been so far approved by the contractee's architect or surveyor is termed as "work uncertified". It is valued at cost and credited to the contract account and debited to the work-in-progress account, which will be transferred in the next year to the debit side of the contract account.

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Work certified and work uncertified can be found in the following manner:

Cost of Work Certified:		*Cost of Work Uncertified:*	
	Cost of work to date		Total cost to date
Less:	Cost of work uncertified	*Less:*	Cost of work certified
	Materials on hand		Materials on hand
	Plant at site		Plant at site
=	Cost of work certified	=	Cost of work uncertified

WORK-IN-PROGRESS

Work-in-progress includes the amount of work certified (valued at contract price) and the amount of work uncertified. The work-in-progress account will appear on the asset side of the balance sheet. The amount of cash received from the contractee and reserve for contingencies (as discussed in the case of incomplete contracts) will be deducted out of this amount. The work-in-progress account appears as follows in the balance sheet.

1. When work certified has been treated according to the first method:

Balance sheet as on _____

Work-in-progress:
Balance in the contractee's A/c
Add: Work uncertified
Less: Reserve for unrealised profit

2. When work certified has been treated according to the second method:

Balance sheet as on _____

Work-in-progress:	
Value of work certified	_____
Cost of work uncertified	_____
Less: Reserve for unrealised profit	_____
Less: Amount received from contractee	_____

In contract accounts the value of work-in-progress consists of: (i) the cost of work completed, both certified and uncertified, (ii) the cost of work not yet complete; and (ii) the amount of profit taken as credit. Taking these into account, the work-in-progress in the balance sheet can be shown as follows:

Balance sheet as on _____

Work-in-progress:	
Cost of work certified	_____
Cost of work uncertified	_____
Less: Amount received from contractee	_____
Add: Profit taken as credit to profit and loss A/c	_____

PROFIT ON INCOMPLETE CONTRACTS

Many contracts take more than one financial year to be completed. A problem arises whether profit on such a contract should be worked out only on its completion or whether some profits may be computed every year. The conservative method is to value work-in-progress only at cost and no credit is taken for profit till it is actually earned. This method, however, results in wide fluctuations in the net profit of the enterprise from year

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to year. If several contracts are completed in a year, the profit will be high while in extreme cases in some years, when not a single contract is fully completed, the profit will be nil. It becomes necessary, therefore, to compute profit on partly completed contracts and take credit for a part of it in the accounts at the year end.

The manner of computation of profit is largely dependent upon how for the contract has advanced, that is, the stage of completion it has reached.

1. Profit should be considered in respect of work certified only, work uncertified should always be valued at cost.
2. For contracts which have been completed less than one-fourth of the contract, no profit should be computed and credited to the profit and loss account.
3. In case of contracts which are complete by more than 25% but less than 50%, one-third of notional profit, reduced in the ratio of cash received to work-certified, is transferred to profit and loss A/c. The balance in the notional profit is carried forward in the same contract as profit in suspense as a provision against future losses, increase in costs and other contingencies. The following formula is used to determine the amount of profit to be transferred to profit and loss A/c.

$$\frac{1}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

Notional profit is the difference between the value of work certified and cost of work certified. It is determined in the following manner.

Notional profit = Value of work certified–(cost of work to date–cost of work not yet certified)

4. In case contracts are complete between 50% and 90% (more than 50% but less than 90%), two-third of notional profit, reduced by the proportion of cash received to work certified, is transferred to profit and loss A/c. The formula to be used for this purpose is:

$$\frac{2}{3} \times \text{Notional Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

5. In case contracts are complete by 90% or more than 90%, the contract is considered almost complete. In such contracts, the estimated total profit is first determined by deducting the total costs to date and additional expenditure necessary to complete the contract from the contract price. A portion of this estimated total profit is credited to profit and loss A/c, which can be determined by using any one of the following formulae:

(i) $$\text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

(ii) $$\text{Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

or

$$\text{Estimated Profit} \times \frac{\text{Cash Received}}{\text{Work Certified}}$$

The second formula is preferable to first formula. In case estimated profit cannot be determined due to some reason, for example, if additional expenditure is not mentioned, then the amount of profit to be transferred to profit and loss A/c is determined using the following formula:

$$\text{Notional Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

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6. The total of loss, if any, should be transferred to the profit and loss account by crediting the contract account.

In contract accounting, the profit earned on contracts is reduced proportionately by the amount of cash received, otherwise the unrealised profit may stand for distribution as dividends. Also, the sound principle of conservatism requires that all future contingencies and possible losses should be accounted for before determining the profit on contract.

COST-PLUS CONTRACT

A cost-plus contract is a contract in which the value of the contract is determined by adding a fixed margin of profit to the total cost of the contract. The contractee agrees to pay this inflated value of contract which includes a profit margin as per the agreement. Both the parties determine in advance the possible costs that would be included in the cost of contract. The profit to be added to the cost of contract may be agreed as a percentage on cost or the capital employed. Cost-plus contracts are generally needed when the costs of contracts cannot be accurately determined due to unstable and fluctuating conditions of materials, labour and service, etc. The price of materials, labour and services usually tend to fluctuate over a long period.

Cost-plus contracts are useful to both the parties, contractor (manufacturer), contractee (customer). The contractor is suitably protected against any fluctuations in the prices of materials, labour, and overhead which will be used in production or completion of the job. A cost-plus contract is beneficial to the contractee (customer) also. The contractee is protected against an uncertain market which may push up the cost of the contract. The price agreed to be paid by the contractee is based on actual cost. In this way the contract price is not determined arbitrarily.

Sometimes a contract may contain an "escalator clause" which provides for change in the price of the contract due to change in the prices of the raw materials, labour and overhead services. The contractor presents evidential proof of increased costs to the contractee to claim reimbursements. Under the escalator clause the contract price is increased for a given increase in the prices of inputs. For instance, it may be agreed that if the prices of raw materials go up by 15%, the contract price will be increased by 2%.

Example 10.5

An amount of Rs. 19,80,000 was incurred on a contract work up to 31.03.2004. Certificates have been received to date to the value of Rs. 24,00,000 against which Rs. 21,60,000 has been received in cash. The cost of work done but not certified amounted to Rs. 45,000. It is estimated that by spending an additional amount of Rs. 1,20,000 (including provision for contingencies) the work can be completed in all respects in another two months. The agreed contract price of the work is Rs. 25 lakhs. Compute a conservative estimate of the profit to be taken to the Profit and Loss Account. *(ICWA, Inter, Stage 1, Dec 2004)*

Solution:

COMPUTATION OF ESTIMATED TOTAL PROFIT

	Rs.
Expenditure incurred upto 31st March, 2004	19,80,000
Estimated additional expenditure (including provision for contingencies)	1,20,000
Estimated total cost (*A*)	21,00,000
Contract price (*B*)	25,00,000
Estimated total profit (*B*–*A*)	4,00,000

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COMPUTATION OF A CONSERVATIVE ESTIMATE OF THE PROFIT TO BE TAKEN TO PROFIT AND LOSS ACCOUNT

(1) $$\text{Estimated Profit} \times \frac{\text{Value of work certified}}{\text{Contract price}} \times \frac{\text{Cash received}}{\text{Value certified}}$$

$$= 4{,}00{,}000 \times \frac{24{,}00{,}000}{25{,}00{,}000} \times \frac{21{,}60{,}000}{24{,}00{,}000} = \text{Rs. } 3{,}45{,}600$$

or

(2) $$\text{Estimated profit} \times \frac{\text{Cash of work to date}}{\text{Estimated total cost}} \times \frac{\text{Cash received}}{\text{Value certified}}$$

$$= 4{,}00{,}000 \times \frac{19{,}80{,}000}{21{,}00{,}000} \times \frac{21{,}60{,}000}{24{,}00{,}000} = \text{Rs. } 3{,}39{,}429 \text{ that is, } 3{,}39{,}430 \text{ (rounded off)}$$

or

(3) $$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Value certified}} = 4{,}00{,}000 \times \frac{21{,}60{,}000}{24{,}00{,}000} = \text{Rs. } 3{,}60{,}000$$

or

$$2/3 \times \text{ National Profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

or

$$= 2/3 \times 4{,}00{,}000 \times \frac{21{,}60{,}000}{24{,}00{,}000} = \text{Rs. } 2{,}40{,}000$$

or

(4) $$\text{National Profit} \times \frac{\text{Work Certified}}{\text{Contract price}}$$

$$= 4{,}00{,}000 \times \frac{24{,}00{,}000}{25{,}00{,}000} = \text{Rs. } 3{,}84{,}000$$

Example 10.6

Engineers Ltd. undertook several contracts during the year 2001. The following information relate to contract No. 107:

		Rs.
Direct Materials		20,250
Direct Wages		15,500
Stores issued		10,500
Loose Tools		2,400
Tractor Expenses:		
Running Material	Rs. 2,300	
Wages of Driver	Rs. 3,000	5,300
Other Direct charges		2,650

The contract took 13 weeks on its completion. The values of loose tools and stores returned at the end of the period were Rs. 200 and Rs. 3,000 respectively. The plant was also returned at a value of Rs. 16,000 after charging depreciation at 20%. The value of tractor was Rs. 20,000 and the depreciation was to be charged to

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the tractors 15% per annum. The administration and office expenses are to be provided at 10% on works cost Profit to be charged at 20% of the total cost.

Prepare the aforesaid Account assuming the balance of the contract was duly received from the contractee.

(B.Com (Hons), Delhi, 2002)

Solution:

Dr. Contract Account Cr.

Particulars		*Rs.*	*Particulars*	*Rs.*
To Direct Material		20,250	By Stores returned	3,000
To Direct Wages		15,500	By Loose Tools returned	200
To Stores Issue		10,500	To Plant returned	16,000
To Loose Tools		2,400	By balance being Works	
To Tractor Expenses:			Cost c/d	58,150
Running Material	2300			
Wages to Drivers	3000	5,300		
To Depreciation on Tractor @ 15% on Rs. 20,000 for 13 weeks		750		
To other direct charges		2,650		
		77,350		77,350
To Balance being works cost b/d		58,150	By Balance being Total	
To Administrative and Office Expenses @ 10% on works cost that is on Rs. 58,150		5,815	Cost c/d	63,965
		63,965		63,965
To Total Cost b/d		63,965	By Contract's A/c	76,758
To Profit and Loss A/c @ 20% on Total cost		12,793		
that is Rs. 63,965		76,758		76,758
To Contract A/c		76,758	By Bank A/c	76,758

Example 10.7

The following is the summarised information relating to contract accounts number 100:

	Rs.
Contract price	6,00,000
Wages	1,64,000
General expenses	8,600
Materials	1,20,000
Cash received (80% of certified work)	2,40,000
Materials at site	10,000
Plant	20,000

Included in the above information are wages Rs. 3,500, materials Rs. 4,000 and other expenses Rs. 2,500 which were incurred since certification. Depreciate plant at 10%. Prepare contract A/c

(B.Com. (Hons), Delhi, 2004)

Solution:

Contract Account No. 100

Dr. **Cr.**

Particulars	*Rs.*	*Particulars*		*Rs.*
To Materials	1,20,000	By Material at site		10,000
To Wages	1,64,000	By Plant in hand		
To General expenses	8,600	Cost	20,000	
To Plant	20,000	*Less:* Dep	2000	18,000
		By work in progress:		
To Balance c/d	25,400	Value of work certified		
		$\frac{2,40,000 \times 100}{80} = 3,00,000$		
		Work-uncertified 10000		3,10,000
	3,38,000			3,38,000
To P and L A/c		By Balance b/d		25,400
$\left(25,400 \times \frac{2}{3} \times \frac{80}{100}\right)$	13,547			
To work in progress	11,853			
	25,400			25,400

Work uncertified = Material + wages + other exp.
= Rs. 4,000 + Rs. 3,500 + Rs. 2,500 = Rs. 10,000

Example 10.8

The following is the trial balance of Premier Construction Company engaged on the execution of Contract No. 1047 for the year 31st Dec., 2005:

		Rs.
Contractee's account (amount received)		3,00,000
Buildings	1,60,000	
Creditors		72,000
Bank balance	35,000	
Capital account		5,00,000
Materials	2,00,000	
Wages	1,80,000	
Expenses	47,000	
Plant	2,50,000	
	8,72,000	8,72,000

The work on contract 1047 was commenced on 1st January 2005. Material costing Rs. 1,70,000 were sent to the site of the contract but those of Rs. 6,000 were destroyed in an accident. Wages of Rs. 1,80,000 were paid during the year. Plant costing Rs. 50,000 was used on the contract all through the year. Plant with a cost of Rs. 2 lakhs was used from 1st January to 30th September and was then returned to stores. Materials of the cost of Rs. 4,000 were at site on 31st December, 2005.

The contract was for Rs. 6,00,000 and the contractee pays 75% of the work certified. Work certified was 80% of the total contract work at the end of 2005. Uncertified work was estimated at Rs. 15,000 on 31st December, 2005. Expenses are charged to contract at 25% of wages. Plant is to be depreciated at 10% p.a.

Prepare Contract No. 1047 account for the year 2005 and make out the Balance Sheet as on 31st December, 2005 in the books of Premier Construction Company. *(B.Com. (Hons), Delhi, 2006)*

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Solution:

Contract No. 1047 Account for the year ended 2005

To Material	1,70,000	By Abnormal loss – P and L A/c			6,000
To Wages	1,80,000	By Plant returned to			
To Expenses (25% of wages)	45,000	store	2,00,000		
			1,85,000		
To Plant	2,50,000	*Less:* Dep @ 10%			
To Profit c/d	90,000	for 9 months	15,000		1,85,000
		By Plant at site	50,000		
		Less: Depreciation			
		@ 10% for the year	5,000		45,000
		By Material at site			4,000
		By Work in Progress			
		Work certified	4,80,000		
		Work uncertified	15,000		4,95,000
	7,35,000				7,35,000
To Profit & Loss A/c (W.N. 1)	45,000	By Profit b/d			90,000
To work in Progress (Reserve)	45,000				
	90,000				90,000

Working Note. Profit taken to Profit and Loss Account

$$90{,}000 \times \frac{2}{3} \times \frac{75}{100} = \text{Rs. } 45{,}000$$

Balance Sheet of Premier Construction Company as on 31st December 2005

Liabilities		*Amount*	*Assets*		*Amount*
Capital		5,00,000	Building		1,60,000
Profit and Loss A/c	45,000		Plant		
Less: Abnormal Loss	6,000		in store	1,80,000	
	39,000		at contract site	45,000	2,25,000
Less: Depreciation on					
plant	5,000		Materials:		
	34,000		in store	30,000	
Less: Unabsorbed	2,000	32,000	at contract site	4,000	34,000
Expenses (W.N. 2)					
Creditors		72,000	Work in Progress:		
			Work certified	4,80,000	
			Work uncertified	15,000	
				4,95,000	
			Less: Reserve	45,000	
				4,50,000	
			Less: Cash Received	3,00,000	1,50,000
			Bank balance		35,000
		6,04,000			6,04,000

Working Note. Actual Expenses	47,000
Absorbed Expenses (25% of wages)	45,000
Unabsorbed Expenses	2,000

Example 10.9

ABC Ltd. began to trade on 1st January, 2006. During 2006 the company was engaged on only one contract of which the contract price was Rs. 5,00,000. Of the plant and materials charged to the contract, plant which cost Rs. 5,000 and materials which cost Rs. 4,000 were lost in an accident. On 31st December, 2006 plant which cost Rs. 5,000 was returned to the store, the cost of work done but uncertified was Rs. 2,000 and materials costing Rs. 4,000 were in hand on site. Charge 10% depreciation on plant. Prepare Contract A/c and the Balance Sheet from the following:

Trial Balance as on 31st December, 2006

	Rs.	Rs.
Share Capital		1,20,000
Creditors		10,000
Cash recd.		
(80% of work certified)		2,00,000
Land and Building	43,000	
Bank Balance	25,000	
Charged to contract:		
Materials	90,000	
Plant	25,000	
Wages	1,40,000	
Expenses	7,000	
	3,30,000	3,30,000

(B.Com. (Hons) Delhi, 2007)

Solution:

Contract A/c

	Rs.		Rs.	Rs.
To Material	90,000	By W.I.P		
To Plant	25,000	Work Certified	2,50,000	
		Work Uncertified	2,000	2,52,000
To Wages	1,40,000	By P and L A/c (Ab. Loss)		
To Expenses	7,000	Material	4,000	
To balance c/d	21,000	Plant	5,000	9,000
		By Plant returned to stores (Cost Less Depreciation (5000 – 500))		4,500
		By Plant at site		13,500
		By Material at site		4,000
	2,83,000			2,83,000
To P and L A/c	11,200	By balance b/d		21,000
To Reserve	9,800			
	21,000			21,000

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Balance Sheet of ABC Ltd. as on 31. Dec. 2006

Liabilities		*Amount*	*Assets*		*Amount*
Share capital		1,20,000	Land and Building		43,000
P and L A/c	11,200		Plant in store		4,500
Less: Ab. Loss	9,000	2200	Plant at the site		13,500
			Material at site		4,000
Creditors		10,000	Work in progress		
			Work certified	2,50,000	
			Work uncertified	2,000	
				2,52,000	
			Less: Reserve	9800	
				2,42,200	
			Less: Cash received	2,00,000	42,200
			Bank		25,000
		1,32,000			1,32,000

Example 10.10

Paramount Engineers are engaged in construction and erection of a bridge under a long-term contract. The cost incurred upto 31.03.2001 was as under:

Fabrication	(Rs. in Lakh)
Direct Materials	280
Direct Labour	100
Overheads	60
	440
Erection costs to date	110
	550

The contract price is Rs. 11 crores and the cash received on account till 31.03.2001 was Rs. 6 crores.

A technical estimate of the contract indicates the following degree of completion of work:

Fabrication–Direct Material–70%, Direct Labour and Overheads 60%, Erection–40%. You are required to estimate the profit that could be taken to Profit and Loss Account against this partly completed contract as at 31.03.2001. *(CA Inter, May 2001)*

Solution:

Estimation of Profit to be taken to Profit and loss Account against partly completed contract as at 31.3.2001

$$\text{Profit to be taken to P/L Account} = \frac{2}{3} \times \text{Notional profit} \times \frac{\text{Cash received}}{\text{Work certified}}$$

(Refer to Working Notes 1, 2, 3 and 4)

$$= \frac{2}{3} \times \text{Rs. } 92.48 \text{ lakh} \times \frac{\text{Rs. } 600 \text{ lakh}}{\text{Rs. } 642.48 \text{ lakh}}$$

$$= \text{Rs. } 57.576 \text{ lakh}$$

Working Notes:

1. Statement showing estimated profit to date and future profit on the completion of contract

Particulars	*Cost to date*		*Further costs*		*Total*
	% completion to date	*Amount Rs. (a)*	*% completion to be done*	*Amount Rs. (b)*	*cost Rs. (a) + (b)*
Fabrication costs:					
Direct material	70	280.00	30	120.00	400.00
Direct labour	60	100.00	40	66.67	166.67
Overheads	60	60.00	40	40.00	100.00
Total fabrication costs: (*A*)		440.00		226.67	666.67
Erection cost: (B)	40	110.00	60	165.00	275.00
Total estimated costs: (*A* + *B*)		550.00		391.67	941.67
Profit		92.48		65.85	158.33
(Refer to Working Note 2)					
		642.48		457.52	1,100.00

2. Profit to date (Notional Profit) and future profit are calculated as below:

$$\text{Profit to date (Notional Profit)} = \frac{\text{Estimated profit on whole contract} \times \text{Cost to date}}{\text{Total cost}}$$

$$= \frac{\text{Rs. } 158.33 \times \text{Rs. } 550}{\text{Rs. } 941.67}$$

$$= \text{Rs. } 92.48 \text{ (lakh)}$$

$$\text{Future profit} = \text{Rs. } 158.33 - \text{Rs. } 92.48$$

$$= \text{Rs. } 65.85$$

3. Work certified:

$$= \text{Cost of the contract to date} + \text{Profit to date}$$

$$= \text{Rs. } 550 + \text{Rs. } 92.48 = \text{Rs. } 642.48 \text{ lakhs}$$

4. Degree of Completion of Contract to date:

$$= \frac{\text{Cost of the contract to date}}{\text{Contract price}} \times 100$$

$$= \frac{\text{Rs. } 642.48 \text{ lakh}}{\text{Rs. } 1{,}100 \text{ lakh}} \times 100$$

$$= 58.40\%$$

Example 10.11

Brock Construction Ltd. commenced a contract on November 1, 2003. The total contract was for Rs. 39,37,500. It was decided to estimate the total profit of the contract and to take to the credit of P/L A/c that proportion of estimated profit on cash basis, which work completed bore to the total contract. Actual

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expenditure for the period November 1, 2003 to October 31, 2004 and estimated expenditure for November 1, 2004 to March 31, 2005 are given below:

		November 1, 2003 to October 31, 2004 (Actuals) Rs.	*November 1, 2004 to March 31, 2005 (Estimated) Rs.*
Material issued		6,75,000	12,37,500
Labour	Paid	4,50,000	5,62,500
	Prepaid	25,000	—
	Outstanding		2,500
Plant purchased		3,75,000	—
Expenses:	Paid	2,00,000	3,50,000
	Outstanding	50,000	25,000
Plant return to store		75,000	3,00,000
(Historical cost)		(on March 31, 2004)	(on March 31, 2005)
Work certified		20,00,000	Full
Work uncertified		75,000	
Cash received		17,50,000	
Material at site		75,000	37,500

The plant is subject to annual depreciation @ 33% on written down value method. The contract is likely to be completed on March 31, 2005.

Required

Prepare the contract A/c. Determine the profit on the contract for the year November, 2003 to October, 2004 on prudent basis, which has to be credited to P/L a/c *(CA, PE, Exam II, Group II, Nov. 2004)*

Solution:

Brock Construction Ltd. Contract A/c
(November 1, 2003 to Oct. 31, 2004)

Dr.					**Dr.**
Particulars		*Amount (Rs.)*			*Amount (Rs.)*
To Materials issued		6,75,000	By Plant returned to store on 31/03/04 at cost	75,000	
To Labour paid	4,50,000		*Less:* Dep (1/3)	10,417	64,583
Prepaid	25,000	4,25,000	By WIP:		
To Plant purchased		3,75,000	Certified	20,00,000	
To Expenses paid	2,00,000		Uncertified	75,000	20,75,000
To Outstanding	50,000	2,50,000	By Plant at site		
To Notional profit c/d		6,89,583	31/10/04 at Cost	3,00,000	
		24,14,583	*Less:* Dep (1/3)	1,00,000	2,00,000
To P/L A/c		1,04,136	By Materials at site		75,000
[2,34,305 × (17,50,000/ 20,00,000) × (20,00,000/ 39,37,500)]					24,14,583
			By Notional Profit b/d		6,89,583
To Work-in-progress		5,85,447			
(Profit in reserve)		6,89,583			6,89,583

Brock Construction Ltd. Contract A/c (1 November, 2003 to March 31, 2005)
(For computing estimated profit)

Dr.				Cr.
Particulars	*Amount (Rs.)*			*Amount (Rs.)*
To Material issued (6,75,000 + 12,37,500)	19,12,500	By Material at site		37,500
To Labour (paid and outstanding) (4,25,000 + 5,87,500 + 2,500)	10,15,000	By Plant returned to stores on 31/3/04		64,583
To Plant purchased	3,75,000	By Plant returned to stores on 31/3/05		1,72,222
		Cost	3,00,000	
		Less: Dep.	1,00,000	
		Less: 5 month Dep.	27,778	
To Expenses (2,50,000 + 3,25,000)	5,75,000	By Contractee A/c		39,37,500
To Estimated profit	2,34,305			
	42,11,805			42,11,805

Example 10.12

A construction company undertook a contract at an estimated price of Rs. 108 lakh, which includes a budgeted profit of Rs. 18 lakh. The relevant data for the year ended 31.03.2002 are as under:

	(Rs. '000)
Materials issued to site	5,000
Direct wages paid	3,800
Plant hired	700
Site office costs	270
Materials returned from site	100
Direct expenses	500
Work certified	10,000
Progress payment received	7,200

A special plant was purchased specifically for this contract at Rs. 8,00,000 and after use on this contract till the end of 31.02.2002, it was valued at Rs. 5,00,000. This cost of materials at site at the end of the year was estimated at Rs. 18,00,000. Direct wages accrued as on 31.03.2002 was Rs. 1,10,000.

Required

Prepare the Contract Account for the year ended 31st March, 2002 and compute the profit to be taken to the Profit and Loss account. *(CA, PE, Exam II, Group II, Nov. 2002)*

Solution:

Contract Account for the year ended 31st March, 2002

Dr.			*Cr.*
	Rs. '000		Rs. '000
To Materials issued to site	5,000	By Materials at site	1,800
To Direct wages	3,800	By Materials returned	100
To Wages accrued	110	By Cost of contract	8,780

(Contd.)

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To Plant hire	700		
To Site Office Costs	270		
To Direct expenses	500		
To Depreciation of special plant	300		
	10,680		10,680
To Cost of contract	8,780	By Work certified	10,000
To Profit and Loss A/c (Refer to Working Note 2)	1,200		
To Work-in-progress c/d (Profit in reserve)	20		
	10,000		10,000

Working Notes:

1. Percentage of contract completion $= \dfrac{\text{Cost of work certified}}{\text{Value of the contract}} \times 100$

$$= \frac{100 \text{ lakh}}{108 \text{ lakh}} \times 100 = 92.59\%$$

2. Since the percentage of Contract completion is more than 90% therefore the profit to be taken to Profit and Loss Account can be computed by using the following formula.

$$\text{Profit to be taken to P and L A/c} = \text{Budgeted/Estimated Profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{\text{Work certified}}{\text{Contract price}}$$

$$= 1{,}800 \times \frac{7{,}200}{10{,}000} \times \frac{10{,}000}{10{,}800}$$

$$= 1{,}800 \times \frac{7{,}200}{10{,}800}$$

$$= \text{Rs. } 1{,}200$$

Example 10.13

M/s New Century Builders have entered into a contract to build an office building complex for Rs. 480 lakh. The work started in April 1997 and it is estimated that the contract will take 15 months to be completed. Work has progressed as per schedule and the actual costs charged till March 1998 are as follows:

	(Rs. in lakh)
Materials	112.20
Labour	162.00
Hire Charges for equipments and other expenses	36.00
Establishment Charges	32.40
	342.60

The following information are available:

	(Rs. in lakh)
Materials in hand (March 31, 1998)	6.60
Work certified (of which Rs. 324 lakh have been paid) at March 31, 1998	400.00
Work not yet certified at March 31, 1998, at cost	7.50

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As per management estimates, the following further expenditure will be incurred to complete the work:

	Rs. (in lakh)
Materials	10.50
Labour	16.00
Sub-contractor	20.00
Equipments hire and other charges	3.00
Establishment charges	6.90

You are required to compute the value of work-in-progress as on March 31, 1998 after considering a reasonable margin of profit and show the appropriate accounts. Make a provision for contingencies amounting to 5% of total costs. *ICWA Inter, Dec. 1998)*

Solution:

Contract Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Materials	1,12,20,000	By Stock of Materials	6,60,000
To Labour	1,62,00,000	By Work-in Progress:	
To Hire Charges	36,00,000	Work certified	4,00,00,000
To Establishment Charges	32,40,000	Work uncertified	7,50,000
To Profit c/d	71,50,000		
	4,14,10,000		4,14,10,000
To Profit & Loss A/c (WN. 1)	50,00,000	By Profit b/d	71,50,000
To Balance (being Reserve)	21,50,000		
	71,50,000		71,50,000

Contractee's Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Contract A/c	4,00,00,000	By Bank	3,24,00,000
		By Balance c/d	76,00,000
	4,00,00,000		4,00,00,000

Working Notes:

1. Profit to be taken to P&L

The profit to be taken to P&L Account on the contract for the year ending 31st March, 1998 has been arrived at as follows

Expenditure upto March 31, 1998 (Rs. 3,42,60,000 – 6,60,000)			= Rs. 3,36,00,000
Add: Estimated Expenditure to Complete:			
Materials	10,50,000		
Add: Stock as on March 31, 1998	6,60,000	17,10,000	
Labour		16,00,000	
Sub Contractors		20,00,000	
Hire charges on Equipment etc.		3,00,000	
Establishment Charges		6,90,000	

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	63,00,000
Provision for Contingencies (@ 5% on total cost (3,99,00,000 × 5/95)	21,00,000
Total Estimated Cost	4,20,00,000
Total Estimated Profit	60,00,000
Contract Price	4,80,00,000

$$\text{Profit to be taken to P\&L} = \text{Total Estimated Profit} \times \frac{\text{Work Certified}}{\text{Contract Price}}$$

$$= \text{Rs. } 60,00,000 \times \frac{\text{Rs. } 4,00,00,000}{\text{Rs. } 4,80,00,000} = \text{Rs. } 50,00,000^*$$

* The amount of profit may further be reduced to cash basis, if desired.

2. Computation of value of work-in-progress

Value of Work Certified	4,00,00,000
Add: Cost of Work Uncertified	7,50,000
	4,07,50,000
Less: Reserve being Profit not taken to P&L as on 31.3.1998	21,50,000
	3,86,00,000
Less: Cash received	3,24,00,000
Balance of Work-in-progress to be shown in Balance Sheet	62,00,000

Example 10.14

One of the building contracts currently engaged in by a construction company commenced 15 months ago and remain unfinished. The following information relating to the work on the contract has been prepared for the year just ended:

Particulars	*Rs. '000*
Contract price	2,500
Value of work certified at the end of year	2,200
Cost of work not yet certified at the end of year	40
Costs incurred:	
Opening balances:	
Cost of work completed	300
Materials on site (physical stock)	10
During the year:	
Material delivered to site	610
Wages	580
Hire of plant	110
Other expenses	90
Closing balance:	
Materials on site (physical stock)	20

As soon as materials are delivered to the site, they are charged to the contract account. A record is also kept of materials as they are actually used on the contract. Periodically a stock check is made and any discrepancy between book stock and physical stock is transferred to a general contract material discrepancy

account. This is absorbed back to each contract, currently at the rate of 0.5% of materials booked. The stock check at the year end revealed a stock shortage of Rs. 5,000.

In addition to the direct charges listed above, general overheads are charged to contracts at 5% of the value of work certified. General overheads of Rs. 15,000 has been absorbed into the cost of work completed at the beginning of the year.

It has been estimated that further costs to complete the contract will be Rs. 2,20,000. This estimate includes the cost of materials on site at the end of the year just finished and also a provision for rectification.

Required:

(a) Determine the profitability of the above contract and recommend how much profit (to the nearest Rs. '000) should be taken for the year just ended. (Provide a detailed schedule of costs.)

(b) State how your recommendation in (a) would be affected if the contract price was Rs. 40,00,000 (rather than Rs. 25,00,000) and if no estimate has been made of costs to completion. (If required, suitable assumption should be made.) *(CA Inter, Nov. 1995)*

Solution:

(a) Schedule of Costs and Profitability

	(Rs. '000)
Cost of Work Completed (Opening Balance)	300
Materials (See WN)	595
Wages	580
Hire of Plant	110
Stock Discrepancy (0.5% of Rs. 595)	3
Other Expenses	90
General Overheads (5% × Rs. 2,200 – Rs. 15)	95
Cost of Contract to date	1,773
Add: Further Costs to complete the contract	220
Estimated Total Cost (*A*)	1,993
Contract Price (*B*)	2,500
Estimated Profit (*B*) – (*A*)	507

$$\text{Profit to be taken to Costing P\&L A/c} = \frac{\text{Estimated Profit} \times \text{Cost of work to date}}{\text{Estimated total cost}}$$

$$= \frac{\text{Rs. } 5,07,000 - \text{Rs. } 17,73,000}{\text{Rs. } 19,93,000}$$

$$= \text{Rs. } 4,51,034$$

Alternatively, the profit to be taken to P&L Account can be ascertained as follows:

$$= \frac{\text{Estimated profit} \times \text{Work certified}}{\text{Contract price}}$$

$$= \frac{\text{Rs. } 5,07,000 \times 22,00,000}{\text{Rs. } 25,00,000}$$

$$= \text{Rs. } 4,46,160$$

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Working Note:

Cost of Material Booked/Utilised (At Site)

Material delivered to site	Rs. 6,10,000
Add: Opening balance of material at site	10,000
	6,20,000
Less: Closing balance of material at site	20,000
	6,00,000
Less: Stock shortage	5,000
Material booked (at site)	5,95,000

When the value of contract is Rs. 40,00,000 and the value of work certified is Rs. 22,00,000 the work completed amounts to more than 50%. The amount of profit to be taken to Costing Profit and Loss Account can be ascertained as follows (if the ratio of cash received/work certified is 80%)

$$= \text{Notional Profit} \times 2/3 \times \frac{\text{Cash received}}{\text{Work certified}}$$

= Rs. 4,67,000* × 2/3 × 80/100

= Rs. 2,49,067 (rounded to Rs. 2,49,000)

* Notional Profit:

= (Value of work certified + Cost of work not certified – Cost of contract to date)

= Rs. 22,00,000 + Rs. 40,000 – Rs. 17,73,000)

= Rs. 4,67,000

Example 10.15

Surya Construction Ltd. with a paid up share capital of Rs. 50 lakhs undertook a contract to construct MIG apartments. The work commenced on the contract on 1st April 2000. The contract price was Rs. 60 lakh. Cash received on account of the contract upto 31st March, 2001 was Rs. 18 lakh (being 90% of the work certified). Work completed but not certified was estimated at Rs. 1,00,000. As on 31st March 2001 material at site was estimated at Rs. 30,000, machinery at site costing Rs. 2,00,000 was returned to stores and wages outstanding were Rs. 5,000. Plant and machinery at site is to be depreciated at 5%.

The following were the ledger balances (Dr.) as per trial balance as on 31st March 2001:

	Rs.
Land and Building	23,00,000
Plant and Machinery (60% at site)	25,00,000
Furniture	60,000
Materials	14,00,000
Fuel and Power	1,25,000
Site expenses	5,000
Office expenses	12,000
Rates and taxes	15,000
Cash at Bank	1,33,000
Wages	2,50,000

Prepare the Contract Account and Balance Sheet. (*B. Com. (Hons), Delhi 2001)*

Solution:

Contract Account

Dr. **Cr.**

		Rs.		Rs.
To Materials	14,00,000		By Work Certified	
			$\frac{18,00,000 \times 100}{90}$	
Less: Material at site				
	(–) 30,000	13,70,000	= 20,00,000	
To Wages	2,50,000		By Work Uncertified	
Add O/s	+ 5,000	2,55,000	= 1,00,000	21,00,000
To Fuel & Power		1,25,000		
To Site Expenses		5,000		
To Office Expenses		12,000		
To Rates & Taxes		15,000		
To Depreciation on Machine at Site				
$\left(\frac{25,00,000 \times 60 \times 5}{100 \times 100}\right)$		75,000		
To Balance c/d		2,43,000		
		21,00,000		21,00,00
To Profit and Loss A/c			By Balance b/d	2,43,000
$2,43,000 \times \frac{1}{3} \times \frac{90}{100}$		72,900		
To Reserve transferred to W/P		1,70,100		
		2,43,000		2,43,000

Working Notes. 1. Work Certified

		Rs.
$\frac{18,00,000 \times 100}{90}$ =		20,00,000
Less:	Cash Received =	18,00,000
		2,00,000
Less:	Profit transferred to WIP	1,70,100
		29,900
Add:	Work uncertified	1,00,000
	Work-in-Progress	1,29,900

2. No depreciation has been charged on Land and Building and furniture as the same have not been shown at site.
3. Machinery returned to stores Rs. 2,00,000 – 5% of Rs. 2,00,000
   = Rs. 2,00,000 – 10,000
   = Rs. 1,90,000

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Balance Sheet
as on 31st March 2001

Liabilities	*Amt.*	*Assets*		*Amt.*
Authorised and subscribed		Work in progress (1)		1,29,900
Capital	—	Land and Building		23,00,000
Issued and paid up Capital	50,00,000	Machinery		
		At Site	15,00,000	
O/S Wages	5,000	(–) Depreciation		
Profit and loss A/c	72,900		(–) 75,000	
			14,25,000	
		(–) Returned		
			(–) 1,90,000	12,35,000
		Machinery At office	10,00,000	
		(+) Returned from site	+ 1,90,000	11,90,000
		Furniture		60,000
		Bank		1,33,000
		Materials at site		30,000
	50,77,900			50,77,900

Example 10.16

MNP Construction Ltd. commenced a contract on April 1, 1999. The total contract was for Rs. 17,50,000. It was decided to estimate the total profit and to take to the credit of P/L A/c the proportion of estimated profit on cash basis, which work completed bore to the total contract. Actual expenditure in 1999–2000 and estimated expenditure in 2000–2001 are given below:

	1999–2000 (Actuals) Rs.	2000–2001 (Estimated) Rs.
Materials issued	3,00,000	5,50,000
Labour : Paid	2,00,000	2,30,000
: Outstanding at end	20,000	30,000
Plant purchased	1,50,000	–
Expenses: Paid	75,000	1,50,000
: Prepaid at end	15,000	–
Plant returned to store (historical cost)	50,000	1,00,000 (on Dec. 31, 2000)
Material at site	20,000	50,000
Work certified	8,00,000	Full
Work uncertified	25,000	–
Cash received	6,00,000	Full

The plant is subject to annual depreciation @ 25% of WDV Cost. The contract is likely to be completed on Dec. 31, 2000. Prepare the Contract A/c. Determine the profit on the contract for the year 1999–2000 on prudent basis, which has to be credited to P/L A/c. *(CA Inter, May 2000)*

Solution:

MNP Construction Ltd.
Contract Account (1st April, 1999 to 31st March, 2000)

Dr. **Cr.**

Particulars	*(Rs.)*	*Amount (Rs.)*	*Particulars*	*Amount (Rs.)*
To Materials issued		3,00,000	By Plant returned to store	37,500
To Labour: Paid	2,00,000		*(Refer to Working Note I)*	
Outstanding	20,000	2,20,000	By Materials at site	20,000
To Plant purchased		1,50,000	By Work certified	8,00,000
(Refer to Working Note 4)			By Work uncertified	25,000
To Expenses		60,000	By Plant at site	75,000
To Notional profit c/d		2,27,500	*(Refer to Working Note 2)*	
		9,57,500		9,57,500
To Profit and Loss A/c		66,321.43	By Notional profit b/d	2,27,500.00
(Refer to Working Note 5)				
To Work-in-Progress A/c		1,61,178.57		
(Profit in reserve)				
		2,27,500.00		2,27,500.00

MNP Construction Ltd.
Contract Account
(1st April, 1999 to 31st December, 2000)
(For computing estimated profit)

Dr. **Cr.**

Particulars	*Amount Rs.*	*Particulars*	*Amount Rs.*
To Materials issued	8,50,000	By Materials at site	50,000
(Rs. 3,00,000 + Rs. 5,50,000)		By Plant returned to store on	37,500
To Labour (paid & outstanding)	4,80,000	31st March 2000	
(Rs. 2,20,000 + Rs. 2,30,000 +		*(Refer to Working Note 1)*	
Rs. 30,000)		By Plant returned to store	60,937.50
To Plant purchased	1,50,000	on 31st December, 2000	
To Expenses	2,25,000	*(Refer to Working Note 3)*	
(Rs. 60,000 + Rs. 1,65,000)		By Contractee's A/c	17,50,000
To Estimated profit	1,93,437.50		
	18,98,437.50		18,98,437.50

Working Notes:

1. Value of the plant returned to store on 31st March, 2000

	Rs.
Historical cost of the plant returned	50,000
Less: Depreciation @ 25% of WDV cost for 1 year	12,500
Value of the plant returned to store on 31st March, 2000	37,500

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2. Value of plant at site:

	Rs.
Historical cost of the plant at site	1,00,000
Less: Depreciation @ 25% of WDV cost for 1 year	25,000
Value of the plant at site on 31st March, 2000	75,000

3. Value of the plant returned to store on 31st December, 2000

	Rs.
Value of the plant on 31st March, 2000	75,000.00
Less: Depreciation @ 25% of WDV for a period of 9 months	14,062.50
Value of the plant on 31.12.2000	60,937.50

4. Expenses paid:

Total expenses paid	75,000
Less: Prepaid expenses at end	15,000
Expenses paid for the year 1999–2000	60,000

5. Profit to be credited to P/L A/c on 31st March, 2000 for the contract likely to be completed on 31st December, 2000

$$\text{Estimated profit} \times \frac{\text{Cash received}}{\text{Work certified}} \times \frac{\text{Work certified}}{\text{Total contract price}}$$

$$= \text{Rs. } 1,93,437.50 \times \frac{6,00,000}{8,00,000} \times \frac{8,00,000}{17,50,000}$$

$$= \text{Rs. } 66,321.43$$

Example 10.17

A contractor, who prepares his account on 31st December each year, commenced a contract on 1st April, 2001. The costing records concerning the said contract reveal the following information on 31st December, 2001.

Materials charged to site	Rs. 2,58,100
Labour engaged	5,60,500
Foremen's salary	79,300

Plants costing Rs. 2,60,000 had been on site for 146 days. Their working life is estimated at 7 years and their final scrap value at Rs. 15,000. A supervisor, who is paid Rs. 4,000 p.m., has devoted approximately three-fourths of his time to this contract. The administrative and other expenses amounts to Rs. 1,40,000. Materials in hand at site on 31st December, 2001 cost Rs. 25,400. Some of the material costing Rs. 4,500 was found unsuitable and was sold for Rs. 4,000 and a part of the plant costing Rs. 5,500 (on 31.12.2001) unsuited to the contract was sold at a profit of Rs. 1,000.

The contract price was Rs. 22,00,000 but it was accepted by the contractor for Rs. 20,00,000. On 31st December, 2001 two-thrids of the contract was completed. Architect's certificate had been issued covering 50% of the contract price and Rs. 7,50,000 has so far been paid on account. Prepare contract account and state how much profit or loss should be included in the financial accounts on 31st December, 2001. Workings should be clearly given. Depreciation is charged on time basis. *(B. Com. (Hons.), Delhi, 2006),(CA Inter)*

Solution:

Contract Account
(From April 1,Dec. 31 2001)

Particulars	*Rs.*	*Particulars*	*Rs.*
To Materials	2,58,100	By Materials at site	25,400
To Labour engaged	5,60,500	By Materials sold	4,000
To Foremem's salary	79,300	By Profit and Loss A/c	500
To Supervisor's salary (WN:1)	27,000	(Loss on sale of materials)	
To Depreciation of plant (WN: 2)	14,000	By Cost of work done c/d	10,49,000
To Administrative and other expenses	1,40,000		
	10,78,900		10,78,900
To Cost of work done b/d	10,49,000	By Work-in-progress:	
To Profit c/d	2,13,250	Work certified (WN: 3)	10,00,000
		Work uncertified (WN: 3)	2,62,250
	12,62,250		12,62,250
To Profit and Loss A/c (2,13,250 × 2/3 × 7,50,000/10,00,000)	1,06,625	By Profit b/d	2,13,250
To work-in-progress A/c (Reserve)	1,06,625		
	2,13,250		2,13,250

Contractee's Account

To Balance c/d	Rs. 7,50,000	By Bank	Rs. 7,50,000

Extracts from Balance Sheet as on 3Ist December, 2001

Liabilities	*Rs.*	*Assets*		*Rs.*
Profits and Loss A/c (WN: 4)	1,07,125	Work-in-progress:		
		Work certified	10,00,000	
		Work uncertified	2,62,250	
			12,62,250	
		Less: Reserve	1,06,625	
			11,55,625	
		Less: Cash received	7,50,000	4,05,625
		Material at site		25,400
		Plant at site (WN: 5)		2,40,500

Working Notes:

1. Supervisor's Salary: 3/4 (9 months × Rs. 4,000) = Rs. 27,000
2. Depreciation of Plant: (Rs. 2,60,000 – Rs. 15,000)/7 years × 146/365 = Rs. 14,000
3. Cost of Work Uncertified:

Cost of 2/3rd of the contract is Rs.. 10,49,000

The estimated cost of the total contract will amount to Rs. 10,49,000 × 3/2 = Rs. 15,73,500

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Cost of 50% of the contract, as certified by the architect would be Rs. 15,73,500/2 = Rs. 7,86,750.
Cost of Work done but uncertified would, therefore be, Rs. 10,49,000 – Rs. 7,86,750 = Rs. 2,62,250.

4. Profit and Loss Account

To Contract A/c (Loss on sale of materials)	Rs. 500	By Contract A/c (Profit transferred)	Rs. 1,06,625
To Balance c/d	1,07,125	By Profit on sale of Plant	1,000
	1,07,625		1,07,625

5. Plant Account

To Balance b/d	Rs. 2,60,000	By Contract A/c (Depreciation)	Rs. 14,000
To Profit and Loss A/c (Profit on sale of plant)	1,000	By Bank (Sale)	6,500
		By Balance c/d	2,40,500
	2,61,000		2,61,000

Example 10.18

The contract Ledger of Alpha Co. revealed the following expenditure on account of contract on 31st December, 2000.

	Rs.
Materials	2,10,000
Plant	70,000
Wages	2,93,000
Expenses	15,000
Establishment charges	10,000

The contract was started on 1st Jan., 2000 and the contract price was Rs. 10,00,000. Cash received to date was Rs. 4,80,000 representing 80% of the work certified, the remaining 20% being retained until completion. The value of plant on 31st December, 2000 was Rs. 20,000 and the value of material on hand was Rs. 6,000. The cost of work finished but not certified on the said date was Rs. 50,000.

Some of the materials, costing Rs. 20,000 were found unsuitable and were sold for Rs. 16,000 and a part of the plant costing Rs. 5,000 unsuited to the contract was sold at a profit of Rs. 1,000.

In order to calculate the profit made on the contract to 31st December, 2000 the contractors estimated further expenditure that would be incurred in completing the contract and took to the credit of Profit and Loss Account for the year that proportion of the estimated net profit to be realised on the contract which the value of work certified bore to the contract price.

The estimaties were as under:

(a) that the contract would be completed by 30th June 2001.
(b) that a further sum of Rs. 30,000 would have to be spent on plant and the residual value of the plant on the completion of the contract would be Rs. 12,000.
(c) the materials in addition to those on hand on 31st December, 2000 would cost Rs. 1,00,000 and that further sundry expenses of Rs. 7,000 would be incurred.
(d) that the wages on the contract for the six months to June, 2001 would amount to Rs. 1,69,900.
(e) that the establishment charges would cost the same amount per month as in the previous year.
(f) that Rs. 18,000 would be sufficient to meet the contingencies.

Prepare the contract account for the year ended 31st December, 2000 and show your calculations of the profit to be credited to Profit and Loss Account of the year. (*B. com (Hons), Delhi, 2007*)

Solution:

Contract A/c
(for the year ended 31.12.2000)

2000	*Rs.*	*2000*		*Rs.*
To Materials	2,10,000	By materials sold		16,000
To Wages	2,93,000	By P and L A/c		
To Plant	70,000	(Loss on material sold)		4,000
To Sundry expenses	15,000	By Plant sold		6,000
To Establishment charges	10,000			
To P and L A/c (Profit on plant sold)	1,000	By Plant on site		20,000
To Balance c/d	1,03,000	By Material in hand		6,000
		By Work-in-progress A/c :		
		Work certified	6,00,000	
		Work uncertified	50,000	6,50,000
	7,02,000			7,02,000
2000, Dec. 31		2000 Dec. 31		
To P and L A/c:		By Balance b/d		1,03,000
$\left(\text{Profit Rs.}\frac{1,09,100 \times 6,00,000}{10,00,000}\right)$	65,460			
To Work-in-progress (Balance of Profit)	37,540			
	1,03,000			1,03,000

Estimated Contract A/c on Completion

	Rs.		*Rs.*
To Materials (2,10,000 + 1,00,000)	3,10,000	By Materials sold	16,000
To Wages (2,93,000 + 1,69,000)	4,62,900	By P and L A/c (loss on materials sold)	4,000
To Plant (70,000 + 30,000)	1,00,000	By Plant sold	6,000
To P and L A/c: Plant sold	1,000	By Plant at the close	12,000
To Sundry Exp. (15,000 + 7,000)	22,000	By Contractee's A/c :	
To Establishment charges (10,000 + 5,000)	15,000	Contract price	10,00,000
To Contingencies	18,000		
To P and L A/c: Profit on completion estimated	1,09,100		
	10,38,000		10,38,000

Example 10.19 (Escalation Clause)

Deluxe Limited undertook a contract for Rs. 5,00,000 on 1st July 2001. On 30th June 2002, when the accounts were closed, the following details about the contract were gathered:

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	Rs.
Materials purchased	1,00,000
Wages paid	45,000
General expenses	10,000
Plant purchased	50,000
Materials on hand 30.6.2002	25,000
Wages accrued 30.6.2002	5,000
Work certified	2,00,000
Cash received	1,50,000
Work uncertified	15,000
Depreciation of plant	5,000

The above contract contained an escalation clause which reads as follows:

"In the event of prices of materials and rates of wages increase by more than 5% the contract price will be increased accordingly by 25% of the rise in the cost of materials and wages beyond 5% in each case".

It was found that since the date of signing the agreement the prices of materials and wage rates increased by 25%. The value of the work certified does not take into account the effect of the above clause.

Prepare the contract account. Workings should form part of the answer. *(ICWA Inter, CA Inter)*

Solution:

Contract Account

	Rs.		*Rs.*
To Materials	1,00,000	By Work-in-progress:	
To Wages (45,000 + 5,000)	50,000	Work certified	2,00,000
To General expenses	10,000	Work uncertified	15,000
To Depreciation on plant	5,000	Contract escalation	
To Profit:		(Working Note 1)	5,000
Transferred to P and L (Working Note 2)	20,000	By Materials in hand	25,000
Taken to WIP	60,000		
	2,45,000		2,45,000

Working Notes:

1. Escalation charges:

(a) Materials

Effect of increase in price of materials	*Total increase (Rs.)*	*Upto 5% (Rs.)*	*Beyond (Rs.)*
	75,000 × 25/125	75,000 × 5/125	
	= 15,000	= 3,000	= 12,000

(b) Wages

Effect of increase in wage rates	50,000 × 25/125	50,000 × 5/125	
	= 10,000	= 2,000	= 8,000
Total increase (a) + (b)	= 25,000	= 5,000	= 20,000
Increase in contract Price (25% of increase beyond 5%)	20,000 × 25/100	= Rs. 5,000	

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2. Computation of profit transferred to Profit and Loss Account: Since more than 1/4th but less than 1/2 of the contract has been completed, 1/3 of the profit earned as reduced on cash basis has been transferred to Profit and Loss Account.

$$80{,}000 \times \frac{1}{3} \times \frac{1{,}50{,}000}{2{,}00{,}000} = \text{Rs. } 20{,}000$$

BATCH COSTING

As stated earlier, a job order can be for an item or a number of items. In the case of the latter, the order is strictly a batch and the total batch cost must be divided by the quantity to give the cost per item. While job costing is concerned with the costing of jobs that are made to a customer's particular requirements, batch costing is used where articles are manufactured in definite batches and held in stock for sale to customers generally. When each order is finished/completed, the cost sheet is totalled and the total cost divided by the quantity produced to show the cost per article or per dozen, etc.

ECONOMIC BATCH QUANTITY

What should be the optimum size of a batch, is an important question. If the size is higher, the unit costs may tend to decline, but the units in inventory will go up. The size of the batch influences the clerical and other machine set-up costs also. Therefore an economic batch quantity should be determined. Generally, the following formula is used which is similar in nature to economic order quantity.

$$E = \sqrt{\frac{2U.S}{C\left(I - \frac{U}{R}\right)}}$$

where E = Economic order quantity
U = Annual usage in units
S = Set-up and order processing costs
R = Annual rate of production
C = Cost of carrying one unit in inventory for one year

If the production of the batch is done over a short period, $\frac{U}{R}$ loses its significance and only then the following formula is applied:

$$E = \sqrt{\frac{2U.S}{C}}$$

Example 10.20

A jobbing factory has undertaken to supply 200 pieces of a component per month for the ensuing six months. Every month a batch order is opened against which materials and labour hours are booked at actuals. Overheads are levied at a rate per labour hour. The selling price contracted for is Rs. 8 per piece. From the following data, present the cost and profit per piece of each batch order and overall position of the order for 1,200 pieces.

(*Contd.*)

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Month	*Batch output*	*Material cost (Rs.)*	*Direct wages (Rs.)*	*Direct labour (hr)*
Jan.	210	650	120	240
Feb.	200	640	140	280
March	220	680	150	280
April	180	630	140	270
May	200	700	150	300
June	220	720	160	320

The other details are:

Month	*Chargeable expenses (Rs.)*	*Direct labour (hr)*
Jan.	12,000	4,800
Feb.	10,560	4,400
March	12,000	5,000
April	10,580	4,600
May	13,000	5,000
June	12,000	4,800

Solution:

Cost Sheet for Six Months Ending 30th June

(Output 1230 units)

Month	*Jan.*	*Feb.*	*March*	*April*	*May*	*June*	*Total*
Batch output (in units)	210	200	220	180	200	220	1,230
Sales value (in Rs.)	1,680	1,600	1,760	1440	1,600	1,760	9,840
Cost of materials (in Rs.)	650	640	680	630	700	720	4,020
Direct wages (in Rs.)	120	140	150	140	150	160	860
Chargeable expenses (in Rs.)	600	672	672	621	780	800	4,145
Total cost (in Rs.)	1,370	1,452	1,502	1,391	1, 630	1, 680	9,025
Total cost per unit (in Rs.)	6.52	7.26	6.83	7.73	8.15	7.64	7.34
Profit per batch (in Rs.)	310	148	258	49	–30	80	815
Profit per unit (in Rs.)	1.48	0.74	1.17	0.27	–0.15	0.36	0.66

Overall position of the order for 1,200 units:

Sales value of 1,200 units @ Rs. 8 Per unit	Rs. 9,600
Total cost for 1,200 units @ Rs. 7.34 per unit	Rs. 8,808
Profit	Rs. 792

Note: Chargeable expenses have been charged to different batches on the basis of direct labour hours for different months; for example

$$\text{For January } \frac{\text{Rs. } 12{,}000}{4{,}800} \times 240 = 600$$

Example 10.21

Leo Limited undertakes to supply 1,000 units of a component per month for the months of January, February and March 2002. Every month a batch order is opened against which materials and labour cost are booked at actuals. Overheads are levied at a rate per labour hour. The selling price is contracted at Rs. 15 per unit.

From the following data, present the profit per unit of each batch order and the overall position of the order for the 3,000 units.

Month	*Batch output (Numbers)*	*Material cost Rs.*	*Labour cost Rs.*
January 2002	1,250	6,250	2,500
February 2002	1,500	9,000	3,000
March 2002	1,000	5,000	2,000

Labour is paid at the rate of Rs. 2 per hour. The other details are:

Month	*Overheads*	*Total labour hours*
January 2002	Rs. 12,000	4,000
February 2002	Rs. 9,000	4,500
March 2002	Rs. 15,000	5,000

Solution:

Leo Limited
Statement of Cost and Profit Per Unit of Each Batch

		January 2002	*Feb. 2002*	*March 2002*	*Total*
(a)	Batch Output (Nos)	1,250	1,500	1,000	3,750
		Rs.	Rs.	Rs.	Rs.
(b)	Sales Value (Rs.. 15 per unit)	18,750	22,500	15,000	56,250
(c)	Costs :				
	Material	6,250	9,000	5,000	20,250
	Wages	2,500	3,000	2,000	7,500
	Overheads (as per note (iii) below)	3,750	3,000	3,000	9,750
	Total	12,500	15,000	10,000	37,500
(d)	Profit per batch (b) – (c)	6,250	7,500	5,000	18,750
(e)	Cost per unit (c) ÷ (a)	10	10	10	
(f)	Profit per unit (d) ÷ (a)	5	5	5	

Working Notes:

	Jan 2002	*Feb. 2002*	*March 2002*
(i) Labour hours:			
Labour cost/Labour rate per hour	Rs. 2,500 / 2	Rs. 3,000 / 2	Rs. 2,000 / 2
	=1,250	= 1,500	=1,000
(ii) Overhead per hour:	Rs. 12,000	Rs. 9,000	Rs. 15,000
Total overheads	4,000	4,500	5,000
Total labour hours	= Rs. 3	= Rs. 2	= Rs. 3
(iii) Overhead for the batch (i) × (ii)	Rs. 3,750	Rs. 3,000	Rs. 3,000

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Overall Position of the Order for 3,000 units

Sales value (3,000 units × Rs. 15)	Rs. 45,000
Less: Total cost (3,000 units × Rs. 10)	Rs. 30,000
Profit	Rs. 15,000

Example 10.22

A work order for 500 units of a commodity has to pass through four different machines of which the machines hour rates are

	Rs.
No. I	1.25
No. II	3.00
No. III	4.00
No. IV	2.50

The following expenses have been incurred on the work order. Materials Rs. 20,000 and wages Rs. 1,500.

Machine	I	Worked for	200 hours
Machine	II	Worked for	300 hours
Machine	III	Worked for	240 hours
Machine	IV	Worked for	100 hours

After the work order had been executed, materials worth Rs. 1,000 were returned to stores.

Office overheads are to be estimated @ 60% of works cost: 10% of the production is going to be discarded, being unsatisfactory for which 1/2 the amount can be realised from sale in the junk market. Find out the rate of selling price per unit if 20% profit on selling price is desired.

Solution:

Statement Showing Cost and Selling Price for 500 Units

	Rs.	*Rs.*	*Rs.*
Material used	20,000		
— Less returned	1,000		19,000
Wages			1,500
Prime Cost			20,500
Work Overhead: Hours × Rate			
Machine No. I 200 × Rs. 1.25		250	
Machine No. II 300 × Rs. 3.00		900	
Machine No. III 240 × Rs. 4.00		960	
Machine No. IV 100 × Rs. 2.50		250	2,360
Work Cost			22,860
Office Overheads: 60% of works cost			13,716
			36,576
Less: Sale of discarded units			
10 % discarded	Rs. 3657.60		
Half to be realised	1828.80		
Loss	1,828.80		1828.80
Total Cost			34,747.20
Profit 20% on selling price or 25% on cost			8,686.80
Sales			43,434.00

Selling Price per unit

$$\frac{\text{Rs. } 43{,}434}{500} = \text{Rs. } 86.86 \text{ approx.}$$

Note: It has been presumed that net resulted output is 500 units, that is, the quantum of work order, after the discarded units have been adjusted for.

THEORY QUESTIONS

1. (i) What is the nature of job costing? How are the costs recorded on job orders?
(ii) Explain the meaning of contract costing and batch costing.

2. Indicate how you would deal with the following items:
(a) Plant and machinery pruchased and used on contract work.
(b) Amounts received from contractee.
(c) Materials lying unused at site.

3. (i) Discuss the implications of cost-plus contracts from the viewpoint of:
(a) Manufacturer
(b) Customer
(ii) What is the relevance of the escalation clause provided in a contract?

4. Describe briefly the nature of accounting problems associated with job costing. *(B.Com. (Hons), Delhi, 2002)*

5. How will you treat profit on incomplete contracts in cost accounts? *(B.Com. (Hons), Delhi, 2004, 2007)*

6. What do you understand by cost-plus contract and Escalation clause in contract costing?
(B.Com. (Hons), Delhi, 2005, 2006, ICWA, Inter, Stage I, Dec. 2006)

7. Distinguish between job costing and process costing. *(B.Com. (Hons), Delhi, 2007)*

8. Explain the following:
(i) Notional profit in contract costing.
(ii) Retention money in contract costing. *(CA, PE, Exam II, Group II, May 2007)*

9. Discuss the process of estimating profit/loss on incomplete contracts. *(CA, PE, Exam II, Group II, Nov. 2003)*

SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions:

(i) Which of the following production activities would be most likely to employ job order costing?
(a) Ship building
(b) Candy manufacturing
(c) Toy manufacturing
(d) Crude oil refining

(ii) In job-order costing, the basic document to accumulate and ascertain the cost of each order is the
(a) Purchase order
(b) Requisition sheet
(c) Invoice
(d) Job cost sheet

(iii) Which of the following will not be used in job-order costing?
(a) Standards
(b) Marginal costing
(c) Averaging of direct labour and material rates
(d) Factory overhead allocation based on direct labour hours applied to the job.

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PROBLEMS

Job Costing

1. The following information for the year ending December 31, 2001 is obtained from the books and records of a factory:

	Completed jobs	*Work-in-progress*
	Rs.	*Rs.*
Raw materials supplied from stores	90,000	30,000
Wages	1,00,000	40,000
Chargeable expenses	10,000	4,000
Materials transferred to work-in-progress	2,000	2,000
Materials returned to stores	1,000	

Factory overheads is 80% of wages and office overhead is 25% of factory cost.
The value of executed contracts during 2002 was Rs. 4,10,000. Prepare the:
(i) consolidated completed jobs acount, and (ii) consolidated work-in-progress account.

Ans: (i) Profit Rs. 63,750
(ii) Balance c/d in WIP Rs. 1,35,000

2. A factory uses a job costing system. The following data are available form the books at the year ending 31st March 2002.

	Rs.
Direct material	9,00,000
Direct wages	7,50,000
Profit	6,09,000
Selling and distribution overhead	5,25,000
Administrative overhead	4,20,000
Factory overhead	4,50,000

Required:

(a) Prepare a cost sheet indicating the prime cost, works cost, production cost, cost of sales and sales value.
(b) In 2002–03, the factory has received an order for a number of jobs. It is estimated that the direct materials would be Rs. 12,00,000 and direct labour would cost Rs. 7,50,000. What would be the price for these jobs if the factory intends to earn the same rate of profit on sales, assuming that the selling and distribution overhead has gone up by 15%. The factory recovers factory overhead as a percentage of direct wages and administrative and selling and distribution overhead as a percentage of works cost, based on the cost rates prevalent in the previous year. *(CA Inter)*

Ans: (a) Prime cost Rs. 16,50,000, Works cost Rs. 21,00,000, Production cost Rs. 25,20,000, Cost of sales Rs. 30,45,000, Sales value Rs. 36,54,000.
(b) Sales value Rs. 42,84,000, Profit Rs. 7,14,000.

3. Mayur Engineering, engaged in job work, has completed all jobs in hand on 30th December, 2001 except Job No. 447. The cost sheet on 30th December showed direct materials and direct labour costs of Rs. 40,000 and Rs. 30,000 respectively as having been incurred on Job No. 447.
The costs incurred by the business on 31st December, 2001, the last day of the accounting year, were as follows:

Direct materials (Job 447)	Rs. 2,000
Direct labour (Job 447)	Rs. 8,000
Indirect labour	Rs. 2,000
Miscellaneous factory overhead	Rs. 3,000

It is the practice of business to make the jobs absorb factory over-heads on the basis of 120 per cent of direct labour cost.
Calculate the value of work-in-progress of Job No. 447 on 31st December, 2001 *(B. Com. (Hons), Delhi)*

Ans: Works cost Rs. 1,25,600.

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4. Honesty Engineering Works has a machining shop in which it manufactures two auto parts, P1 and P2 out of forging F1 and F2. For the quarter ending December 2003, following cost data are available:

	Rs.
Consumption of raw materials: F1	1,50,000
: F2	2,00,000
Wages and salaries	1,53,000
Stores and spares	12,000
Repairs and maintenance	15,000
Power	16,000
Insurance	8,000
Depreciation	50,000
Factory overheads	68,000
Administration overhead	64,400
Distribution overheads	75,000
Total cost	8,11,400

You are given following further information:

(a) Production and sale of P1 and P2 were as under:

	P1	P2
Production (pieces)	6,000	4,000
Sales of above pieces) (Rs.)	4,80,000	5,20,000

(b) Direct wages paid were Rs. 36,000 in case of P1 and Rs. 32,000 for P2. This basis is used for apportioning wages and salaries and factory overheads. Following machine-hours were utilised in production of these products:

P1	550
P2	450

(c) Stores and spare, repairs and maintenance, power, insurance and depreciation are charged to cost of both the products on the basis of machine hours used.
Administrative overheads are apportioned on the basis of respective conversion costs while distribution overheads on the basis of their sales realisation.

(d) All the production was sold out:

Required: Prepare cost sheets of both the products and work out profit earned on each of them. *(ICWA, Inter)*

Ans: Profit P1 Rs.. 86,940, P2 Rs.. 1,01,660

5. A manufacturing company has an installed capacity of 1,20,000 units per annum. The cost structure of the product manufactured is an under:

Variable cost (per unit)	
Material	Rs. 8.00
Labour (subject to a minimum of Rs. 56,000 per month)	Rs. 8.00
overheads	Rs. 3.00
Fixed overheads	Rs. 1,04,000 per annum
Semi-variable overheads	Rs. 48,000 per annum at 60% capacity, which increase by Rs. 6,000 per annum for increase of every 10% of the capacity utilisation or any part thereof.

The capacity utilisation for the next year is estimated at 60% for 2 months, 75% for 6 months and 80% for the balance part of the year. If the company is planning to have a profit of 25% on the selling price, calculate the estimated selling price for each unit of production. Assume there is no opening or closing stock. *(CA, Inter,)*

Ans: Selling Price per unit Rs. 28.

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6. The expenses of a new machine for a particular month are as under:
(i) power Rs. 50,000, (ii) maintenance and repairs Rs. 10,000, machine operator's wages Rs. 2,000, (iv) supervision Rs. 6,000 (v) Depreciation Rs. 40,000. Other particulars are given below:

Product	*Rate of Production (units/hr.)*	*Production units*
A	30	1,800
B	10	500
C	6	300
D	4	260

The entire production was to offered to the Government on 'cost-plus 20%' basis. Material cost per unit are: *A*: Rs. 40; *B*: Rs. 60; *C*: Rs. 100; and *D*: Rs. 300. Prepare a statement showing product wise 'cost' and 'offer price'. *(ICWA, Inter)*

Ans:

	Products			
	A	*B*	*C*	*D*
Cost per unit (Rs.)	56	108	180	420
Offer price (Rs.)	67.20	129.60	216	504

7. In a manufacturing company, a product passes through five operations. The output of the fifth operation becomes the finished product. The output rejection, output, and labour and overheads of each operation for a period are as under:

Operation	*Input (units)*	*Rejection (units)*	*Output (units)*	*Labour and overhead (Rs.)*
1	21,600	5,400	16,200	1,94,400
2	20,250	1,350	18,900	1,41,750
3	18,900	1,350	17,550	2,45,700
4	23,400	1,800	21,600	1,40,400
5	17,280	2,880	14,440	86,400

You are required to:
(a) Determine the input required in each operation for one unit of the final output.
(b) Calculate the labour and overhead cost at each operation for one unit of the final output and the total labour and overhead cost of all operations for one unit of the final output. *(CA, Inter)*

Ans:

	Operations				
	1	2	3	4	5
(a) Input required (units)	2.00	1.50	1.40	1.30	1.20
(b) Labour and overhead per unit of output (Rs.)	18.00	10.50	18.20	7.80	6.00

8. A component shop manufactures part–*S* 1090 in two operations called operation–*A* and operation–*B*. After inspection for quality, whole of the accepted output from operation–*A* is passed to the operation–*B* for further processing. The whole of the raw materials are introduced in operation–*A*. The rejection rate and realisation (at scrap value) from the rejects for the two operations are as under:

Operation	*Rejection rate (%)*	*Scrap value (Rs./piece)*
A	10	6.50
B	15	13.00

Two pieces from operation–*A* are combined to produce one piece in operation–*B*.

(a) Prepare a statement showing gross production, rejection and accepted production for the two operations.

(b) Prepare a cost sheet showing total cost, quantities and cost per piece of accepted outputs for operations–*A* and operation–*B* from the given data:

	Operation A	*Operation B*
Raw material cost	Rs. 10 lakhs	
Labour and Overheads	Rs. 10 lakhs	Rs. 5 lakhs
Accepted Outputs	90,000 pieces	38,250 pieces

(ICWA, Inter)

Ans:

	Operation	
	A	*B*
(a) Accepted production (pieces)	90,000	38,250
(b) Cost per piece (Rs.)	21.50	61.37

Contract Costing

9. Compute a conservative estimate of profit on a contract (which is 80% complete) from the following particulars. Illustrate at least four methods of computing the profit:

	Rs.
(i) Total expenditure to date	1,02,000
(ii) Estimated further expenditure to complete the contract (including contingencies)	20,400
(iii) Contract price	1,83,600
(iv) Work certified	1,20,000
(v) Work uncertified	10,200
(vi) Cash received	97,920

(B. Com. (Hons), Delhi 1997)

Ans: Profit to be taken to P and L A/c
Ist method Rs. 40,000
IInd method Rs. 32,640
IIIrd method Rs. 51,000
IVth method Rs. 41,616

10. An expenditure of Rs. 1,94,000 has been incurred on a contract to the end of 31st March, 2000. The value of work certified is Rs. 2,20,000. The cost of work done but not yet certified is Rs. 6,000. It is estimated that the contract will be completed by 30th June, 2000 and an additional expenditure of Rs. 40,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of $2\frac{1}{2}$ % for contingencies. The contract price is Rs. 2,80,000 and Rs. 2,00,000 has been realised in cash upto 31st March, 2000.
Calculate the proportion of Profit to be taken to the Profit and Loss Account as on 31st March, 2000 under different methods. *(B. Com. (Hons), Delhi 2000)*

Ans: Total notional profit Rs. 32,000;
Profit to be taken to P and L A/c
(a) Rs. 31,546.42 (b) using conservative method Rs. 28678.57

11. A contractor commenced work on a particular contract on 1st April, 2001. He closes the books of accounts for the year on 31st December of each year. The following information is revealed from his costing records on 31st December, 2001.

Materials sent to site	Rs. 43,000
Foreman	12,620
Labour	1,00,220

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A machine costing Rs. 30,000 remained in use on site for 1/5th of the year. Its working life was estimated at 5 year and scrap value at Rs. 2,000.
A supervisor is paid Rs. 2,000 per month and had devoted half of his time on contract.
All other expenses were Rs. 14,000. The materials on site were Rs. 2,500. The contract price was Rs. 4,00,000.
On 31st December, 2001, 2/3rd of the contract was completed. However, the architect gave certificate only for Rs. 2,00,000 on which 80% was paid. Prepare contract account.

Ans: Profit transferred to P & L A/c Rs. 35,683.
Profit transferred to Reserve 31,222.

12. *SV* construction Ltd. have obtained a contract for construction of a bridge. The value of the contract is Rs. 12 lakhs and the work commenced on 1st October, 2001. The following details are shown in their books for the year ending 30th September 2002.

	Rs.
Plant purchased	60,000
Wages paid	3,40,000
Material issued to site	3,36,000
Direct expenses	8,000
General overheads apportioned	32,000
Wages accrued as on 30.9.2002	2,800
Materials at site as on 30.9.2002	4,000
Direct expenses accrued as on 30.9.2002	1,200
Work not certified at cost	14,000
Cash received being 80% of work certified	6,00,000

Life of plant purchased is 5 years and scrap value is nil.

1. Prepare the contract account for the year ending 30th September, 2002
2. Show the amount of profit which you consider might be fairly taken on the contract and how you have calculated it.

Ans: Profit taken to Profit and Loss A/c Rs. 19,200.

13. Kapoor Engineering Company undertakes a long-term contract which involves the fabrication of prestressed concrete blocks and the erection of the same on consumer's site.
The following is supplied regarding the contract which is incomplete on 31st March, 2001.
Cost incurred:

	Rs.
Fabrication costs to date:	
Direct materials	2,80,000
Direct labour	90,000
Overheads	75,000
	4,45,000
Erection costs to date	15,000
Total	4,60,000
Contract price	8,19,000
Cash received on account	6,00,000

Technical estimate of work completed to date:
Fabrication:
Direct materials 80%
Direct labour and overheads 75%
Erection 25%

You are required to prepare a statement for submission to the management indicating:

(a) the estimated profit on the completion of the contract, and
(b) the estimated profit to date on the contract. *(CA Inter)*

Ans: Estimated profit Rs. 1,38,000 on contract.

14. Pioneer Construction Company Ltd. obtained a contract for the erection of a multi-storey building. Building operations started in July 2001. The contract price was Rs. 9,00,000. On 30th June 2002, the end of the financial year, the cash received on account was Rs. 3,60,000, being 80% of the amount on the surveyor's certificate. The following additional information is given:

	Rs.
Materials issued to contract	1,80,000
Materials on hand at site as on 30th June 2002	7,500
Wages	2,46,600
Plant purchased specially for contract and to be depreciated at 10% per annum	30,000
Direct expenses incurred	12,900
General overhead allocated to contract	7,600
Work finished but not yet certified: cost	15,000

You are required to prepare the contract account and statement showing the profit on the contract to 30th June 2002, indicating what proportion of the profit the company would be justified in taking to the credit of the profit and loss account, and to show what entries in respect of the contract would appear in the balance sheet.

Ans: Profit taken to P & L A/C Rs. 11,946

Balance Sheet

Plant Rs. 27,000

WIP Rs. 1,02,046

15. The following information relates to a building contract for Rs. 10,00,000.

	2001 Rs.	2002 Rs.
Materials issued	3,00,000	84,000
Direct wages	2,30,000	1,05,000
Direct expenses	22,000	10,000
Indirect expenses	6,000	1,400
Work certified	7,50,000	10,00,000
Work uncertified	8,000	—
Materials at site	5,000	7,000
Plant issued	14,000	2,000
Cash recd. from contractor	6,00,000	10,00,000

The value of plant at the end of 2001 and 2002 was Rs. 7,000 and Rs. 5,000 respectively.

Prepare: (i) the contract account, and (ii) contractee account for two years 2001 and 2002 taking into consideration such profit for transfer to the profit and loss account as you think proper. *(B. Com. (Hons), Delhi)*

Ans: Profit taken to Profit and Loss account 2001, Rs. 1,05,600; 2002, Rs. 1,32,000

16. Alcon Construction Company Ltd. commenced its business of construction on 1.1.2001. The Trial balance as on 31.12.2001 showed the following balances:

	Dr. (Rs.)	Cr. (Rs.)
Paid up share capital		1,00,000
Cash received on account of contract (80% of work certified)		1,20,000
Land and buildings	30,000	
Machinery at cost (75% at site)	40,000	
Bank	4,000	
Materials at site	40,000	
Direct labour	55,000	
Expenses at site	2,000	
Lorries and vehicles	30,000	
Furniture	1,000	
Office equipment	10,000	

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Postage and telegrams	500	
Office expenses	2,000	
Rates and taxes	3,000	
Fuel and power	2,500	
	2,20,000	2,20,000

The contract price is Rs. 3,00,000 and work certified is Rs. 1,50,000. The work completed 'since certification' is estimated at Rs. 1,000 (at cost). Machinery costing Rs. 2,000 was returned to stores at the end of the year. Stock of materials at site on 31.12.2001 was of the value of Rs. 5,000. Wages outstanding were Rs. 200. Depreciation on machinery at 10%.

You are required to calculate the profit from the contract and show how the work-in-progress will appear in the balance sheet as on 31.12.2001. *(B. Com. (Hons), Delhi)*

Ans: Profit taken to Profit and Loss A/c Rs. 28,427
Amount shown in Balance Sheet Rs. 6,127

17. The *PQR* Co. Ltd. undertakes to build a cooling tower at a contract price of Rs. 6,75,000. It is estimated that it will take two years to complete, and work is commenced on Ist May 2001. The company's year ended on 30th September, and on that date, in 2002 the position of the contract was as follows:

Certificates to Sept. 15, 2002		Rs. 4,75,000
Less: 10% retention		47,500
		4,27,500
Add: Extra work over contract as agreed	Rs. 3,100	
Last time	230	3,330
This time		4,30,830
Less: Cash paid on account		4,08,330
Amount now due (and paid Oct. 24,2002)		Rs. 22,500

Expenditure on the contract was as follows:

Materials sent by suppliers direct to site	Rs. 2,12,000
Materials sent from plant and stores yard	Rs. 1,500
Wages	Rs. 1,05,000
Haulage of plant	2,400
Expenses incurred on contract	3,800
Establishment charges apportioned to contract	30,300

On 30th September 2002 it is estimated that materials on site amounted to Rs. 3,050.

During the contract, plant to the value of Rs. 35,000 was transferred from the site. The plant remaining on site at 30th September was valued at Rs. 32,000.

The amount of work done (at cost) between the date of the last certificate and the end of the financial year was estimated as Rs. 10,250.

PQR Co. Ltd. are careful as to the amount of profit to be taken on uncompleted contracts, and as only a few months' work had been done at 30th September 2001 no profit at all was then taken.

(a) You are required, supposing the company were to take credit for profit on the contract, to:
  (i) Calculate the amount that you consider may be fairly taken into the firm's accounts at 30th September 2002;
  (ii) Calculate the work-in-progress figure. How would this new figure be shown in the balance sheet of *PQR* Co. Ltd.?

(b) Show the Contract Account in the firm's costing ledger to record the above facts.

Ans: Profit taken to Profit and Loss A/c Rs. 65,240
Work In Progress Rs. 4,39,190

18. A contractor has entered into a long-term contract at an agreed price of Rs. 1,75,000 subject to an escalation clause for materials and wages as spelt out in the contract and corresponding actual are as follows:

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Materials	*Standard*	*Actual*
A	5,000 kg. @ Rs. 5/-	5,050 kg. @ Rs. 4.80
B	3,500 kg. @ Rs. 8/-	3,450 kg. @ Rs. 7.90
C	2,500 lt. @ Rs. 6/-	2,600 lt. @ Rs. 6.60
Wages:		
P	2,000 hr. @ Rs. 7/-	2,100 hr. Rs. @ 7.20
Q	2,500 hr. @ Rs. 7.50/-	2,450 hr. Rs. @ 7.50
R	3,000 hr. @ Rs. 6.50/-	3,100 hr. Rs. @ 6.60

Reckoning the full actual consumption of materials and wages, the company has claimed a final price of Rs.. 1,77,360. Give your analysis of the admissible escalation claim and indicate the final price payable. *(ICWA, Inter)*

Ans: Final price payable Rs. 1,75,850

Batch Costing

19. Component SW-10X is made entirely in machine shop No. ASW II. Material cost is Rs. 20 per component. Each component takes 6 minutes to produce and the machine operator is paid Rs. 15 per hour. Machine-hour rate is Rs. 72 per hour. The setting up of the machine to produce the equipment takes 3 hours for the operator.

You are required to prepare cost sheets cost sheets showing the setting-up costs and the production costs, both in total (that is, for the batch) and per component, assuming a batch size of (a) 100 components, (b) 150 components and (c) 200 components. *(ICWA, Inter)*

Ans:

	Batch Size		
	100	150	200
Total cost (Rs.)	3,131	4,566	6,301

20. All Play and No. Work Ltd. are specialists in the manufacture of sports goods. They manufacture croquet mallets but purchase the wooden balls, iron arches and stakes required to complete a croquet set.

Mallets consist of a head and handle. The handle uses 1.5 board feet per handle at Rs. 40 per board foot. The spoilage loss is negligible for manufacture of handles. Heads frequently split and create considerable scrap. A head requires 0.20 board feet of high quality lumber costing Rs. 70 per board foot. Spoilage normally works out to 20% of the completed heads, 4% of the spoiled heads can be salvaged and sold as scrap at Rs. 10 per spoiled head.

In the department, machining and assembling the mallets, 12 men work 8 hours per day for 25 days in a month. Each worker can machine and assemble 15 mallets per uninterrupted 50 minutes time frame. In each 8-hour working day, 15 minutes are allowed for coffee-break, 8 minutes on an average for training, and 9 minutes for supervisory instructions. Besides 10% of each day is booked as idle time to cover checking in and checking out, changing operations, getting material and other miscellaneous matters. Workers are paid at a comprehensive rate of Rs. 6 per hour.

The department is geared to produce 40,000 mallets per month and the normally expenses of the department are as under:

	Rs.
Finishing and paining the mallets	50,800
Lubricating oil for cutting machines	300
Depreciation for cutting machines	700
Repairs and maintenance	100
Power to run the machines	200
Plant manager's salary	2,700
Other overheads allocated to the department	1,20,000

As the mallets are machined and assembled in lots of 500, prepare a total cost sheet for one lot and advise the management on the selling price to be fixed per mallet in order to ensure a minimum of 20% margin on selling price. *(CA, Inter)*

Ans: Selling price to be fixed at Rs. 1,02,292

PROCESS COSTING

11

Learning Objectives

After reading this chapter, you should be able to:

1. explain process costing — its nature, characteristics and its costing procedures; its differences with job costing;
2. explain preparation of process cost accounts under various situations;
3. understand waste, scrap, abnormal gain; equivalent production analysis; joint product and by-product, and
4. discuss the procedure of accounting for joint product and by-product as well.

NATURE OF PROCESS COSTING

Process costing is that form of operations costing which is used where standardised goods are produced in large volume with continuous production flow. This costing method is used in industries like chemicals, petroleum, textiles, steel, rubber, cement, plastic, shoes, sugar and coal. Those concerns which produce items such as screws, bolts and small electrical parts can also use this costing method. Process costing is also used in the assembly type industry which manufactures items, such as typewriters, automobiles, aeroplanes and household electrical appliances such as washing machines, refrigerators, electrical irons, radios, television sets, etc. For example, an electronics manufacturing company may have the following process or cost centres: materials set-up, wiring, and soldering. Service industries, such as gas, water, electric power and heat may also follow process cost accounting.

Characteristics

A process costing method has the following distinctive characteristics:

1. *Cost collection* Manufacturing costs are accumulated for each production department or process.
2. *Time period assumption* Manufacturing costs are accumulated by department or process for specific time periods, say a month, and the process costing is designed to measure units produced during this time period.
3. *Averaging process* The most important point is that product costing under process costing is an averaging process. The unit cost is obtained by accumulating all manufacturing costs and dividing it by units produced or some measure of production.

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4. *Separate ledger* Each process or department has its own account and records the processing costs incurred by the department.
5. *Homogeneous product* Under processing industries, the production is continuous and emphasis is on uniform or standardised product. It is difficult to identify a specific unit of output with the time of production.
6. *Transfer to finished goods* Completed units and their associated costs are transferred to next process if something is still to be done on those units. Completed units are transferred to finished goods if nothing is to be done.
7. *Cost of spoiled units* Cost of lost or spoiled units is added to the cost of good units completed, thus increasing the average cost per unit.

Process Costing and Job Costing

Process costing and job costing differ on the following counts:

1. *Applicability* Job costing is applicable in situations where the objective is to identify costs with specific products or jobs. Process costing, on the other hand, is used in case of mass production of similar units that continuously pass through different departments or processes.
2. *Cost collection* In job costing, manufacturing costs are accumulated for particular jobs or batches of product using job cost sheets. In process costing, manufacturing costs are accumulated for entire departments or processes and the cost of particular jobs or batches or products is not determinable.
3. *Time period assumption* In job costing, costs are accumulated for a specific product or job without taking into account the production time which may be more than one accounting period. In process costing, costs are accumulated for specific departments/processes for a given time period (say a month). That is, production is measured for specific time periods in process costing.
4. *Purpose* In job costing production is generally dependent on customers' orders and specifications. Under process costing, production is done for storing stock of goods and for future sale.
5. *Computation of unit costs* In job costing unit cost is obtained by dividing the cost of the job order by units produced in the job order. Under process costing, unit costs are obtained by dividing departmental/process costs by process production.
6. *Work-in-progress* In job costing, one work-in-progress account is maintained. But in process costing, individual work-in-progress accounts are prepared for each production/process department to ascertain manufacturing costs by process.

COSTING PROCEDURES UNDER PROCESS COSTING

In process costing, an account is maintained for each process to which all costs of material, labour, direct expenses and overhead are debited:

Materials

In process costing all the materials required for production are issued to the first process, where after processing, they are passed on to the next process and so on; each process merely performs the same operation on the material which has been passed on from the first process. Alternatively, materials may pass from the first process to the second process, where extra or new raw materials are added; then more materials are added in the next process; this may continue until completion.

Labour

Labour costs incurred in a particular process are posted to the debit of the process account concerned. However, where workers are engaged in more than one process, the gross wages are distributed to each process on the basis of time spent on each process.

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Direct Expenses

Items of expenditure which can be directly attributed to a process are debited to the relative process account. Examples of such expenses are cost of electricity, depreciation and hire charges of equipments.

Factory Overhead

Expenses which are not charged direct are apportioned on the basis of absorption rates. Also, overhead may be recovered at a predetermined rate based on direct wages, prime cost, etc.

PREPARATION OF PROCESS COST ACCOUNTS

As stated earlier, for each process an individual process account is prepared. The method of preparing process accounts is discussed herewith on the basis of the following situations which may be found in a production situation:

1. Process costing having no process loss and no opening and closing work-in-progress.
2. Process costing having process losses or gains (normal loss, abnormal loss, abnormal gain).
3. Process costing having opening and closing work-in-progress at various stages of completion.
4. Process costing having opening and closing work-in-progress with process losses or gains.
5. Inter-process profits.

Process Costing Having No Process Loss/Gain and No Opening and Closing Work-in-Progress

The preparation of process accounts is very easy, if no loss or gain has arisen during the processing operation of the product. All costs of material, labour, direct expense, and apportioned overhead are debited to the process account. The total (accumulated) costs of the process are transferred to the second process as raw materials (input) for that process.

Example 11.1

From the following figures show the cost of three processes of manufacture. The production of each process is passed on to the next process immediately on completion.

	Process A	*Process B*	*Process C*
Wages and materials	Rs. 30,400	Rs. 12,000	Rs. 29,250
Works overheads	5,600	5,250	6,000
Production in units	36,000	37,500	48,000
Stock (Units from preceding process—1st July, 2007)		4,000	16,500
Stock (Units from preceding process—31st July, 2007)		1,000	5,500

Solution:

Process A Account

To Wages and materials	Rs. 30,400	By transfer to process *B*	
To Works overheads	5,600	@ Re 1 per unit	Rs. 36,000
	36,000		36,000

Process B Account

To Stock: unit from preceding process @ Re. 1 per unit	Rs. 4,000	By Stock: units from preceding process @ Re. 1 per unit	Rs. 1,000
To Transfer from Process *A*	36,000	By Transfer to Process *C* @ Rs. 1.50 per unit	56,250
To Wages and material	12,000		
To Works overheads	5,250		
	57,250		57,250

Process C Account

To Stock: units from preceding process @ Rs. 1.50 per unit	Rs. 24,750	By Stock: units from preceding process @ Rs. 1.50 per unit	Rs. 8,250
To Transfer from Process *B*	56,250	By Transfer to finished goods account @ Rs. 2 per unit	Rs. 1,08,000
To Wages and materials	29,250		
To Works overheads	6,000		
	1,16,250		Rs. 1,16,250

Example 11.2

The Neodrug manufacturers process a product 'plant food' through three distinct processes, the product of one process being transferred to the next process and so on to finished product intact.

Raw materials, labour and direct expenses incurred on each of the processes are given below:

Particulars	*Process A*	*Process B*	*Process C*
Raw materials	Rs. 1,00,000	Rs. 80,000	Rs. 20,000
Labour	50,000	60,000	70,000
Direct expenses	15,000	25,000	50,000

The overhead expenses for the period amounted to Rs. 3,60,000 and is to be distributed to the processes on the basis of labour wages.

There were no stocks in any of the processes at the beginning or at the close of the period. Ignore wastages.

(a) Assuming that the output was 1,00,000 kilos, show the process accounts of *A*, *B* and *C* indicating also the unit cost per kilo under each element of cost and the output in each process.

(b) If 10% of the output is estimated to be lost in the course of sale and sampling, what should be the selling price per unit (correct to two decimal place) so as to provide for gross profit of $33\frac{1}{2}\%$ on selling price.

Solution:

Process A

	Per kg	*Total*		*Per kg*	*Total*
To Raw materials	1.00	1,00,000	By Transfer to Process *B*	2.65	2,65,000
To Labour	0.50	50,000			
To Direct expenses	0.15	15,000			
To Overheads	1.00	1,00,000			
	2.65	2,65,000		2.65	2,65,000

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Process B

To Transfer from	Rs.	Rs.	By Transfer to	Rs.	Rs.
Process *A*	2.65	2,65,000	Process *C*	5.50	5,50,000
To Raw materials	0.80	80,000			
To Labour	0.60	60,000			
To Direct expenses	0.25	25,000			
To Overheads	1.20	1,20,000			
	5.50	5,50,000		5.50	5,50,000

Process C

To Transfer from	Rs.	Rs.	By Transfer to	Rs.	Rs.
Process *B*	5.50	5,50,000	finished goods		
To Raw materials	0.20	20,000	A/c	8.30	8,30,000
To Labour	0.70	70,000			
To Direct expenses	0.50	50,000			
To Overheads	1.40	1,40,000			
	8.30	8,30,000		8.30	8,30,000

(b) Cost of finished goods Rs. 8,30,000

Profit ($33\frac{1}{3}$% on selling price) 4,15,000

Sales 12,45,000

Gross output 1,00,000 kg

Less = wastage 10% 10,000

90,000 kg

Selling price per kg $= \frac{12,45,000}{90,000 \text{ kg}} =$ Rs. 13.83 per kg

Process Costing Having Process Losses and/or Gains

All materials put into process are not likely to be good saleable products. Some loss, scrap and wastage is inevitable in process industries. Process loss can be divided into two categories: (i) Normal loss, (ii) Abnormal loss. Normal loss is the loss which is unavoidable, uncontrollable and expected in normal conditions. It may be inherent in the manufacturing process. Abnormal process loss is controllable and avoidable and generally caused by abnormal or unexpected conditions, such as bad designing, poor materials, accident and negligence, etc.

The treatment of normal and abnormal losses differ in process accounts. Normal losses are absorbed by good production. Assume, for example, that 25,000 units of a mixture were put into process and that during processing 5,000 units were lost through evaporation. This in an unavoidable loss. If the total cost recorded was Rs. 25,00,000 the remaining 20,000 units would be assigned a unit cost of Rs. 125.

$$\frac{\text{Cost of production}}{\text{Number of units completed}} = \frac{\text{Rs. } 25,00,000}{20,000} = \text{Rs. } 125$$

Abnormal losses are valued as good units. The unit cost which is used to value good units is also applied for valuation of abnormal loss units. The cost of abnormal loss units computed in this manner is transferred to a separate abnormal loss account and credited to relevant process account. Subsequently, this loss is transferred to the costing profit and loss account and the abnormal loss account is thus closed.

Waste

Waste is without any value. If waste is part of the normal process loss, the cost is absorbed by the good production. Alternatively, if waste represents abnormal process loss, the waste (abnormal loss) is valued like good units and treated as abnormal process loss.

Scrap

Scrap means discarded material emerging from certain manufacturing operations. It has some but minor value. Where the normal loss is in the form of scrap and has some realisable value, the process account is credited with the amount which could be realised from sale of normal scrap. The abnormal loss, if represented by scrap may have a similar realisable value. The amount realised from sale of scrap representing abnormal loss is credited to the abnormal loss account and the balance in the abnormal loss account is transferred to the costing profit and loss account. The question of crediting the amount realised from sale of scrap representing abnormal loss in the relevant process account does not arise. The relevant process account is credited and the abnormal loss account is debited with the cost of abnormal loss valued as finished output. In case there are normal loss, abnormal loss, scrap, the following procedure will help in the preparation of process accounts:

1. Normal loss should be computed on the basis of information given in the question.
2. The cost per unit of production after taking into account normal loss units should be determined assuming that abnormal loss does not exist. The cost per unit is calculated on the basis of the following information:
   (a) Normal production, i.e. inputs (units) minus normal loss units.
   (b) Normal cost of production, i.e. all costs incurred (appearing on the debit side of a process account) minus proceeds (if any) realised from the sale of normal loss units.

   Normal cost of production divided by normal production will give the cost per unit of output.
3. The cost per unit determined as above is used to value abnormal loss units and that would be the cost of abnormal loss.
4. The abnormal loss account is debited and the relevant process account credited with the amount and quantity of abnormal loss as calculated in (3) above.
5. The cost per unit as obtained in (3) will also be used to determine the cost of good production units produced by the process.
6. The proceeds realised from the sale of normal loss representing scrap is transferred to the relevant process account.
7. The proceeds realised from the sale of abnormal loss representing scrap is transferred to a separate abnormal loss account and not to the relevant process account.
8. The abnormal loss account is closed by transferring the total cost of abnormal loss units to the costing profit and loss account if there is no scrap. In case abnormal loss represents scrap, only the net amount (total cost of abnormal loss units minus scrap) will be transferred to the costing profit and loss account.

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Abnormal Gain (Effectives)

Abnormal gain arises when the actual loss is less than the normal loss expected. The abnormal gain is valued in the same manner as abnormal loss and is credited to a separate account known as the abnormal gain account. The abnormal gain account appears on the debit side of the relevant process account. The amount of scrap which would otherwise have been realised, had there been normal loss and no abnormal gain, is debited to the abnormal gain account and the balance is credited to the costing profit and loss account. Cost per unit of output computed (as mentioned above) is used to value the output transferred to the next process.

Example 11.3

In a manufacturing unit, raw material passes through four processes, I, II, III and IV and the output of each process is the input of the subsequent process. The loss in the four processes I, II, III and IV are respectively 25%, 20%, 20% and $16\frac{2}{3}$ % of the input. If the end product at the end of Process IV is 40,000 kg, what is the quantity of raw material required to be fed at the beginning of Process I and the cost of the same at Rs. 5 per kg?

Find out also the effect of increase or decrease in the material cost of the end product for variation of every rupee in the cost of the raw material. *(B. Com. (Hons), Delhi 1998, CA Inter)*

Solution:

	Input	*Loss*	*Output*
Process I	100	25	75
Process II	75	15	60
Process III	60	12	48
Process IV	48	8	40

In case the end product at the Process of IV is 40,000 kg, the quantity of raw material required to be fed at the beginning of Process I comes to:

$40{,}000 \times 100/40 =$ 1,00,000 kg or 2.50 kg for output of 1 kg

Total cost of material = Rs. 5,00,000

For every rupee increase or decrease in the cost of raw material, the cost of the end product will increase or decrease by Rs. 2.50 (that is 2.50 × Re. 1)

This can be verified as follows:

Present cost of raw material of 1,00,000 kg @ Rs. 5 = Rs. 5,00,000

Cost of end product Rs. 5,00,000/40,000 = Rs. 12.50 per kg

Increase in cost

In case the raw material cost increases by Re. 1 per kg

The total cost will be: Rs. 6,00,000

New cost per kg of final product Rs. 6,00,000/40,000 = Rs. 15

Thus, on account of increase of Re. 1 in the cost of raw material, the end product cost has gone up from Rs. 12.50 per kg to Rs. 15 per kg, that is an increase of Rs. 2.50.

Decrease in Cost

In case the raw material cost decreases by Re. 1 per kg

The total cost will be Rs. 4,00,000

New cost per kg of final product Rs. 4,00,000/40,000 = Rs. 10

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Thus, the final product cost has come down from Rs. 12.50 to Rs. 10 per kg, that is a decrease of Rs. 2.50 per kg.

Example 11.4

1,000 units of raw material @ Rs. 3 per unit were introduced in Process *A* in the beginning of a month. The following additional information is given about Process *A* for the month:

Direct Labour Cost	Rs. 4,000
Overhead expenses	20% of prime cost
Normal wastage	20% of input
Realisable value of wastage	Rs. 2 per unit
Output	900 units

Prepare Process *A* A/c.

(B.Com, Delhi, 2002)

Solution:

Process A Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Units introduced @ Rs. 3	1000	3000	By Normal Wastage	200	400
To Direct Labour cost		4000	By Transfer to Process *B*	900	9000
To Overhead expenses		1400			
To Abnormal gain	100	1000			
	1100	9400		1100	9400

Working Note:

	Unit	*Amounts (Rs.)*
Total cost of units introduced	1000	8400
Less: Normal wastage	200	400
Normal output	800	8000

Value of Abnormal Gain

$$= \frac{\text{Normal cost}}{\text{Normal output}} \times \text{Units of Abnormal gain}$$

$$= \frac{8000}{800} \times 100$$

$$= \text{Rs. } 1000$$

Example 11.5

From the following information, prepare a Process Account, Abnormal Gain Account and Normal Loss Account:

(i) Input of raw material 840 units @ Rs. 40 per unit
(ii) Direct Material—Rs. 5,924
(iii) Direct wages—8,000
(iv) Overheads—Rs. 8,000
(v) Actual output—750 units

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(vi) Normal loss—15%
(vii) Value of scrap per unit—Rs. 10 per unit

(B.Com, Delhi, 2003)

Solution:

Process Acount

Particulars	*Units*	*Amount (Rs.)*	*Particulars*	*Units*	*Amount (Rs.)*
To Raw Materials	840	33,600	By Normal Loss (15% of 840 units)	126	1,260
To Direct Material		5,924			
To Direct Wage		8,000	By Transfer to next process A/c @ Rs. 76 per unit	750	57,000
To Overheads		8,000			
To Abnormal Gain	36	2,736			
	867	58,260		876	58,260

Abnormal Gain Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Normal Loss A/c	36	360	By Process A/c	36	2,736
To Costing Profit and Loss A/c		2,376			
	36	2,736		36	2,736

Normal Loss Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process A/c	126	1,260	By Cash (Sale proceeds)	90	900
			By Abnormal Gain A/c	36	360
	126	1,260		126	1,260

* Units of Abnormal Gain = Actual output + Normal loss – Input

= 750 + 126 – 840

= 36 Units.

$$\text{Value of Abnormal Gain} = \frac{\text{Normal cost}}{\text{Normal output}} \times \text{Units of Abnormal gain}$$

$$= \frac{55,524 \times 1,260}{840 - 126} \times 36$$

= Rs. 2,736

Example 11.6

D Ltd. introduced 5,000 units in a process at a cost of Rs. 10,000. The wages and overheads incurred are Rs. 10,000 and Rs. 8,000 respectively. It is expected that 10% of the output is likely to be defective. Actual output of goods is 4,400 units. The rectification of defective units costs Rs. 4 per unit.

Calculate the cost per unit and show how will you deal with the cost of rectification of abnormal defective units. *(B.Com, Delhi, 2004)*

Solution:

Process Account

Particulars	*Units*	*Amount (Rs.)*	*Particulars*	*Units*	*Amount (Rs.)*
To unit introduced	5000	10,000	By abnormal loss	100	600
To wages		10,000	(Excessive defective)		
To overheads		8,000	By finished stock		
			A/c-@ Rs. 6	4900	29,400
			(Note 2 and 3)		
To Rectification of normal defective Units (500 × Rs. 4)		2,000			
(Note-1)	5000	30,000		5000	30,000

Notes:

1. Rectification of normal defective units is an item of factory overheads. Hence 10% of 5000 units that is, 500 units multiplied by Rs. 4 that is Rs. 2000 has been added to the cost.
2. Total output = actual output + rectified units = 4400 + 500 = 4900 units.
3. There is no normal loss. Therefore cost per unit

$$= \frac{\text{Normal cost}}{\text{Normal output}} = \frac{\text{Rs. } 30,000}{5000} = \text{Rs. } 6$$

Normal cost = Total cost – Scrap value of normal loss

= Rs. 30,000 – 0 = Rs. 30,000

Normal output = Units introduced – Units of normal loss

= 5000 – 0 = 5000

4. Units of abnormal loss = 5000 – 4900 = 100 units.

   Value of abnormal loss = Units of abnormal loss × Cost per unit

   = 100 × 6 = Rs. 600
5. Cost of rectification of abnormal defective units is debited to the Costing Profit and Loss Account.

Example 11.7

Ayush Ltd. produces a Herbal Shampoo which is made by subjecting certain crude herbs to two successive processes: *A* and *B*. The following data in respect of processing have been obtained from the accounting records of the company for a cost period:

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Particulars	*ProcessA*	*Process B*
Inputs (units)	50,000	46,000
Normal loss	10%	?
Costs Incurred:	Rs.	Rs.
Materials (Herbs)	9,00,000	1,96,000
Direct labour	4,26,000	2,47,000
Production overhead	2,84,000	1,78,000
Realisable scrap value/unit	7	20

The output of Process *A* is transferred direct to Process *B*. The output of Process *B* was 43,200 units, which were sold at Rs. 60 per unit showing a profit of 20% on cost.

You are required to prepare the Process Cost Accounts assuming that there was no closing stock of W.I.P. and finished goods. *(B.Com. Delhi, 2005)*

Solution:

Process of Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Raw Material	50000	9,00,000	By Normal Loss		
To Direct Labour		4,26,000	(10% of Inputs)	5000	35,000
To Production			By Process and A/c	45000	15,75,000
Overhead		2,84,000	good transferred		
	50,000	16,10,000		50,000	16,10,000

$$\text{Rate per unit} = \frac{\text{Rs. } 16,10,000 - \text{Rs. } 35,000}{50,000 - 5000} = \text{Rs. } 35.$$

Process B Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process *A* A/c	45,000	15,75,000	By Normal Loss [45000 – 43200]	1800	36,000
To Materials		1,96,000	By finished		
To Direct Labour		2,47,000	Stock A/c	43200	21,60,000
To Production overhead		1,78,000			
	45,000	21,96,000		45000	21,96,000

Finished Stock Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process *B* A/c	43200	21,60,000	By Bank A/c		
To Costing Profit and Loss A/c [20% of Rs. 2160000]		4,32,000	(Sales)	43,200	25, 92,000
	43200	25,92,000		43,200	25,92,000

$$\text{Selling Price} = \frac{\text{Rs. } 25,92,000}{43200} = \text{Rs. } 60$$

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Example 11.8

A product passes through three distinct processes *A*, *B* and *C*. The normal loss of units in each process is 5%, 10% and 15% and the same is sold at Rs. 2, Rs. 4, Rs. 5 per unit respectively. Expenses for the month were as follows:

	Process		
	A	B	C
Sundry Materials (Rs.)	5,200	3,960	5,924
Wages (Rs.)	4,000	6,000	8,000
Actual output in unit	1,900	1,680	1,500

2000 units @ Rs. 3 per unit were put into Process *A*. The total overheads are Rs. 18,000 which are to be recovered at 100% of wages. Prepare necessary Process Account. *(B. Com, Delhi, 2006)*

Solution:

Process A Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To units introduced	2000	6,000	By Normal Wastage	100	200
To Sundry Materials		5,200	By Process *B* A/c		
To Wages		4,000	(Bal fig.) @ Rs. 10	1900	19,000
To Overheads		4,000	each		
	2000	19,200		2000	19,200

Process B Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Transfer from			By Normal Wastage	190	760
Process *A*	1900	19,000	By Abnormal		
To Sundry Materials		3,960	Wastage	30	600
To wages		6,000	By Process C A/c		
To Overheads		6,000	(transfer @	1680	33,600
			Rs. 20 per unit)		
	1900	34,960		1900	34,960

Process C Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Transfer from			By Normal Wastage	252	1,260
Process *B* A/c	1680	33,600	By Finished		
To Sundry Materials		5,924	Goods Stock		
To Wages		8,000	A/c @ Rs.	1500	57,000
To Overheads		8,000	38 per unit		
To Abnormal Gain	72	2,736			
(Note 2)					
	1752	58,260		1752	58,260

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Notes : 1. Value of Abnormal Loss

$$= \frac{\text{Rs. } 34,960 - \text{Rs.}760}{\text{Units } 1900 - 190} \times 30 = \text{Rs. } 600$$

2. Value of Abnormal Gain

$$= \frac{\text{Rs. } 55,524 - \text{Rs.}1,260}{\text{Units } 1680 - 252} \times 72 = \text{Rs. } 2,736$$

Example 11.9

At the end of process *A*, carried on in a factory during the week ending July 31st, 2001 the number of units produced was 850 excluding 50 units damaged at the very end of the process. The damaged units realised Rs. 3 per unit as scrap. A normal wastage of 10 per cent occurs during the process, the wastage realised was Rs. 2 per unit.

A unit of raw material costs Rs. 4. The other expenses for the week were:

	Rs.
Wages	500
Power	200
General expenses	450

40% of the output is sold so as to show a profit of 16 $\frac{2}{3}$ per cent on the selling price; the rest of the output is transferred to Process *B*.

Prepare Process *A* Account. *(B.Com.(Hons), Delhi 2002)*

Solution:

Dr. **Process A A/c** **Cr.**

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Material @ Rs. 4 per unit	1000	4,000	By Normal Wastage (@ Rs. 2 per unit)	100	200
To Wages		500	By Damaged Unit sold (@ Re. 3 per unit)	50	150
To Power		200			
To General Expenses		450	By Sale		
To P & L A/c		384	(40% of production at profit of 16 $\frac{2}{3}$ % on S.P.)	340	2,304
			By Transfer to process *B* (60% of production at cost price)	510	2,880
	1000	5,534		1,000	5,534

Working Notes:

Material input = 1,000 units

1. Normal wastage = $\frac{1,000 \times 10}{100}$ = 100 units

sold @ Rs. 2 per unit = 100 × 2 = Rs. 200

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2. Damaged units = 50
   sold @ Rs. 3 per unit = 50 × 3 = Rs. 150
3. Cost of production of 850 units
   Rs. 4,000 + 500 + 200 + 450 – (Rs. 200 + 150) = Rs. 4,800
4. Sale 40% of production at profit of $16\frac{2}{3}$ % on S.P. or 20% on C.P.

$$\frac{4,800 \times 40 \times 120}{100 \times 100} = \text{Rs. } 2,304$$

5. Remaining 60% of production transferred to Process *A* at cost

$$= \frac{\text{Rs. } 4,800 \times 60}{100} = \text{Rs. } 2,880$$

Example 11.10

The following particulars relate to two process—*X* and *Y* for the month of Jan. 2005:

	Process X	*Process Y*
Total input (units) @ Rs. 1.50 p.u.	50,000	1,000
Normal loss (% of input)	10%	5%
Additional costs incurred:		
Materials	—	3,600
Direct Labour	35,000	45,000
Overheads	27,500	39,500
Realisable value of scrap p.u.	Re. 0.50	Rs. 2
Output (units)	43,000	43,000

The entire output of process *X* was transferred to process *Y*. The entire output of process *Y* was sold at Rs. 6 per unit. Assume, there was no opening or closing stock or any type in process *X* or *Y*.

You are required to prepare the necessary accounts for the period. *(B.Com. (Hons), Delhi, 2005)*

Solution:

Process X

	Units	*Amt.*		*Units*	*Amt*
To Inputs	50000	75,000	By Normal Loss	5000	2,500
To Material	—	—	By Abnormal Loss	2000	6,000
To Direct Labour	—	35,000	By Cost of Prod-	43000	1,29,000
To Overheads	—	27,500	uction tranferred to *Y*		
	50000	1,37,500		50000	1,37,500

Cost of Abnormal Loss

$$= \frac{1,35,00}{45,000} \times 2,000$$

$$= \text{Rs. } 6,000$$

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Process Y

	Units	*Amt.*		*Units*	*Amt*
To Process *X*	43000	1,29,000	By Normal Loss	2150	4,300
To Material	—	3,600	By Cost of	43000	2,24,000
To Labour		45,000	Production		
To Overhead		39,500			
To Abnormal gain	2150	11,200			
	45150	2,28,300		45150	2,28,300

Normal output = 43,000 – 2,150 = 40,850 units

Cost of Normal output = 2,17,100 – 4,300 = Rs. 2,12,800

$$\text{Cost of abnormal gain (effectiveness)} = \frac{\text{Rs. } 2,12,800}{40850 \text{ units}} = \text{Rs. } 11,200$$

Example 11.11

The product manufactured by the Standard Chemicals Ltd. passes through three processes I, II and III. The following costs have been incurred for the month of September, 1996:

Details	*Process I (Rs.)*	*Process II (Rs.)*	*Process III (Rs.)*
1. Material Consumed	40,000	7,500	5,000
2. Direct Wages	22,500	10,000	10,000
3. Direct Expenses	20,500	2,250	2,505
Total	83,000	19,750	17,505
	(units)	(units)	(units)
4. Output	3,900	3,850	3,200
5. Finished Process Stock:			
(i) 01.9.1996	600	550	800
(ii) 30.9.1996	500	800	Nil
6. Stock Valuation on 01.9.1996 (Rs. per unit)	24.50	31.00	37.00
7. Percentage of Wastage	2	5	10
8. Net Realisable Value of wastage per unit (Rs.)	13.50	16.25	21.00

Four thousand units of raw materials were introduced in Process No. I at a cost of Rupees twenty thousand.

Stocks are valued and transferred to subsequent processes at weighted average cost. The percentage of wastage is computed on the number of units entering the process concerned.

Prepare: (i) Process Accounts; (ii) Process Stock Accounts; (iii) Normal Wastage Accounts; (iv) Abnormal Wastage/Effectives Account. *(B. Com. (Hons), Delhi 1997)*

Solution:

(i) and (ii) **Process I Account**

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Input	4000	20,000	By Normal Wastage	80	1,080
To Materials		40,000	By Abnormal Wastage	20	520
To Direct Wages		22,500	By Process I Stock A/c	3900	1,01,400
To Direct Expenses		20,500			
	4000	1,03,000		4000	1,03,000

Process I Stock Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Balance b/d	600	14,700	By Process II A/c	4000	1,03,200
(@ Rs. 24.5 per unit)			By Balance c/d	500	12,900
To Process I A/c	3900	1,01,400	(@ Rs. 25.8 per unit)		
	4500	1,16,100		4,500	1,16,100

Process II Account

Particulars	*Units*	*Rs*	*Particulars*	*Units*	*Rs.*
To Process I Stock A/c	4000	1,03,200	By Normal Wastage	200	3,250
(@ Rs. 25.8 per unit)			By Process Stock A/c	3850	1,21,275
To Direct Material		7,500	(@ Rs. 31.5 per unit)		
To Direct Wages		10,000			
To Direct Expenses		2,250			
To Abnormal					
Effectives A/c	50	1,575			
	4050	1,24,525		4050	1,24,525

Process II Stock Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Balance b/d	550	17,050	By Process III A/c	3600	1,13,175
(@ Rs. 31 per unit)			By Balance c/d	800	25,150
To Process II A/c	3850	1,21,275	(@ Rs. 31.44 per unit)		
	4400	1,38,325		4400	1,38,325

Process III Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process II Stock A/c	3600	1,13,175	By Normal Wastage A/c	360	7,560
To Materials		5,000	By Abnormal Wastage A/c	40	1,520
To Direct Wages		10,000	By Process III Stock A/c	3200	1,21,600
To Direct Expenses		2,505			
	3600	1,30,680		3600	1,30,680

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Process III Stock Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Balance b/d (@ Rs. 37 per unit)	800	29,600	By Finished Goods Stock A/c (@ Rs. 37.8 per unit)	4,000	1,51,200
To process III A/c	3,200	1,21,600			
	4,000	1,51,200		4,000	1,51,200

(iii) Normal Wastage Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process I A/c	800	1,080	By Sale Proceeds:		
To Process II A/c	200	3,250	Process I	800	1,080
			Process II	150	2,438
			By Abnormal Effectives A/c	50	812
	1,000	4,330		1,000	4,330

(iv) Abnormal Wastage Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Process I A/c	20	520	By Sales Proceeds:		
To Process III A/c	40	1,520	Process I	20	270
			Process III	40	840
			By Costing P/L A/c		930
	60	2,040		60	2,040

Abnormal Effectives Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Normal Wastage A/c	50	812	By Process II A/c	50	1,575
To Costing P/L A/c		763			
	50	1,575		50	1,575

Working Notes:

1. *Cost of Abnormal Wastage in Process* $I = \dfrac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Wastage in Units}$

$$= \frac{1{,}03{,}000 - 1{,}080}{3{,}920} \times 20$$

$$= \frac{1{,}01{,}920}{3{,}920} \times 20 = \text{Rs. } 520$$

2. *Cost of Abnormal Effectives in Process II* $= \dfrac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Effectives in Units}$

$$= \frac{1,22,950 - 3,250}{3,800} \times 50$$

$$= \frac{1,19,700}{3,800} \times 50 = \text{Rs. } 1,311$$

3. *Cost of Abnormal Wastage in Process III* $= \dfrac{\text{Normal Cost}}{\text{Normal Output}} \times \text{Ab. Wastage in units}$

$$= \frac{1,30,680 - 7,560}{3,600 - 360} \times 40$$

$$= \frac{1,23,120}{3,240} \times 40 = \text{Rs. } 1,520$$

Example 11.12

A product passes through two processes. The output of Process I becomes the input of Process II and the output of Process II is transferred to warehouse. The quantity of raw materials introduced into Process I is 20,000 kg. at Rs. 10 per kg. The cost and output data for the month under review are as under:

	Process I	*Process II*
Direct Materials	Rs. 60,000	Rs. 40,000
Direct Labour	Rs. 40,000	Rs. 30,000
Production Overheads	Rs. 39,000	Rs. 40,250
Normal Loss	8%	5%
Output	18,000	17,400
Loss realisation of Rs./Unit	2.00	3.00

The company's policy is to fix the Selling price of end product is such a way as to yield a Profit of 20% on Selling price.

Required

(i) Prepare the Process Accounts

(ii) Determine the Selling price per unit of the end product. *(CA, PE, Exam. II, Group II, Nov. 2002)*

Solution:

Process I Account

Dr. *Cr.*

Particulars	*kg.*	*Rate / kg.* Rs.	*Amount* Rs.	*Particulars*	*kg.*	*Rate / kg.* Rs.	*Amount.* Rs.
To Raw Material	20,000	10	2,00,000	By Normal loss	1,600	2.00	3,200
To Direct Material			60,000	By Abnormal	400	18.25	7,300
To Direct Labour			40,000	loss (Refer to Working Notes 1 and 2)			
To Production overheads			39,000	By Transfer to Process II	18,000	18.25	3,28,500
	20,000		3,39,000		20,000		3,39,000

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Process II Amount

Dr. *Cr.*

Paraticulars	*kg*	*Rate / kg.* *Rs.*	*Amount* *Rs.*	*Paraticulars*	*kgs*	*Rate/ kg.* *Rs.*	*Amount* *Rs.*
To Process I Account	18,000	18.25	3,28,500	By Normal loss	900	3.00	2.700
To Direct materials			40,000	By Transfer to warehouse	17,400	25.50	4,43,700
To Direct labour			30,000				
To Production overheads			40,250				
To Abnormal gain	300	25.50	7,650				
	18,300		446400		18300		446400

Working Notes:

1. **Abnormal Loss in Process I:**
   Required production (20,000 kg. – 1,600 kg.) 18,400
   Actual production (in kg.) 18,000
   Abnormal loss (in kg.) 400
2. **Value of Abnormal Loss in Process I:**

$$= \left(\frac{\text{Normal cost of normal ourput}}{\text{Normal output}}\right) \times \text{Abnormal loss}$$

$$= \left(\frac{\text{Rs. } 3{,}35{,}800}{18{,}400 \text{ kg.}}\right) \times 400 \text{ kg.} = \text{Rs. } 18.25 \times 400 \text{ kg.} = 7{,}300$$

3. **Abnormal Gain in Process II:**
   Required production (18,000 kg. – 900 kg.) 17,100
   Actual production 17,400
   Abnormal gain (in kg.) 300
4. **Value of Abnormal Gain in Process I:**

$$= \left(\frac{\text{Rs. } 4{,}36{,}050}{17{,}100 \text{ kgs}}\right) \times 300 \text{ Kg.} = \text{Rs. } 25.50 \times 3{,}000 \text{ kg.} = \text{Rs. } 7{,}650.00$$

(ii) **Determination of Selling Price of the End Product:**
If the cost price of end product is Rs. 80 the unit sale price is Rs. 100

If the cost price of end product is Re. 1, the unit sale price is $\frac{100}{80}$

If the cost price is Rs. 25.50, then the sale price of the end product is $\frac{100}{80} \times 25.50$

$= \text{Rs. } 31.875$

Example 11.13

A company manufactures its sole product by passing the raw material through the distinct processes in its factory. During the months of April 2004, the company purchased 96,000 kg of raw material at Rs. 5 per kg and introduced the same in process I. Further particulars of manufacture for the month are given below:

	Process I	*Process II*	*Process III*
Material consumed	Rs. 33,472	Rs. 27,483	Rs. 47,166
Direct labour	80,000	72,000	56,000
Overheads	1,20,000	1,08,000	84,000
Normal waste in process as % of input	3%	1%	1%
Sale value of waste (Rs./kg)	2	3	5
Actual output during the month (kg)	93,000	92,200	91,500

Prepare the three process accounts and accounts relating to abnormal loss/gain, if any.

(ICWA, Inter Stage 1, Dec. 2004)

Solution:

Process I Account

	Quantity (kg.)	*Rate (Rs.)*	*Amount (Rs.)*		*Quantity (kg.)*	*Rate (Rs.)*	*Amount (Rs.)*
To Input of raw material	96000	5.00	4,80,000	By Process-II A/c (Transferred to)	93,000	7.60	7,06,800
To Other materials			33,472	By Normal waste A/c (3% of 96000)	2880	2.00	5,760
To Direct labour			80,000	By Abnormal Loss A/c	120	7.60	912
To Overheads			1,20,000				
	96000		7,13,472		96000		7,13,472

Process II Account

	Quantity (kg.)	*Rate (Rs.)*	*Amount (Rs.)*		*Quantity (kg.)*	*Rate (Rs.)*	*Amount (Rs.)*
To Process-I A/c (Transferred form)	93000	7.60	7,06,800	By Process-III A/c (Transferred to)	92200	9.90	12,780
To Materials			27,483	By Normal Waste A/c			
To Direct labour			72,000	(1% of 93000)	930	3.00	2,790
To Overheads			1,08,000				
To Abnormal gain	130	9.90	1287				
	93130		9,15,570		93130		9,15,570

Process-III Account

	Quantity (kg.)	*Rate (Rs.)*	*Amount (Rs.)*		*Quantity (kg.)*	*Rate (Rs.)*	*Amount (Rs.)*
To Process-II A/c (Transferred from)	92200	9.90	9,12,780	By Finished Good Stock	91500	12.00	10,98,000
To Materials			47,166	By Normal Waste	922	5.00	4,610
To Direct Labour			56,000	(1% of 92200)			
To Overheads			84,000				
To Abnormal	222	12.00	2,664				
	92422		11,02,610		92422		11,02,610

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Abnormal Loss Account

	Quantity (kg.)	*Amount (Rs.)*		*Quantity (Kg.)*	*Amount (Rs.)*
To Process I Account	120	912	By Cash @ Rs. 2 (normal waste)	120	240
			By Profit and Loss Account		672
	120	912		120	912

Abnormal Gain Account

	Quantity (kg.)	*Amount (Rs.)*		*Quantity (Kg.)*	*Amount (Rs.)*
To Process-II A/c (normal waste) @ Rs. 3	130	390	By Process II A/c	130	1,287
			By Process-III A/c	222	2,664
To Process-III A/c Normal waste @ Rs. 5	222	1,110			
To Profit and Loss	—	2,451			
	352	3,951		352	3,951

Working Notes:

Valuation of Output, Abnormal Loss/Gain are worked out below:

$$\frac{\text{Total cost of Input} - \text{Sale Value of Normal Waste}}{(\text{Input quantity} - \text{Quantity of Normal Waste})}$$

Process I:

$$\frac{713472 - 5760}{96000 - 2880} = \frac{707712}{93120} = \text{Rs. } 7.60$$

Process II:

$$\frac{914283 - 2790}{93000 - 930} = \frac{911493}{92070} = \text{Rs. } 9.90$$

Process III:

$$\frac{1099946 - 4610}{92200 - 922} = \frac{1095336}{91278} = \text{Rs. } 12.00$$

Example 11.14

A product passes through two distinct processes *X* and *Y* before completion. During a certain period, 10000 units of crude material were introduced in process *X* at a cost of Rs. 40,000. After processing in dept *X*, 9000

units of processed material were transferred to process *Y* for finishing. From process *Y* finally 8,600 units of the finished product were obtained and transferred to Finished Goods store.
Further data regarding normal waste, costs etc. are given below:

		Process X	*Process Y*
Costs incurred:	Material	Rs. 10,000	Rs. 5,000
	Labour	20,000	15,000
	Overheads	10,000	8,000
Normal waste (% of input)		8%	5%
Realisable value of waste per unit		Rs. 5	Rs. 8

There was no opening or closing stock in any process.
Required:

(a) Process Accounts
(b) Normal Loss Account
(c) Abnormal Loss/Gain Accounts
(d) Selling price per unit of the finished product, if management wants 25% profit on sales.

(ICWA, Inter, Stage 1, Dec 2005)

Solution:

(a) **Process X Account**

Particulars	*Units*	*Rate (Rs.)*	*Amount (Rs.)*	*Particulars*	*Units*	*Rate*	*Amount (Rs.)*
To Units introduced	10000	4.00	40,000	By Process Y A/c (Transtd to)	9000	8.26	74,348
To Materials			10,000	By Normal Loss	800	5.00	4,000
To Labour			20,000	By			
To Overheads			10,000	By Abnormal Loss	200	8.26	1,652
	10000		80,000		10000		80,000

Process Y Account

Particulars	*Units*	*Rate (Rs.)*	*Amount (Rs.)*	*Particulars*	*Units*	*Rate (Rs.)*	*Amount (Rs.)*
To Process-X A/c (Transferred from)	9000	8.26	74348	By Finished good stock	8600	11.55	99,325
				By Normal loss	450	8.00	3,600
To Materials			5,000				
To Labour			15,000				
To Oveheads			8,000				
To Abnormal gain	50	11.55	577				
	9050		1,02,925		9050		1,02,925

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(b) **Normal Loss Account**

Particulars	*Units*	*Rate (Rs.)*	*Amount (Rs.)*	*Particulars*	*Units*	*Rate (Rs.)*	*Amount (Rs.)*
To Process *X* A/c	800	5.00	4,000	By Abnormal	50	8.00	400
To Process *Y* A/c	450	8.00	3,600	gain (Process *Y*)			
To Abnormal Loss	200	5.00	1,000	By Cash/Bank	1400		8,200
(Process *X*)	1450		8,600		1450		8,600

(c) **Abnormal Loss Account**

Particulars	*Units*	*Rate (Rs.)*	*Amount (Rs.)*	*Particulars*	*Units*	*Rate (Rs.)*	*Amount (Rs.)*
To Process *X* A/c	200	8.26	1,652	By Normal Loss	200	5.00	1,000
				By Profit and Loss A/c			652
	200		1,652		200		1,652

Abnormal Gain Account

Particulars	*Units*	*Rate (Rs.)*	*Amount (Rs.)*	*Particulars*	*Units*	*Rate (Rs.)*	*Amount (Rs.)*
To Normal Loss A/c	50	8	400	By Process *Y*	50	11.55	577
To Profit and Loss A/c			177				
	50		577		50	11.55	577

(d) Computation of Selling price per unit of the finished product.

Cost of Finished Product	Rs. 11.55
Profit required (25% of sales that is, $33\frac{1}{3}$% of cost)	Rs. 3.85
Selling price per unit	Rs. 15.40

Working Notes:

Valuation of abnormal loss, Abnormal gain and output/finished product are worked out below:

$$\frac{\text{Total cost of Input} - \text{Sale Value of Normal loss}}{(\text{Input units Normal loss units})}$$

$$\text{Process } X = \frac{\text{Rs. } (80,000 - 4,000)}{(10000 - 800)} = \frac{\text{Rs. } 76,000}{9200 \text{ units}} = \text{Rs. } 8.26$$

$$\text{Process } Y = \text{Rs. } \frac{\text{Rs. } 1,02,348 - 3,600}{9000 - 450} = \frac{\text{Rs. } 98,748}{8550}$$

$$= \text{Rs. } 11.55$$

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Example 11.15

A company manufactures a chemical product by a series of operations in three processes. Raw material is fed into Process I and the finished chemical that comes out of Process III is transferred to the finished goods store. The following particulars relating to operations for April 2007 are given below:

	Process I	*Process II*	*Process III*
Raw materials issued 80,000 kg	Rs. 9,60,000		
Direct wages	Rs. 1,25,600	Rs. 1,72,000	Rs. 1,42,500
Overhead costs	Rs. 1,68,000	Rs. 1,77,280	Rs. 1,24,690
Normal processing loss (% of input)	3%	2%	1%
Output transferred to next process	74,000 kg	69,400 kg	69,000 kg
Work-in-process (processed material awaiting transfer to next process)	3,000	2,400	–

Prepare the accounts of Process I, II and III and also abnormal loss and abnormal gain accounts, if any.

(ICWA, Inter, Stage I, June 2007)

Solution:

If waste sold has nil value Process Accounts would appear as follows:

Process I Account

	Quantity (kg)	*Amount (Rs.)*		*Quantity (kg)*	*Amount (Rs.)*
To Materials Issued	80000	9,60,000	By Normal Loss	2400	–
To Direct Wages		1,25,600	By Abnormal Loss	600	9693
To Overheads		1,68,000	By W.I.P. (Closing Balance)	3000	48,464
			By Process II	74000	11,95,443
	80000	12,53,600		80000	12,53,600

(Rate for valuation: $\frac{\text{Actual Cost}}{\text{Normal Output}} = \frac{\text{Rs.}12,53,600}{80,000 - 2,400} = \frac{12,53,600}{77,600\text{ kg}}$ = Rs. 16.1546)

Process II Account

	Quantity (kg)	*Amount (Rs.)*		*Quantity (kg)*	*Amount (Rs.)*
To Process I	74000	11,95,443	By Normal Loss	1480	–
To Direct Wages		1,72,000	By Abnormal Loss	720	15,336
To Overheads		1,77,280	By W.I.P. (Closing Balance)	2400	51,122
			By Process III	69400	14,78,265
	74000	15,44,723		74000	15,44,723

(Rate for valuation: $\frac{\text{Actual Cost}}{\text{Normal Output}} = \frac{15,44,723}{74,000 - 1,480} = \frac{15,44,723}{72,520\text{ kg}}$ = Rs. 21.30)

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Process III Account

	Quantity (kg)	*Amount (Rs.)*		*Quantity (kg)*	*Amount (Rs.)*
To Process II	69,400	14,78,265	By Normal Loss	694	–
To Direct Wages		1,42,500	By Finished goods store	69,000	17,52,924
To Overheads		1,24,690			
To Abnormal Gain	294	7,469			
	69,694	17,52,924		69,694	17,52,924

(Rate for valuation: $\frac{\text{Actual Cost}}{\text{Normla Output}} = \frac{17,45,455}{69,400 - 694} = \frac{17,45,455}{68,706}$ = Rs. 25.4047)

Abnormal Loss Account

	Quantity (kg)	*Amount (Rs.)*		*Quantity (kg)*	*Amount (Rs.)*
To Process I	600	9,693	By Profit and Loss A/c	–	25,029
To Process II	720	15,336			
		25,029			25,029

Abnormal Gain Account

	Quantity (kg)	*Amount (Rs.)*		*Quantity (kg)*	*Amount (Rs.)*
To Profit and Loss A/c	–	7,469	By Process III	294	7,469
		7,469			7,469

Process Costing Having Work-in-Progress at Different Stages of Completion

When a process consists of opening and closing stock fully completed, the cost unit is obtained by dividing the total cost including the cost of opening stock by the number of units completed. This unit cost is used to price the output transferred to the next process and to value the units which remain in inventory. The following example illustrates this situation:

Process I

	Units	*Rs.*		*Units*	*Rs.*
To Stock (opening)	2000	3,500	By Transfer to	9000	27,000
To Materials	10000	20,050	second process		
To Wages		9,450	By Stock	3000	9,000
To Overhead		3,000			
	12000	36,000		12000	36,000

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$$\text{Unit cost} = \frac{\text{Rs. } 36,000}{12000 \text{ units}} = \text{Rs. } 3 \text{ per unit}$$

The unit cost, Rs. 3 per unit, has been used to price the goods transferred to the second process as well as to the stock.

Closing Work-in-Progress

In most situations, process may consist of partially completed closing units at the end of an accounting period. It is apparent that a partially completed unit must carry a cost that is lower than a finished unit. It follows that where there are inventories of closing work-in-progress, units costs cannot be computed by simply dividing the total cost by the number of units processed. Units in work-in-process must be converted to a base that can be equated with finished production. This analysis is known as Equivalent Production Analysis.

Equivalent units are defined in I.C.M.A. Terminology of Management and Financial Accountancy as follows:

"Equivalent units are a notional quantity of completed units substituted for an actual quantity of incomplete physical units in progress, when the aggregate work content of the incomplete units is deemed to be equivalent to that of the substituted quantity. The principle applies when operations costs are being apportioned between work-in-progress and completed output."

Equivalent Production Analysis

Before unit costs can be computed, closing inventories of work-in-progress must be converted into finished equivalents (also called equivalent production). This is done by multiplying the actual number of units in process by their stage of completion measured in terms of cost. Thus 2,000 units in an inventory estimated to be 50% complete are equal in cost to 1,000 units that have been completed:

Actual number of units × Stage of completion = Finished equivalent

$$2{,}000 \times 50\% = 1{,}000 \text{ units}$$

The following four possibilities may exist with regard to work-in-progress or the question of equivalent production:

1. Closing work-in-progress without any process loss or gain.
2. Closing work-in-progress with process loss or gain.
3. Opening and closing work-in-progress with no process loss or gain.
4. Opening and closing work-in-progress along with process loss or gain.

Situation I (Only Closing Work-in-Progress)

In this case equivalent production is determined in the case of closing work-in-progress by applying percentages of completion for each element of cost. After computing equivalent production, the cost per unit of equivalent production is found and this cost per unit is used to value the finished output transferred to the second process and also closing work-in-progress units. It should be noted that the cost per unit (for each element of cost) is applied to equivalent production of work-in-progress units and not to work-in-progress units directly.

Examples 11.16 to 11.18 explain the preparation of process accounts in this situation.

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Example 11.16

Prepare statement of equivalent production, statement of cost and process account from the following information:

Units introduced	7,600
Output (units)	6,000
Process cost (Rs):	
Material	14,560
Labour	21,360
Overhead	14,240
Degree of completion for closing work-in-progress	
Material	80%
Labour	70%
Overhead	70%

Solution:

Statement of Equivalent Production

Input	*Output items*	*Equivalent Production*						
		Units	*Materials*		*Labour*		*Overhead*	
			units	*%*	*units*	*%*	*units*	*%*
Units introduced	1. Units completed and transferred	6,000	6,000	100	6,000	100	6,000	100
7,600	2. Work-in-progress	1,600	1,280	80	1,120	70	1,120	70
7,600		7,600	7,280		7,120		7,120	

Statement of Cost

Element cost	*Cost (Rs.)*	*Equivalent production*	*Cost per completed unit (Rs.)*
Material	14,560	7,280	2
Labour	21,360	7,120	3
Overhead	14,240	7,120	2
	50,160		7

Statement of Apportionment of Cost

Output transferred		6,000 × Rs. 7 = Rs. 42,000
Work-in-progress:		
Material	1,280 × 2 = 2,560	
Labour	1,120 × 3 = 3,360	
Overhead	1,120 × 2 = 2,240	= 8,160
	—	50,160

Process Account

	Units	*Amount Rs.*		*Units*	*Amount Rs.*
To Materials	7,600	14,560	By Output transferred	6,000	42,000
To Labour		21,360	By Closing work-in-progress	1,600	8,160
To Overhead		14,240			
	7,600	50,160		7,600	50,160

Example 11.17

The product manufactured by a light engineering factory undergoes two operations. The following data are available relating to expenses incurred on production during November, 2005:

	Machining	*Finishing*
Units as input	90,000	60,000
Expenses incurred in process :	Rs.	Rs.
Direct material	2,70,000	Nil
Direct labour	1,28,000	45,000
Overheads	64,000	1,35,000

At the end of the month there were 30,000 units lying incomplete in Machining Operation. While the full quantity of material has been consumed for the total production, the expenditure on Labour and Overheads was estimated to be $66\frac{2}{3}$ % in respect of the incompleted products.

You are required to prepare a detailed Cost Statement showing the final cost per unit assuming:

(i) Completed units of Machining Operations are transferred to the Finishing Operation;

(ii) Finishing Operation has completed all the units received from the earlier operation during November 2005 leaving no work-in-progress at the end of the month. *(ICWA Inter)*

Solution:

(i) Statement of Equivalent Production

Machining Operation:		*Total units*	*Equivalent Units* DM	DL	OV
Completed units		60,000	60,000	60,000	60,000
Incompleted units		30,000	30,000	20,000	20,000
Total		90,000	90,000	80,000	80,000
Finishing operation : units					
Transfer from machining operation	60,000	60,000	60,000	60,000	60,000

(ii) Statement of Cost per Unit of Machining Operation

	DM	*DL*	*Overheads*
Costs incurred	2,70,000	1,28,000	64,000
Output	90,000	80,000	80,000
Cost per unit	3.00	1.60	.80

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Statement of Total Cost

		Total
Machining Operation Costs:		
Direct material		2,70,000
Direct labour		1,28,000
Overheads		64,000
		4,62,000
Less: Closing stock (30,000 Units)		
DM 30,000 × 3	= 90,000	
DL 20,000 × 1.6	= 32,000	
OV 20,000 × .08	= 16,000	1,38,000
Cost of Finished Output from Machining Operation		3,24,000
Add: Finished operation costs:		
Direct Labour		45,000
Overheads		1,35,000
Total cost after finishing operation		5,04,000
Total output		Units 60,000
Cost per unit		Rs 8.40

Example 11.18

A manufacturing concern, engaged in mass production produces standardised electric motor in one of its departments. From the following particulars of a job of 50 motors, you are required to value the work-in-progress and finished goods.

(a) Costs incurred as per job card:

Direct material	Rs. 75,000	Overheads	Rs. 60,000
Direct labour	Rs. 20,000		

(b) Selling price per motor: Rs. 4,500

(c) Selling and distribution expenses are at 30% of sales value.

(d) 25 motors are completed and transferred to finished goods.

(e) Completion stage of work-in-progress:

Direct Material	100%	Direct Labour and Overhead	60%

(ICWA Inter)

Solution:

Statement of Equivalent Production and Cost

Particulars	*Direct Material*		*Labour & Overhead*		
	%	*Qty*	*%*	*Qty*	*Total*
Transferred to finished goods	100	25	100	25	
Work-in-progress	100	25	60	15	
Equivalent units		50		40	
Total cost (Rs.)		75,000		80,000	1,55,000
Cost per equivalent unit (Rs.)		1,500		2,000	3,500

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Actual Cost of Production per Unit of Finished Goods

Direct material	Rs. 1,500
Labour & overhead	Rs. 2,000
Total	Rs. 3,500

Market Value per Unit of Finished Goods

Selling price	Rs. 4,500
Less: Selling and distribution overheads @ 30% of Rs 4,500	Rs. 1,350
	Rs. 3,150

Stocks should be at the lower of the cost (that is, Rs 3,500) or market value (that is, Rs. 3,150). Hence, basis of valuation will be market value in this case.

Value of Work-in-Progress

Direct Material: Rs. 1,500 × 25 units	= Rs. 37,500
Labour & Overhead: Rs. (3,150 – 1,500) × 15 units	= Rs. 24,750
	Rs. 62,250

Value of Finished Goods Stock

25 units × Rs. 3,150	= Rs. 78,750
Total Value of Inventory = Rs. 78,750 + Rs. 62,250	= Rs. 1,41,000

Situation 2 (Closing Work-in-Progress and Process Loss or Gain)

Process loss may occur (i) early in a process or during a process; or (ii) at the final stages of a process. The point of occurrence of normal losses (spoiled units) has an important bearing on deciding which of the following two approaches should be used in process accounting:

1. *First Approach*—Cost of normal loss units should be spread over the entire production, that is, cost of normal loss units should be included in the cost of all units computed as equivalent production.
2. *Second Approach*—Cost of normal loss units should be included in the cost of all good units which have been completed and thus cost of normal loss units will not be charged to closing work-in-progress.

The first approach is followed when normal loss occurs at the beginning of or during a process. Since the normal loss occurs early in processing it applies to both completed production and units that are left in process; all work (production) done in that period should be charged with the normal loss. This is achieved by using a value of zero as the finished equivalent of the units lost, thus forcing the good unit that remains to absorb the cost of the bad units. The normal loss units are completely ignored, the cost per unit is increased. Costs for the period are divided by a smaller number of equivalent units, thereby increasing the cost per unit. Cost apportionment to units completed and units still in process is computed using the higher unit cost. Thus, normal spoilage costs are automatically spread over all the equivalent good units (units completed and units in process).

The second approach is followed when normal process loss occurs at the end of a process (for example, loss discovered after final inspection). In this case, as mentioned above, cost of normal loss units is included in the cost of only completed units and not in closing work-in-progress units. If the lost units occur at the end of a process, they are usually regarded as belonging to the completed units and hence costs are charged to those units which have been finished. Since none of the units lost or spoiled (normal loss units) come from

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closing work-in-progress, no part of the cost of spoiled units should be charged to the units still in process; the cost of spoiled units must be absorbed by the good units completed. This is done by first treating the normal loss units as completed and charging them with the same cost that applies to good completed units. The cost charged to normal loss units is then added to the cost of the good completed units, thus excluding any of the cost of the normal loss units in cost of work-in-progress units.

In absence of specific information regarding occurrence of normal loss, it should be preferably assumed that normal loss has taken place during a process and not at the end of a process. Hence, in such a case, the first approach (as mentioned above) should be followed.

Examples 11.19 to 11.21 explain the above two approaches.

Example 11.19

During the month of April 2003, 4000 units were introduced into Process *A* at the cost of Rs. 23,200. At the end of the month 3000 units were completed and transferred to Process *B* A/c. 720 units were still in process and 280 units were scrapped. A normal wastage of 5% was expected. It was estimated that the incomplete units have reached a stage in production as follows:

Materials	75%
Labour and overheads	50%
The additional costs incurred were:	
Materials	Rs. 6,160
Wages	Rs. 13,760
Overheads	Rs. 6,880
Unit scrapped realised at Rs. 2 per unit.	
Prepare:	

1. A statement showing equivalent production
2. Statement of evaluation and process *A* Account:

(B.Com. (Hons), Delhi, 2004)

Solution:

1. **Statement of Equivalent Production**

Input (units)	*Output*	*Units*	*Equivalent Production*			
			Material		*Labour and overhead*	
			Qty.	*%*	*Qty.*	*%*
4000	Normal loss	200	–	–	–	–
	Abnormal loss	80	80	100	80	100
	Finished Production	3000	3000	100	3000	100
	Work-in-Progress	720	540	75	360	50
4000	Total	4000	3620		3440	

2. Statement showing cost per unit

Statement of Cost

Elements of Cost	*Cost (Rs.)*	*Equivalent production unit*	*Cost per units (Rs.)*
Materials			
Cost of units introduced	23,200		
Direct Materials	6,160		
	29,360		
Less: Scrap value of Normal loss 200 units × 2	400		
	28,960	3620	8
Wages	13,760	3440	4
Overheads	6,880	3440	2
Total	49,600		14

Statement of Evaluation

Particulars	*Element of Cost*	*Equivalent production (units)*	*Cost per unit Rs.*	*Cost Rs.*	*Total cost Rs.*
Abnormal loss	Material	80	8	640	
	Labour	80	4	320	
	Overheads	80	2	160	1,120
Finished Production					
	Material	3000	8	24,000	
	Labour	3000	4	12,000	
	Overheads	3000	2	6,000	42,000
Work in Progress					
	Material	540	8	4,320	
	Labour	360	4	1,440	
	Overheads	360	2	720	6,480
					49,600

Example 11.20

SBL LTD. furnishes you the following information relating to Process-*B* for the month of April, 2006:

(i) Opening Work-in-Progress: Nil
(ii) Units introduced — 10,000 units @ Rs. 5 per unit
(iii) Expenses debited to the process *B* Rs. 5,000
(iv) 8,000 units of finished output were transferred to the next process during the month
(v) Normal Loss in Process — 10% of input.
(vi) Closing Work-in-Progress — 800 units.
(vii) Completion stage, closing work in progress material 100%, labour and overhead 50%. Abnormal loss material 100%, labour and overhead 80%.
(viii) Scrap realisation: Normal Loss — @ Rs. 2 per unit; Abnormal Loss — @ Rs. 4 per unit.

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You are required to prepare:

(1) Statement of Equivalent production.
(2) Statement of Cost of each element.
(3) Statement of Evaluation.
(4) Process *B* Account
(5) Abnormal Loss Acccount.

(ICWA, Inter, Stage 1, June 2006)

Solution: **SBL LTD.**

(1) Statement of Equivalent Production

Input Units	*Particulars*	*Output Units*	*Equivalent production*			
			Material		*Labour and overheads*	
			Units	*%*	*Units*	*%*
	Opening WIP	–	–	–	–	–
10000	Introduced during the month	–	–	–	–	–
	Finished out put (transferred to next process)	8000	8000	100%	8000	100%
	Normal loss	1000	–	–	–	–
	Abnormal loss	200	200	100%	160	80%
	Closing WIP	800	800	100%	400	50%
10000		10000	9000		8560	

(2) Statement of cost of each element

Particulars	*Materials Rs.*	*Labour Rs.*	*Overheads Rs.*	*Total Rs.*
Units Introduced	50,000			50,000
Processing Material	24,600	10,400	5,000	40,000
	74,600	10,400	5,000	90,000
Loss: Scrap Realisation for normal Loss (1000 × 2)	2,000			2,000
Net cost	72,600	10,400	5,000	88,000
Equivalent production (Units)	9,000	8,560	8,560	
Cost per unit (Rs.)	8.067	1.215	0.584	9.666

(3) Statement of evaluation

Items	*Elements*	*Equivalent Unit*	*Cost Per Unit (Rs.)*	*Cost Rs.*	*Total*
Finished output transferred to next process	Materials				
	Labour				
	Overheads	8000	9.866	78926	78,926
Abnormal loss	Materials	200	8.067	1,613	
	Labour	160	1.215	194	
	Overheads	160	0.584	93	1,900
Closing WIP	Materials	800	8.067	6,454	
	Labour	400	1.215	486	
	Overheads	400	0.584	234	7,174

(4) Process-*B* Account for the month April 2006

Dr. Cr.

Particulars	*Units*	*Amount Rs.*	*Particulars*	*Units*	*Amount Rs.*
To Units Introduced	10000	50,000	By Finished output	8000	78,926
Processing Materials	-	24,600	Transferred		
Direct labour		10,400	- Normal loss	1000	2,000
Overheads		5,000	- Abnormal loss	200	1,900
			- Closing WIP	800	7,174
	10000	90,000		10000	90,000

(5) Abnormal Loss Account

Dr. Cr.

Particulars	*Units*	*Amount Rs.*	*Particulars*	*Units*	*Amount Rs.*
To Process-*B* A/c	200	1,900	By Cash/Bank (realisation of scrap @ Rs. 4/-	200	800
			By Profit and loss A/c		1,100
	200	1,900		200	1,900

Example 11.21 (Normal Loss during a Process)

R.P. Ltd. furnishes you the following information relating to Process *B* for the month of October 2007.

(i) Opening work-in-progress—Nil
(ii) Units introduced—10,000 units @ Rs. 3 per unit.
(iii) Expenses debited to the process:

Direct materials	Rs. 14,650
Labour	Rs. 21,148
Overheads	Rs. 42,000

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(iv) Normal loss in process—One per cent of input.
(v) Closing work-in-progress—350 units—Degree of completion
Material 100%
Labour and overheads 50%
(vi) Finished output 9,500 units
(vii) Degree of completion of abnormal loss:
Material 100%
Labour and overheads 80%
(viii) Units scrapped as normal loss were sold at Re. 1 per unit.
(ix) All the units of abnormal loss were sold at Rs. 2.50 per unit.

Prepare:

1. Statement of Equivalent production;
2. Statement of cost of finished goods, Abnormal loss and Closing work-in-progress. *(ICWA Inter)*

Solution:

1. Statement of Equivalent Production (Process B)

	Equivalent Production						
	Total units	*Material unit*	*Completion %*	*Labour units*	*Completion %*	*Over-heads*	*Completion %*
Finished output	9,500	9,500	100	9,500	100	9,500	100
Normal loss 1% of input of 10,000	100	—	—	—	—	—	—
Abnormal loss (balancing fig.)	50	50	100	40	80	40	80
Closing work-in-progress	350	350	100	175	50	175	50
	10,000	9,900		9,715		9,715	

Statement of Cost per Equivalent Unit

	Material	*Labour*	*Overhead*
Units introduced 10,000 × 3	30,000	—	—
Add: Direct material	14,650		
	44,650		
Less: Sale of normal scrap 100 × 1	100		
	44,550	21,148	42,000
Cost per equivalent unit of production	Rs. 44,550	Rs. 21,148	Rs. 42,000
	9,900	9,715	9,715
	= Rs. 4.50	= Rs. 2.18	= Rs. 4.32
Total cost per unit of production	= (4.50 + 2.18 + 4.32) = Rs. 11.00		

2. Statement of Cost

Finished goods	= 9,500 × 11			1,04,500
Abnormal loss:				
Material	= 50 × 4.50	=	225.0	
Labour	= 40 × 2.18	=	87.2	
Overheads	= 40 × 4.32	=	172.8	485
Closing WIP:				
Material	= 350 × 4.50	=	1,575	
Labour	= 175 × 2.18	=	382	
Overhead	= 175 × 4.32	=	756	2,713
		Total		1,07,698

3. Process B Account

	Units	*Amount (Rs.)*		*Units*	*Amount (Rs.)*
The Opening WIP	Nil	Nil	By Normal loss	100	100
To Units introduced	10,000	30,000	By Abnormal loss	50	485
To Direct materials		14,650	By Finished output		
			(Rs 11 per unit)	9,500	1,04,500
To Labour		21,148	By Closing WIP c/d	350	2,713
To Overheads		42,000			
	10,000	1,07,798		10,000	1,07,798
To Material	12,000	60,000	By Spoilage	1,000	—
			By Output transferred	10,000	1,10,000
To Labour		33,600			
To Overhead		22,400	By Closing work-in-progress	1,000	6,000
	12,000	1,16,000		12,000	1,16,000

Note: As entire material is placed in the process at the beginning of the first process, it has been assumed that closing work-in-progress is complete 100% with regard to materials. Therefore, percentage of completion of 20% has been applied only in case of labour and overhead.

Situation 3 (Opening and Closing Work-in-Progress without Process Loss or Gain)

A process account may have opening work-in-progress as well as closing work-in-progress. The treatment of closing work-in-progress is the same with regard to equivalent production and determining its cost. In case of opening work-in-progress, the production or finished units completed during the period will comprise two lots: (i) the first lot will be of opening work-in-progress which is partially incomplete and which will be completed during the period; (ii) the second lot of production will be of those units which are introduced into the process during the current period and have been completed during the period.

Since costs tend to vary from period to period, each lot may carry different units costs. The procedure of calculating equivalent production for opening work-in-progress units depends on which method of costing (cost flow assumption) has been used. If standard costing is not used, generally accepted accounting practices permit use of any one of the following three cost flow assumptions:

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1. First-in, First-out (FIFO)
2. Weighted Average Costing
3. Last-in, First-out (LIFO)

FIFO The FIFO method of costing is based on the assumption that opening work-in-progress units are the first to be completed, the first costs incurred in the period should be attached to units in opening work-in-progress. After opening work-in-progress units have been completed, new units are taken up during the current period. Equivalent production of opening work-in-progress can be calculated as follows:

Equivalent production = Units in opening W.I.P × Percentage of work needed to finish the units

Costs associated with the opening inventory in process are separated from costs of units started and completed during the period, and the costs of the two periods are not combined before final transfer of completed units out of process. No unit of opening work-in-progress is automatically found in closing work-in-progress.

Weighted Average Costing Under average costing, opening work-in-progress units and costs both are combined with new production started in current period (both unit and cost) and weighted average cost per unit is determined by dividing the total cost (opening work-in-progress cost + current cost) by equivalent production. Costs attached with the opening inventory lose their identity because of this merger. The opening inventory cost is treated as if it were current period cost. No distinction is made between completed units from opening inventory and completed units from the new production. In fact, all units finished during the current accounting period are treated as if they were started and finished during that period. Therefore, equivalent production (of opening work-in-progress) will be all units of opening work-in-progress. There is only one final unit cost for all completed units—a weighted average unit cost.

FIFO and average costing, although based on different costing concepts, do not necessarily produce significantly different unit costs. The differences in unit costs between the two costing methods may exist only under the following conditions:

1. Opening work-in-progress units are large, relative to the number of units started during the current period. The lesser number of units in opening inventory will have little influence on the average cost.
2. The stage of completion of the opening work-in-progress units is quite advanced. In absence of this, previous period costs of opening inventory will not have any impact on the average cost.
3. Previous period costs are substantially different from current period costs.

Average costing under normal conditions (if the above conditions do not exist) is the most appropriate, accurate and simple. However, if the above conditions prevail, the average cost may not be helpful in efficiency measurement and cost control.

LIFO In LIFO method the assumption is that the units entering into the process in the last are the first to be completed. This method influences differently the costs of complete units and the closing work-in-progress. The cost of opening work-in-progress is charged to the closing work-in-progress and thus the closing work-in-progress appears at the cost of opening work-in-progress. The completed units appear at their current costs.

Examples 11.22 to 11.26 present FIFO, Average Costing and LIFO methods in process accounts.

Example 11.22

The following particulars are extracted from the book of *Y* Ltd. for the month of August 2003:

Opening stock of W.I.P.		200 units
Degree of completion:		
Materials	100%	
Labour	40%	
Overhead	40%	

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Units introduced in August, 2003		1,050
Completed units in August, 2003		1,100
Closing W.I.P. (units)		150
Degree of completion:		
Materials	100%	
Labour	70%	
Overhead	70%	

Prepare a statement of equivalent production. *(B.Com. (Hons), Delhi, 2003)*

Solution:

(i) Average Cost Method

Statement of Equivalent Production

Production	*Units*	*Material*		*Labour and overhead*	
		% of completion	*Equivalent units*	*% of completion*	*Equivalent prod.*
Finished units	1,100	100	1,100	100	1,100
Closing Work-in-Progress	150	100	150	70	105
	1,250		1,250		1,205

(ii) Under FIFO Method

Statement of Equivalent Production

Production	*Units*	*Material*		*Labour and overhead*	
		% of completion	*Equivalent production*	*% of completion*	*Equivalent production*
Opening W.I.P.	200	–	–	60	120
Completely processed during the period (1050-150)	900	100	900	100	900
Closing W.I.P.	150	100	150	70	105
	1250		1050		1125

Example 11.23

The Vega Manufacturing Co. uses FIFO method of inventory valuation in process costing. The following data relate to Process I for the month of April, 2004:

(i)	Beginning work in process:		
	Quantity	:	1500 units
	Value	:	Rs. 4,500
(ii)	Introduced during the month	:	5,000 units
(iii)	Transferred to Process II	:	5,500 units
(iv)	Ending work-in-process	:	1,000 units
(v)	Degree of completion:		

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	Beginning W.I.P	Ending W.I.P
Materials	100%	100%
Conversion	80%	60%

(vi) Cost added during the month:

Materials	:	Rs. 10,000
Labour	:	Rs. 9,800
Overheads	:	Rs. 4,900

You are required to:

(i) Prepare a statement of equivalent production;

(ii) Prepare Process I account. *(B.Com.(Hons), Delhi, 2004)*

Solution:

Statement of Equivalent Production

Production	*Units*	*Material*		*Labour*	*Overhead*
		% of completion	*Equ. pro.*	*% of completion*	*Equ. pro.*
Opening WIP	1500	–	–	20	300
Completely processed during the period (5500 – 1000)	4500	100	4500	100	4500
Closing WIP	1000	100	1000	60	600
Total	7000		5500		5400

Statement of Cost

Element of Cost	*Cost incurred during the year (Rs.)*	*Equivalent production units*	*Cost per units (Rs.)*
Materials	10,000	5500	1.818
Labour	9,800	5400	1.815
Overhead	4,900	5400	0.907
	24,700		4.540

Statement of Evaluation

	Rs.	*Rs.*
Opening work in progress (current cost):		
Material		
Labour: 300 units @ 1.815	545	
Overhead: 300 units @ .907	273	818
Closing WIP:		
Material: 1000 units @ 1.818	1818	
Labour: 600 units @ 1.815	1089	
Overhead: 600 units @ .907	545	3,452
Units completely processed during the year (4500 @ Rs. 4.540)		20,430
		24,700

Process Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To opening WIP	1500	4,500	By finished stock to next process (Rs. 4500 + 818 + Rs. 20430)	5500	25,748
To Material	5000	1,000			
To labour		9,800			
To Overhead		4,900			
			By Closing WIP	1000	3,452
	6500	29,200		6500	29,200

Example 10.24 (LIFO)

From the following information prepare: (a) Statement of equivalent production (b) Statement of cost for each element (c) Statement of apportionment of cost and (d) Process account for Process A using the LIFO method of inventory costing for the month of December 2007.

Units in process, Dec. 2007 (All material used, 50% completed regarding labour and overhead)	10,000
New units introduced	20,000
Total units	30,000

Production report reveals the following information:

Units completed	15,000
Units in process on December 31, 2007 (All material used, 50% complete regarding labour and overhead)	15,000
Loss in process	Nil

Cost Record

Work-in-process as on December 1, 2007

	Rs.
Material	3,600
Labour	3,900
Overhead	3,900

Cost for December, 2007	Rs.
Material	14,400
Labour	31,150
Overhead	31,150
Total Cost	88,100

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Solution:

Process A (LIFO Method)
Statement of Equivalent Production

Input		*Output*		*Equivalent Production*					
Particulars	*Units*	*Particulars*	*Units*	*Material*		*Labour*		*Overhead*	
				Units	*%*	*Units*	*%*	*Units*	*%*
Opening stock	10,000	Unit completed	15000	15000	100	15000	100	15000	100
New units		Closing inventory							
introduced	20,000	(a) work on O/WIP	10000*	—		—		—	
		(b) New units	5000	5000	100	2500	50	2500	50
	30,000		30000	20000		17500		17500	

*No work has been done on units which represented opening work-in-process.

Statement of Cost of Each Element

Elements of cost	*Cost in process* *Rs.*	*Equivalent production* *Units*	*Cost per unit* *Rs.*
Material	14,400	20000	0.72
Labour	31,150	17500	1.78
Overhead	31,150	17500	1.78
	76,700		

Statement of Apportionment of Cost

Item	*Elements*	*Equivalent production*	*Cost per unit*	*Cost*	*Total*
		Units	Rs.	Rs.	Rs.
Units completed	Material	15000	0.72	10,800	
	Labour	15000	1.78	26,700	
	Overhead	15000	1.78	26,700	64,200
Closing inventory					
Opening WIP	Material	—	0.72	—	
	Labour	—	1.78	—	
	Overhead	—	1.78	—	
New units	Material	5000	0.72	3,600	
	Labour	2500	1.78	4,450	
	Overhead	2500	1.78	4,450	12,500
					76,700

Process A Account

Particulars	*Units*	*Amount Rs.*	*Particulars*	*Units*	*Amount Rs.*
To Opening WIP	10,000	11,400	By Units completed	15,000	64,200
Units introduced	20,000		By Closing stock	15,000	23,900
Material		14,400			
Labour		31,150			
Overhead		31,150			
	30,000	88,100		30,000	88,100

Note: Process A/c has been credited with an amount of Rs. 23,900 being the cost of closing stock, determined as follows:

Costs of opening WIP:	Rs.
Material	3,600
Labour	3,900
Overhead	3,900
	11,400
Add: Cost of work done on opening WIP	Nil
Add: Costs of newly introduced units	12,500
	23,900

Example 11.25 (FIFO)

Vinal Ltd. produces Article *B* from a material which passes through two processes namely *P* and *Q*. The details relating to a month are as under:

	Process P	*Process Q*
Materials introduced (units)	10000	
Transferred to next process (units)	9000	
Work-in-progress:		
At the beginning of the month (units)	—	600
At the end of the month (units)	1000	400
Expenses:		
Work-in-process at the beginning of the month	—	9400
Materials introduced at the beginning of the process	120000	
Labour and overheads	27600	18200

Stage of completion of work-in-process:

Process *P*: Closing W.I.P. 20% complete in respect of labour and overheads.

Process *Q*: Opening W.I.P. 33 $\frac{1}{3}$% complete in respect of labour and overheads.
Closing W.I.P. 25% complete in respect of labour and overheads.

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The finished output *B* emerging out of Process *Q* is sold at Rs. 20 per unit.

The management is considering an alternative by which the finished output *B* could be further treated by installing a new machine at a capital cost of Rs. 8 lakhs. In such an event, the final product known as article *N* produced by this operation could be sold at Rs. 25 per unit. The operating expenses of the aforesaid further treatment are estimated at Rs. 23,000. The company desires a return on investment of 25%.

Required:

(a) Prepare the process cost accounts for Process *P* and *Q*.
(Show the working of equivalent units and cost per equivalent unit in each process).
(b) Prepare a statement of profitability of Product *B* as it emerges from Process *Q*.
(c) Advise the management whether further treatment of Product *B* by installing the new machine should be taken up or not. *(ICWA Inter)*

Solution:

(a) Process Cost Accounts

Equivalent Units—Process P

Input units		*Materials*		*Labour & Overhead*	
		Units	*Completion (%)*	*Units*	*Completion (%)*
9,000	Units completed	9,000	100	9,000	100
1,000	Closing stock	1,000	100	200	20
	Equivalent units	10,000		9,200	
	Expenses	Rs. 1,20,000		Rs. 27,600	
	Cost per equivalent unit Rs.	12		Rs. 3	

Cost of closing stock = 1,000 × Rs. 12 + 200 × Rs. 3 = Rs. 12,600
Cost of completed units = Rs. 1,20,000 + Rs. 27,600 – Rs. 12,600 – Rs. 1,35,000

Equivalent Units—Process Q

Input		*Materials*		*Labour & Overhead*	
		Units	*Completion (%)*	*Units*	*Completion (%)*
600	Opening stock (work completed in current period)	—		400	$66\frac{2}{3}$
8,600	Units completed (units started less closing stock; 9,000 – 400)	8600	100	8600	100
400	Closing stock (work done in current period)	400	100	100	25
	Equivalent units	9000		9100	
	Expenses	Rs. 1,35,000		Rs. 18,200	
	Cost per equivalent unit	Rs. 15		Rs. 2	

Cost of closing stock = 400 × Rs. 15 + 100 × Rs. 2 = Rs. 6,200
Cost of finished stock (Product *B*) = Rs. 9,400 + Rs. 1,35,000 + Rs. 18,200 – Rs. 6,200 = Rs. 1,56,400

Process P Account

	Units	*Rs.*	*Units*		*Rs.*
To Materials	10000	1,20,000	By Transfer to Process *Q*	9000	1,35,000
To Labour and overhead		27,600	By Closing stock	1000	12,600
	10000	1,47,600		10000	1,47,600

Process Q Account

	Units	*Rs.*		*Units*	*Rs.*
To Opening stock	600	9,400	By Transfer to finished stock (Product *B*)	9200	1,56,400
To Process *P*	9000	1,35,000			
To Labour and overhead		18,200			
			By closing stock	400	6,200
	9600	1,62,600		9600	1,62,600

(b) Profitability of Product *B*

Sales (9,200 units at Rs. 20 per unit)	Rs. 1,84,000
Cost of production	Rs. 1,56,400
Profit per month	Rs. 27,600

	Units	*Rs.*	*Units*	*Rs.*
(c) Further Processing of Product *B* to Final Product *N*				
Sales (9,200 units of *N* @ Rs. 25)				Rs. 2,30,000
Cost of Production:				
Upto Product *B* stage			Rs. 1,56,400	
Further processing			Rs. 23,000	Rs. 1,79,400
Profit per month				Rs. 50,600
Profit without further processing				Rs. 27,600
Additional profit by further processing				Rs. 23,000 per month
Desired return on fresh investment		= 25% on Rs. 8,00,000 = 2,00,000 per year = Rs. 16,667 per month		

Further processing results in:

Additional profit per month of Rs. 23,000 which works out to a return of 34.5% $\left(\frac{23,000 \times 12 \times 100}{8,00,000}\right)$ on investment as against the desired return of 25%.

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Therefore, subject to the consideration of other non-cost factor, if any, the proposal for further processing is recommended for acceptance.

Example 11.26 (Average Costing)

Following information is available regarding Process *A* for the month of February, 1999:

Production Record

Units in process as on 1.2.1999	4,000
(All materials used, 25% complete for labour and overhead)	
New units introduced	16,000
Units completed	14,000
Units in process as on 28.2.1999	6,000
(All materials used, $33\frac{1}{3}$% complete for labour and overhead)	

Cost Records

Work-in-process as on 1.2.1999	Rs.
Materials	6,000
Labour	1,000
Overhead	1,000
	8,000
Cost during the month:	
Materials	25,600
Labour	15,000
Overhead	15,000
	55,600

Presuming that average method of inventory is used, prepare:

(i) Statement of equivalent production.
(ii) Statement showing cost for each element.
(iii) Statement of apportionment of cost.
(iv) Process cost account for Process *A*. *(CA Inter, May 1999)*

Solution:

(i) Statement of Equivalent Production (Average Cost Method)

Particulars			*Materials*		*Labour*		*Overhead*	
Input (units)	*Output*	*Units*	*% com-pletion*	*Equi valent units*	*% com-pletion*	*Equi valent units*	*% com-pletion*	*Equi-valent units*
20,000	Completed	14,000	100	14,000	100	14,000	100	14,000
	WIP	6,000	100	6,000	$33\frac{1}{3}$	2,000	$33\frac{1}{3}$	2,000
20,000		20,000		20,000		16,000		16,000

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(ii) Statement of Cost

Particulars	*Materials*	*Labour*	*Overhead*	*Total*
Cost of Opening Work-in-progress (Rs.)	6,000	1,000	1,000	8,000
Cost incurred during the month (Rs)	25,600	15,000	15,000	55,600
Total Cost (Rs.): (i)	31,600	16,000	16,000	63,600
Equivalent units: (ii)	20,000	16,000	16,000	
Cost per equivalent unit (Rs.) (iii) = (i)/(ii)	1.58	1	1	3.58

(iii) Statement of Cost Apportionment

			Rs.	Rs.
Cost of output transferred: (i)	14,000 units @	Rs. 3.58		50,120
Cost of closing work-in-progress: (ii)				
Materials	6,000 units @	Rs. 1.58	9,480	
Labour	2,000 units @	Re 1	2,000	
Overhead	2,000 units @	Re 1	2,000	13,480
Total Cost: (i) + (ii)				63,600

Dr. (iv) Process A Account Cr.

Particulars	*Units*	*Rs.*	*Particulars*	*20,000*	*63,600*
To Opening *WIP*	4,000	8,000	By Completed units	14,000	50,120
To Materials	16,000	25,600	By Closing WIP	6,000	13,480
To Labour		15,000			
To Overhed		15,000			
	20,000	63,600		20,000	63,600

Situation 4 (Opening and Closing Work-in-Progress with Process Losses or Gains)

In this situation, due adjustments are made for normal loss, abnormal loss, and abnormal gain in calculation of equivalent production. However, there is no change in the treatment of normal loss, abnormal loss and abnormal gain. Normal spoilage cost is borne by the good units produced; proceeds realised from the sale of normal loss scrap are credited to the relevant process account. These proceeds (sale of scrap) are also taken into account while calculating cost per unit of equivalent production. Abnormal loss units are valued like good units.

Examples 11.27 to 11.32 display the preparation of Process Accounts in this situation.

Example 11.27

The following data are available in respect of Process I for March, 2007:

(i) Opening stock of work-in-progress: 800 units at a cost or Rs. 4,000.

(ii) The degree of completion of opening W.I.P.:

Materials	100%
Labour	60%
Overhead	60%

(iii) Input of materials at a total cost of Rs. 36,800 units for 9,200 units.

(iv) Direct wages incurred Rs. 16,740.

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(v) Production overheads Rs. 8,370.
(vi) Units scrapped 1,200 units. The stage of completion of these units was:

Materials	100%
Labour	80%
Overhead	80%

(vii) Closing work-in-progress: 900 units. The stage of completion of these units was:

Materials	100%
Labour	70%
Overhead	70%

(viii) 7,900 units were completed and transferred to the next process.
(ix) Normal loss is 8% of the total input (opening stock plus units put into the process).
(x) Scrap value is Rs. 4 per unit.

You are required to:

(a) Compute equivalent production.
(b) Calculate cost per equivalent unit.
(c) Calculate the cost of abnormal loss (or gain), closing work-in-progress and units transferred to the next process using FIFO method.
(d) Show the Process Account for March, 2007. *(B.Com.(Hons), Delhi, 2007)*

Solution:

Statement of Equivalent Output (FIFO Method)

Input	*Particulars*	*Unit*	*Matenal*		*Labour and Overhead*	
			%	*Unit*	*%*	*Unit*
	Opening stock	800	–	–	40%	320
	Normal Loss (8% of Total Input)	800	–	–	–	–
	Abnormal Loss (1200 – 800)	400	100%	400	80%	320
	Finished Goods	7100	100%	7100	100%	7,100
	Closing W.I.P.	900	100%	900	70%	630
	Equivalent Output	10000		8,400		8,370

Cost per Equivalent Unit

Particulars	*Amount Rs.*	*Eq. unit*	*Per unit*
Material	36,800		
Less: Scrap (800 × 4)	3,200		
	33600	8400	4
Labour and Overhead (16740 + 8370)	25,110	8370	3
Cost per Equivalent unit			7

(*Contd.*)

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Cost per Equivalent Unit

Particulars	*Amount Rs.*	*Eq. unit*	*Per unit*
W.N. Cost of Abnormal Loss			
Material (400 × 4)			1,600
Labour and Overhead (320 × 3)			960
			2,560
Cost of closing W.I.P.			3,600
Material (900 × 4)			1,890
Labour and Overhead (630 × 3)			5,490

Process A/c

Particulars	*Unit*	*Amount Rs.*	*Particulars*	*Unit*	*Amount*
To Opening W.I.P.	800	4,000	By Normal Loss	800	3,200
To Material	9200	36,800	By Abnormal Loss	400	2,560
To Labour		16,740	By Finished Goods*	7900	54,660
To Overhead		8,370	By Closing W.I.P.	900	5,490
	10000	65,910		10000	65,910

Cost of Finished Goods

Cost of completing op. stock (4000 + 320 × 3)	4,960
Cost of completing next 7100 units (7100 × 7)	49,700
	54,660

Example 11.28

From the following information prepare:

(a) Statement of equivalent production;
(b) Statement of element of cost/unit;
(c) Statement of apportionment of cost;
(d) Process II account under FIFO method.

(i) Opening stock—800 units costing Rs. 6,038 (transferred in cost Rs. 1,200, material Rs. 1,578, labour Rs. 1,710, overheads Rs. 1,550)
(ii) Transferred from previous Process I—12,000 units costing Rs. 16,350.
(iii) Cost incurred in Process II:

Material	Rs. 11,600
Labour	Rs. 20,760
Overheads	Rs. 15,570

(iv) Normal loss in process II—10%
(v) Scrap realised @ Rs. 10/10 units
(vi) Closing stock—1800 units
(vii) Transfer to next process—9,700 units
(viii) Degree of completion:

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	Op. Stock (%)	*Cl. Stock (%)*	*Scrapped Units (%)*
Material	60	60	100
Labour	40	51	41
Overheads	40	51	41

(B.Com.(Hons), Delhi, 2006)

Solution:

Statement of Equivalent Production

			Material		*Labour and Overhead*	
Input	*Particulars*	*Output*	*%*	*Unit*	*%*	*Unit*
800	Opening W.I.P. finished	800	40%	320	60%	480
12000	Input introduced					
	Units introduced and finished	8900	100%	8900	100%	8900
	Normal loss	1200	—	—	—	—
	Abnormal Loss	100	100%	100	41%	41
	Closing stock	1800	60%	1080	51%	918
12800		12800		10400		10339

Statement of Cost per unit

Particulars	*Material I*	*Material II*	*Labour*	*Overhead*
Cost	16350	11600	20760	15570
Less: Sale of Scrap	—	1200	—	—
	16350	10400	20760	15,570
Equivalent Production	10400	10400	10339	10,339
Per unit cost	1.5721	1	2.0079	1.5059

Statement of Apportionment of cost

Particulars	*Item*	*Equivalent Units*	*Rate Per Unit*	*Total*
Cost of Completed Units				
Opening cost of 800 units				6,038
further cost on opening stock	Material I	320	1.5721	
	Material II	320	1.0000	
	Labour	480	2.0074	
	Overhead	480	1.5059	2,510
Cost of units Introduced and Finished during the year				
Cost of 8900 completed units	Material I	8,900	1.5721	
	Material II	8,900	1.0000	
	Labour	8,900	2.0079	
	Overhead	8,900	1.5059	54,165
				62,713

(Contd.)

Statement of Apportionment of cost

Particulars	*Item*	*Equivalent Units*	*Rate Per Unit*	*Total*
Total cost of finished goods				
Cost of Abnormal Loss	Material I	100	1.5721	
100 units Abnormal Loss	Material II	100	1.0000	
	Labour	41	2.0079	
	Overhead	41	1.5059	401
Closing Work in Progress				
1800 units of closing W.I.P.	Material I	1,080	1.5721	
	Material II	1,080	1.0000	
	Labour	918	2.0079	
	Overhead	918	1.5059	6004

Process II Account

Particulars	*Unit*	*Amount*	*Particulars*	*Unit*	*Amount*
To Opening stock	800	6,038	By Normal loss	1,200	1,200
To Units received from			@ Rs. 1 per unit		
Process II	12,000	16,350	By Abnormal loss	100	401
To Material		11,600	By transfer to finished	9,700	62,713
To Labour		20,760	products		
To Overhead		15,570	By Closing W.I.P.	1,800	6,004
	12,800	70,318		12,800	70,318

Example 11.29

The following data relate to Process *Q*:

(i) Opening work-in-process 4,000 units
Degree of completion:

Materials	100%	Rs.	24,000
Labour	60%	Rs.	14,400
Overheads	60%	Rs.	7,200

(ii) Received during the month of April, 1998 from Process *P*
40,000 units Rs. 1,71,000

(iii) Expenses incurred in Process *Q* during the month

Materials	Rs.	79,000
Labour	Rs.	1,38,230
Overheads	Rs.	69,120

(iv) Closing work-in-process: 3,000 units
Degree of completion:
Materials 100%
Labour & Overheads 50%

(v) Units scrapped 4,000 units
Degree of completion:
Materials 100%
Labour and Overheads 80%

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(vi) Normal loss: 5% of current input
(vii) Spoiled goods realised Rs. 1.50 each on sale.
(viii) Completed units are transferred to warehouse.

Required: Prepare:

(i) Equivalent units statement.
(ii) Statement of cost per equivalent unit and total costs.
(iii) Process *Q* Account.
(iv) Any other account necessary. *(CA Inter, May 1998)*

Solution

(i) Statement of Equivalent Production

Input Units	*Particulars*	*Output Units*	*Equivalent Production*					
			Materials		*Labour*		*Overheads*	
			% Comp-letion	*Units Comp-letion*	*% Comp-letion*	*Units*	*%*	*Units*
4000	Opening work-in-progress (units, Completed and transferred to warehouse)	4000	—	—	40	1600	40	1600
40,000	Units completed and transferred to warehouse	33,000	100	33,000	100	33,000	100	33,000
	Closing work-in-progress	3,000	100	3,000	50	1,500	50	1,500
	Normal Loss	2,000	—	—	—	—	—	—
	Abnormal loss	2,000	100	2,000	80	1,600	80	1,600
				38,000		37,700		37,700

(ii) Statement of Cost Per Equivalent Unit and Total Cost

Particulars	*Material I (Process P)*	*Material II (Process Q)*	*Labour and Overhead (Process Q)*
Cost (Rs.)	1,71,000	79,000	2,07,350
Less: Recovery from sale of scrapped 2,000 units at Rs. 1.50 per unit being normal loss	—	3,000	—
	1,71,000	76,000	2,07,350
Equivalent Production	38,000	38,000	37,700
Cost per unit	Rs. 4.5	Rs. 2	Rs. 5.50

(*Contd.*)

(ii) Statement of Cost Per Equivalent Unit and Total Cost

Particulars	*Material I (Process P)*	*Material II (Process Q)*	*Labour and Overhead (Process Q)*
Cost of Completed Units:			
Opening Stock 4,000 units			45,600
Costs incurred to complete Opening Stock into finished products (1,600 × 5.50)			8,800
			54,400
Cost of 33,000 completed units (33,000 units × Rs. 12)			3,96,000
Total Cost of 37,000 completed units			4,50,400
Cost of Closing WIP 3,000 units (3,000 units × Rs. 6.50) + (1,500 units × Rs. 5.50)			27,750
Cost of 2,000 Abnormal Loss units (2,000 units × Rs. 6.50) + (1,600 units × Rs. 5.50)			21,800
			4,99,950

(iii) Process Q Account

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Opening Work in Progress	4000	45,600	By Normal Loss	2000	3,000
To Units received	40000	1,71,000	By Completed Units (transferred	37000	4,50,400
To Costs Incurred:					
Materials		79,000	to warehouse)		
Labour		1,38,230	By Closing Work	3000	27,750
Overheads		69,120	in Progress		
			By Abnormal Loss	2000	21,800
	44000	5,02,950		44000	5,02,950

(iv) Abnormal Loss Account

Particulars	*Units*	*Rs.*	*particulars*	*Units*	*Rs.*
To Process Q Account	2000	21,800	By Sale Proceeds	2000	3,000
			By Profit & Loss Account (Loss)		18,800
		21,800			21,800

Example 11.30

Following details are related to the work done in Process *A* of *XYZ* Company during the month of March, 2007:

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Opening work-in-progress (2000 units)	Rs.
Materials	80,000
Labour	15,000
Overheads	45,000
Materials introduced in Process *A* (38000 units)	14,80,000
Direct labour	3,59,000
Overheads	10,77,000
Units scrapped: 3000 units	
Degree of completion:	
Materials	100%
Labour and overheads	80%
Closing work-in-progress: 2000 units	
Degree of Completion:	
Materials	100%
Labour and overheads	80%
Units finished and transferred to Process *B*: 35,000	
Normal Loss:	
5% of total input including opening work-in-progress	
Scrapped units fetch Rs. 20 per piece.	

You are required to prepare;

(i) Statement of equivalent production;
(ii) Statement of cost;
(iii) Statement of distribution cost; and
(iv) Process *A* Account, Normal and Abnormal Loss Accounts.

(CA, PE, Exam II, Group II, May 2007)

Solution:

Statement of Equivalent Production

Input	*Units*	*Output*	*Units*		*Equivalent production*		
					Material		*Labour and Overheads*
				%	*Units*	*%*	*Units*
Opening WIP	2000	Completed and transfer to Process *B*	35000	100	35000	100	35000
Units introduced	38000	Normal loss (5% of 40000)	2000		–		–
		Abnormal loss	1000	100	1000	80	800
		Closing WIP	2000	100	2000	80	1600
	40000		40000		38000		37400

Statement of Cost

Details	*Cost at the beginning of process* Rs.	*Cost added* Rs.	*Total cost* Rs.	*Equivalent lent Units* Rs.	*Cost per unit* Rs.
Material	80,000	14,80,000	15,60,000		
Less: Value of normal loss (20 × 2,000 =			40,000)	38,000	40
			15,20,000		
Labour	15,000	3,59,000	3,74,000	37,400	10
Overheads	45,000	10,77,000	11,22,000	37,400	30
					80

Statement of Distribution of Cost

(a) Completed and transferred to process *B* = 35000 units @ Rs. 80 = Rs. 28,00,000

(b) Abnormal loss: 1000 units:

Materials 1000 units @ 40 = Rs. 40,000

Labour and Overheads 800 units @ 40 = Rs. 32,000

Rs. 72,000

(c) Closing WIP = 2000 units

Materials 2000 units @ 40 = Rs. 80,000

Labour and Overheads 1600 units @ 40 = Rs. 64,000

Rs. 1,44,000

Process A Account

Dr. Cr.

	Particulars	*Units*	*Amount*		*Particulars*	*Units*	*Amount*
To	Opening WIP	2000	1,40,00 0*	By	Normal Loss	2000	40,000
	Material introduced	38000	14,80,000	By	Abnormal Loss	1000	72,000
	Direct labour		3,59,000	By	Process *B* A/c transfer to next process	35000	28,00,000
	Overheads		10,77,000				
				By	Closing WIP	2000	1,44,000
		40000	30,56,000			40000	30,56,000

* Materials + Labour + Overheads = Rs. (80,000 + 15,000 + 45,000) = Rs. 1,40,000.

Normal Loss Account

Dr. Cr.

To	Process *A* A/c	2,000	40,000	By	By Cost Ledger Control A/c	2,000	40,000
		2,000	40,000			2,000	40,000

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Abnormal Loss Account

To	Process 'A' A/c	1,000	72,000	By	By Cost Ledger Control A/c	1,000	20,000
					By Costing Profit and Loss A/c		52,000
		1,000	72,000			1,000	72,000

Example 11.31

From the following information for the month of October, 2003, prepare Process III cost accounts:

Opening WIP in Process III	1800 units at Rs. 27,000
Transfer from Process II	47700 units at Rs. 5,36,625
Transferred to Warehouse	43200 units
Closing WIP of Process III	4500 units
Units scrapped	1800 units
Direct material added in Process III	Rs. 1,77,840
Direct Wages	Rs. 87,840
Production Overheads	Rs. 43,920

Degree of Completion:

	Opening Stock	*Closing Stock*	*Scrap*
Material	80%	70%	100%
Labour	60%	50%	70%
Overheads	60%	50%	70%

The normal loss in the process was 5% of the production and scrap was sold @ Rs. 6.75 per unit.

(CA, PE, Exam II, Group II, Nov. 2003)

Solution:

Statement of Equivalent Production
(Process III)

Input		*Output*		*Equivalent production*					
				Material A		*Material B*		*Labour and overheads*	
Details	*Quantity units*		*Quantity units*	*Quantity units*	*%*	*Quantity units*	*%*	*Quantity units*	*%*
Op WIP	1800	Work on Op. WIP	1800	–	–	360	20	720	40
Process II Transfer	47700	Introduced and completed during the month	41400	41400	100	41400	100	41400	100
		Normal loss (5% of 45,000 units)	2250	—	—	—	—	—	—
		Cl. WIP	4500	4500	100	3150	70	2250	50
			49,950	45,900		44910		44370	
		Abnormal gain	–450	–450	100	–450	100	–450	100
	49500		49500	45450		44460		43920	

Working Note

Production units = Opening units + Units transferred from Process II – Closing units

= 1,800 units + 47,700 units – 4,500 units = 45,000 units

Statement of Cost

	Cost *Rs.* *(a)*	*Equivalent units* *(b)*	*Cost per equivalent unit* *Rs.* *(a) / (b)*
Material *A* (Transfer from previous process)	5,36,625		
Less: Scrap value of normal loss (2,250 units × Rs. 6.75).	15,187		
	5,21,438	45,450	11.4728
Material *B*	1,77,840	44,460	4.0000
Labour	87,840	43,920	2.0000
Overheads	43,920	43,920	1.0000
	8,31,037.50		18.4728

Statement of Apportionment of Process Cost

			Rs.
Opening WIP	Material *A*		27,000
Completed opening WIP units – 1800	Material *B*	360 units × Rs. 4 = Rs. 1,440	
	Wages	720 units × Rs. 2 = Rs. 1,440	
	Overheads	720 units × Re. 1 = Rs. 720	3,600
Introduced and completed – 41400 units		41,400 units × Rs. 18.4728	7,64,773
Total cost of 43,200 finished goods units			7,95,373
Closing WIP units – 4500	Material *A*	4,500 units × Rs. 11.4728	51,628
	Material *B*	3,150 unit × Rs. 4	12,600
	Wages	2,250 units × Rs. 2	4,500
	Overheads	2,250 units × Re. 1	2,250
			70,978
Abnormal gain units — 450 units		450 units × Rs. 18.4728	8,313

Process III A/c

	Units	*Rs.*		*Units*	*Rs.*
To Balance b/d	1800	27,000	By Normal Loss	2250	15,187
To Process II A/c	47700	5,36,625	By Finished goods stock	43200	7,95,373
To Direct material		1,77,840			
To Direct Wages		87,840			
To Production overheads		43,920	By Closing WIP	4500	70,978
To Abnormal gain	450	8,313			
	49950	8,81,538		49950	8,81,538

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Example 11.32

The following information is given in respect of Process No. 3 for the month of January, 2001.

Opening stock—2,000 units made-up of:

Direct Material I	Rs. 12,350
Direct Material II	Rs. 13,200
Direct Labour	Rs. 17,500
Overheads	Rs. 11,000

Transferred from Process No. 2: 20000 units @ Rs 6.00 per unit.

Transferred to Process No. 4: 17000 units

Expenditure incurred in Process No. 3:

Direct Materials	Rs. 30,000
Direct Labour	Rs. 60,000
Overheads	Rs. 60,000

Scrap: 1000 units—Direct Materials 100%, Direct Labour 60%, Overheads 40%. Normal Loss 10% of production.

Scrapped units realised Rs. 4 per unit.

Closing Stock: 4000 units—Degree of completion: Direct Materials 80%, Direct Labour 60% and Overheads 40%.

Prepare Process No. 3 Account using average price method, alongwith necessary supporting statements.

(CA Inter, May 2001)

Solution:

Statement of Equivalent Production
(Average cost method)

Particulars	*Total*	*Material I*		*Material II*		*Labour*		*Overhead units*	
	units	*%*	*units*	*%*	*units*	*%*	*units*	*%*	*units*
Units completely processed	17000	100	17000	100	17000	100	17000	100	17000
Normal Loss 10% of {2,000 units + 20,000 units – 4,000 units} (Refer to working note)	1800	—	—	—	—	—	—	—	
Abnormal gain	– 800	100	– 800	100	– 800	100	– 800	100	– 800
Closing stock	4000	100	4000	80	3200	60	2400	40	1600
	22000		20200		19400		18600		17800

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Statement of Cost

	Cost Rs.	*Equivalent units*	*Rate/Equivalent (unit) Rs.*
Material I:			
Opening balance 2000 units	12,350		
Cost of 20000 units @ Rs 6/- per unit	1,20,000		
Less: Scrap realised (1800 units × Rs. 4)	(7,200)		
	1,25,150	20200	6.1955
Material II:			
Opening stock	13,200		
In process II	30,000		
	43,200	19400	2.2268
Labour:			
Opening labour	17,500		
In process II	60,000		
	77,500	18600	4.1667
Overhead:			
Opening stock	11000		
In process II	60000		
	71000	17800	3.9888
Total cost per unit			16.5778

Statement of Evaluation

			Rs.
Cost of 17000 finished goods units (17000 units × Rs. 16.5778)			2,81,822.60 or 2,81,822 (say)
Cost of 800 abnormal unit (800 units × Rs. 16.5778)			13,262.24 or 13,262 (say)
Cost of 4000 closing work-in-progress units:			48,289.92 or 48,290 (say)
			Rs.
Material I	4,000 units × Rs. 6.1955	=	24,782.00
Material II	3,200 units × Rs. 2.2268	=	7,125.76
Labour	2,400 units × Rs. 4.1667	=	10,000.08
Overhead	1,600 units × Rs. 3.988	=	6,382.08
			48,289.92

Process 3 A/c

Dr. **Cr.**

Particulars	*Units*	*Rs.*	*Particulars*	*Units*	*Rs.*
To Opening WIP	2000	54,050	By Normal loss	1800	7,200
To Process II	20000	1,20,000	By Finished good units	17000	2,81,822
			By Closing balance	4000	48,290
To Direct Material II		30,000			
To Direct Labour		60,000			
To Overhead		60,000			
To Abnormal gain	800	13,262			
	22800	3,37,312		22800	3,37,312

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Working Note: Normal loss given is 10% of production. The word production here means those units which come upto the state of inspection. In that case, opening stock plus receipts minus closing stock of WIP will represent units of production (2000 units + 20000 units – 4000 units). In this case the units of production comes to 18000 units and hence 1800 units as normal loss units.

INTER-PROCESS PROFITS

In processing industries, sometimes, the output of each process transferred to the next process is charged at an inflated cost or market value instead of only at actual cost. That is, each process is charged with its input at current prices. Truly speaking, the efficiency of each process should be determined in terms of current prices and not on the basis of a price relating to the previous period. In this manner profit or loss determined will be realistic and remedial action may be taken where the profit on any process is insufficient. The profit or loss made by the transferor process is thus revealed in the process account.

Inter-process profits accounting tends to make the costing records more complicated. Also, such profits will inflate the value of stock and work-in-progress in excess of the actual costs. For financial accounting purposes such inflated stocks are to be brought down at the lower cost or market value. Thus, for balance sheet purposes, the values of stocks computed under inter-process profits are not useful. Stock adjustment is needed purely for reasons of prudence and to conform to generally accepted accounting principles. But for individual process accounts, the inclusion of departmental process profits may be necessary.

Example 11.33

The following are the details in respect of Process *X* and Process *Y* of a processing factory:

	Process X	*Process Y*
	Rs.	Rs.
Material	10,000	—
Labour	10,000	14,000
Overhead	4,000	10,000

The output of Process *X* is transferred to Process *Y* at a price calculated to give a profit of 20% on the transfer price and the output of Process *Y* is charged to finished stock at a profit of 25% on the transfer price. The finished department realised Rs. 1,00,000 for the finished goods received from Process *Y*. You are asked to show process accounts and total profits, assuming there was no opening and no closing work-in-progress. *(CA Inter)*

Solution:

Process X Account

	Rs.		Rs.
To Material	10,000	By Transfer to	30,000
To Labour	10,000	Process *Y*	
To Overhead	4,000		
To Profit (20% of transfer price)	6,000		
	30,000		30,000

Process Y Account

	Rs.		Rs.
To Transfer from Process X	30,000	By Transfer to finished stock A/c	72,000
To Labour	14,000		
To Overhead	10,000		
To Profit (25% of the transfer period)	18,000		
	72,000		72,000

Profit and Loss Account

	Rs.		Rs.
To Cost of sale	72,000	By Sales	1,00,000
To Profit c/d	28,000		
	1,00,000		1,00,000
To Total profit	Rs. 52,000	By Profit b/d	Rs. 28,000
		By Profit on Process *X*	6,000
		By Profit on Process *Y*	18,000
	52,000		52,000

Example 11.34

A Ltd. produces product *AXE* which passes through two processes before it is completed and transferred to finished stock. The following data relate to October 2007.

Particulars	*Process*		*Finished stock*
	I	*II*	
	Rs.	Rs.	Rs.
Opening stock	7,500	9.000	22,500
Direct materials	15,000	15,750	
Direct wages	11,200	11,250	
Factory overheads	10,500	4,500	
Closing stock	3,700	4,500	11,250
Inter-process profit included in opening stock		1,500	8,250

Output of Process I is transferred to Process II at 25% profit on the transfer price.

Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at prime cost. Finished stock is valued at the price at which it is received from Process II. Sales during the period are Rs. 1,40,000. Prepare process cost account and finished goods account showing the profit element at each stage. *(CA Inter)*

Solution:

Process I Account

	Total (Rs.)	*Cost (Rs.)*	*Profit (Rs.)*		*Total (Rs.)*	*Cost (Rs.)*	*Profit (Rs.)*
Opening stock	7,500	7,500	–	Transfer to	54,000	40,500	13,500
Direct material	15,000	15,000	–	Process II			
Direct wages	11,200	11,200	–	account			
	33,700	33,700					
Less: Closing stock	3,700	3,700					
Prime cost	30,000	30,000	–				
Overhead	10,500	10,500					
Process cost	40,500	40,500	–				
Profit ($33\frac{1}{2}\%$ of total cost) (See Working Note I)	13,500	–	13,500				
	54,000	40,500	13,500		54,000	40,500	13,500

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Process II Account

	Total (Rs.)	*Cost (Rs.)*	*Profit (Rs.)*		*Total (Rs.)*	*Cost (Rs.)*	*Profit (Rs.)*
Opening stock	9,000	7,500	1,500	Transfer to			
Transferred from Process I	54,000	40,500	13,500	finished stock account	1,12,500	75,750	36,750
Direct material	15,750	15,750	—				
Direct wages	11,250	11,250	—				
	90,000	75,000	15,000				
Less: Closing stock	4,500	3,750	750				
Prime cost	85,500	71,250	14,250				
Overhead	4,500	4,500	—				
Process cost	90,000	75,750	14,250				
Profit (25% on total cost) (See Working Note 2)	22,500	—	22,500				
	1,12,500	75,750	36,750		1,12,500	75,750	36,750

Finished Stock Account

	Total (Rs.)	*Cost (Rs.)*	*Profit (Rs.)*	*Total (Rs.)*	*Cost (Rs.)*	*Profit (Rs.)*
Opening stock	22,500	14,250	8,250	1,40,000	82,500	57,500
Transferred from Process II	1,12,500	75,750	36,750			
	1,35,000	90,000	45,000			
Less: Closing stock	11,250	7,500	3,750			
Finished stock cost	1,23,750	82,500	41,250			
Profit	16,250	—	16,250			
	1,40,000	82,500	57,500	1,40,000	82,500	57,500

Working Notes:

Let the transfer price be 100 then profit is 25; that is, cost price is 75.

1. If cost is Rs. 75 then profit is Rs. 25.
   If cost is Rs. 40,500 then profit $25/75 \times 40{,}500$ = Rs. 13,500.
2. If cost is Rs. 80 then profit is Rs. 20.
   If cost is Rs. 90,000 then profit $20/80 \times 90{,}000$ = Rs. 22,500.

JOINT PRODUCT AND BY-PRODUCT

Joint Product

Joint products may be defined as distinctly different major products that are inevitably produced simultaneously from common inputs or by common processing. The quantity and sales value of each joint product are such that none of them may be designated as minor products; all joint products are major products.

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Many industries, such as chemicals, oil refining, mining, meat packing and similar industries are involved in such joint production processes and manufacture two or more products from the same raw material. In oil refining, for example, fuel, oil, gasoline, kerosene, lubricating oils are but a few of the many products that emerge.

An increase in the output of one product will bring about an increase in the quantity of others, or vice versa, but not necessarily in the same proportion. At the same phase of production, two or more separately identifiable products will result from the joint production process. This phase or point is referred to as the split-off point.

Joint Products have the following Characteristics:

1. Joint-products are the primary objectives of manufacturing operations.
2. The sales value of each of the joint products are relatively high and none of the joint products are significantly greater in value than other joint products.
3. The joint products may require further processing or may be sold directly after the split-off point.
4. Joint products require simultaneous common processing.
5. The manufacturer has little or no control over the relative quantities of the various products that will result.

By-product

The term "by-product" is often used synonymously with the term "minor products". It refers to those multiple products that have insignificant sales values relative to those of major products. Otherwise, by-products are the same as joint products. By-products are those products that result incidentally from the manufacture of the main product or products. Processing is not aimed in their direction.

ACCOUNTING FOR JOINT PRODUCT COST

When two or more products are classified as joint products, each individual product must be charged with a proportionate share of the total cost of the joint products. Prior to the point of split off, products are not subject to identification and costs are joint; after separation, product identification is possible and costs become separable. Thus, joint cost is a cost incurred prior to the point at which separately identifiable products emerge from the same process.

Accounting for joint product costs achieve the following objectives:

1. Allocating joint product costs incurred prior to the split-off point.
2. Identifying the production costs incurred after the split-off point to process joint products.

If a product is sold immediately after split-off, its unit costs consist totally of allocated joint costs. If a joint product is processed further after split-off, its unit cost will contain allocated joint costs plus the material, labour and overhead costs of additional processing. The following are apportionment bases usually found in practice for apportionment of joint costs:

1. Physical quantity method.
2. Relative market or sales value method.
3. Average unit cost method.
4. Weighted average cost method.

Physical Quantity Method

Under the quantity method, cost allocation is a simple apportionment of cost in proportion to volume. These physical measures may be units, pounds, kilograms, tonnes, gallons, etc.

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The following example illustrates this method.

Product	*kg.*	*Proportion to total*	*Cost allocated (Rs.)*	*Cost per kg (Rs.)*
A	30,000	1/2	1,80,000	6
B	20,000	1/3	1,20,000	6
C	10,000	1/6	60,000	6
	60,000		3,60,000	6

Relative Market or Sales Value Method

The relative sales value method is often used to apportion joint product costs at the split-off point. The result is a percentage of cost to sales value for the output of the joint process. The sales value of each of the joint products is then multiplied by this percentage to arrive at the apportioned cost for that joint product.

The data given in the above example is being used herewith to explain the sales value method.

Product	*Quantity produced*	*Unit sales price*	*Sales value of production*		*Cost apportioned*	
		Rs.	Amount	%	Total	per unit
A	30,000	4	1,20,000	20	72,000	2.4
B	20,000	9	1,80,000	30	1,08,000	5.4
C	10,000	30	3,00,000	50	1,80,000	18.0
	60,000		6,00,0000	100	3,60,000	

Cost can be allocated in the following two ways:

1. Ratio of cost to sales value $= \dfrac{\text{Rs. } 3,60,000}{\text{Rs. } 6,00,000} = 60\%$

   Product *A* 60% of Rs. 1,20,000 = Rs. 72,000
   Product *B* 60% of Rs. 1,80,000 = Rs. 1,08,000
   Product *C* 60% of Rs. 3,00,000 = Rs. 1,80,000

2. Ratio of sales value of product to total sales value applied to total cost:

   Product *A* 20% of Rs. 3,60,000 = Rs. 72,000
   Product *B* 30% of Rs. 3,60,000 = Rs. 1,08,000
   Product *C* 50% of Rs. 3,60,000 = Rs. 1,80,000

Profits Under the Sales Value Method Move as the Sales Price

Product	*Cost (Rs.)*	*Selling price (Rs.)*	*Profit*	
			Amount (Rs.)	*%*
A	72,000	1,20,000	48,000	40%
B	1,08,000	1,80,000	72,000	40%
C	1,80,000	3,00,000	1,20,000	40%

Average Unit Cost Method

This method apportions total manufacturing costs to the various products by using an average unit cost obtained by dividing the total number of units produced into the total manufacturing cost. If all units produced are measured in terms of the same unit and do not differ greatly, this method can be used without much disadvantage. But when the units manufactured are not measured in similar terms, this method cannot be applied.

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The average cost is computed by using the following formula:

$$\frac{\text{Total manufacturing cost}}{\text{Total number of units produced}}$$

Weighted Average Cost Method

Under this method, weight factors are often assigned to each unit based upon size of the unit, difficulty of manufacture, time used in making the units, difference in type of labour employed, amount of material used, etc. Finished production of every kind is multiplied by weight factors to apportion total costs to individual units. This method is also known as the survey method.

ACCOUNTING FOR BY-PRODUCTS

By-products can be classified into two categories according to their marketable condition at the split-off point: (i) those sold in their original form without need for any further processing; (ii) those which require further processing in order to be saleable. Because of wide variations in the nature of by-products, different accounting treatments are found in practice, such as the following:

1. *Sales of by-product as other income* If the value of the by-product is comparatively small, many manufacturers treat the by-product like scrap material, and sell it. The sale proceeds of by-product are treated as other income.
2. *Sales of by-products as a reduction in the cost of joint products* This method can be followed by reducing the cost of the main product by the total estimated income from the by-product less the selling expense incurred in effecting the sale of the by-product.
   By-products which are not sold, are kept in stock at nil value.
3. *Treating by-products having no cost at the time of separation but charging them with all costs after separation* In such a case, costs incurred after separation should be deducted from the saleable value of the by-product and the balance should be credited to the profit and loss account or the relevant process account.
4. *Recording costs of by-products* This method is applied when the by-products are of relatively high value and also require additional processing after separation from the main product. This requires apportionment of joint costs of the product upto the split-off point. The cost of further processing the by-product is debited to the by-product account. This by-product account is credited with the sale proceeds of the by-products, and any profit or loss is transferred to the costing profit and loss account.
5. *Replacement cost method* The replacement cost method is used in those industries where by-products resulting from the manufacturing process are used within the company. The cost assigned to the by-product is the purchase or replacement cost existing in the market.
6. *Market value (reversal cost) method* This method reduces the manufacturing cost of the main product, not by the actual revenue received, but by an estimated market value of the by-product prevailing at the time the by-product is recovered or sold.

Example 11.35

A factory is engaged in the production of a chemical *X* and in the course of its manufacture a by-product *Y* is produced, which after a separate process has a commercial value. For the month of March 2007 the following are summarised cost data:

	Joint Expenses	Separate Expenses	
	X	*X*	*Y*
	Rs.	Rs.	Rs.
Materials	19,200	7,360	780
Labour	11,700	7,680	2,642
Overheads	3,450	1,500	544

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The output of the month was 142 kg of *X* and 49 kg of *Y*. The selling price of *Y* averaged Rs. 280 per kg. Assuming the profit on *Y* is estimated at 50% of selling price, calculate the cost of *X* per tonne.

(B.Com.(Hons), Delhi, 2007)

Solution:

Statement Showing Y's Share in Joint Expenses

			Rs.
Selling price (49 × 280)			13,720
Less:	Profit (50%)		6,860
	Total Cost		6,860
Less:	Subsequent cost after Separation (780 + 2642 + 544)		3,966
	Share of Joint Expense of *Y*		2,894
Total Joint Expenses (19,200 + 11,700 + 3,450)			34,350
Less:	Share of Joint Expenses of *Y*		2,894
	Share of Joint Expenses of *X*		31,456
		Total Cost of *X*	
			Rs.
	Share of Joint Expense of *X*		31,456
Add:	Further cost after separation		
	Material	7,360	
	Labour	7,680	
	Overhead	1,500	16,540
	Total Cost of *X*		47,996

Cost per kg of $X = \frac{47,996}{142}$ = Rs. 338 per kg.

Example 11.36

In the course of manufacture of the main product *P*, by-products *A* and *B* also emerge. The joint expenses of manufacture amount to Rs. 1,19,550. All the products are processed further after separation and sold as per details given below:

	Main Product	By-product	
	P	*A*	*B*
	(Rs.)	(Rs.)	(Rs.)
Sales	90,000	60,000	40,000
Cost beyond split-off stage	6,000	5,000	4,000
Profit as percentage of sales	25%	20%	15%

Selling and administration overheads are absorbed as percentage of cost of sales. Prepare a statement showing the apportionment of joint cost to the main product and by-products. Also prepare main product *P* account.

(B. Com. (Hons), Delhi, 2001)

Solution:

Statement Showing the Apportionment of Joint Costs

	Main Product	*By product*		*Total*
	P	*A*	*B*	
	Rs.	Rs.	Rs.	Rs.
Sales	90,000	60,000	40,000	1,90,000
Less: Profit (that is 25%, 20% and 15% respectively from *P*, *A* and *B*)	22,500	12,000	6,000	40,500
Cost of sales	67,500	48,000	34,000	1,49,500
Less: Selling expenses (675 : 480 : 340) Rs. 1,49,500 – Rs. 1,19,550 – 14,000 = Rs. 14,950	6,750	4,800	3,400	14,950
Cost of Production	60,750	43,200	30,600	1,34,550
Less: Cost after separation	6,000	5,000	4,000	15,000
Value at split-off point	54,750	38,200	26,600	1,19,550

P (Main Product) Account

To Joint expenses of Manufacture	1,19,550	By transfer of share in Joint expenses	
To Separate Expenses	6,000	By Product *A*	38,200
		By Product *B*	26,600
		By Cost of Product of *P*	60,750
	1,25,550		1,25,550
To Cost of Product *P*	60,750	By Sales	90,000
To Selling and Admn.Exp.	6,750		
To Profit	22,500		
	90,000		90,000

Example 11.37

A factory is engaged in the production of a chemical BOMEX and in the course of its manufacture, a by-product BRUCIL is produced, which after further processing has a commercial value. For the month of April, 2005, the following are the summarised cost data:

	Joint Expenses	*Separate Expenses*	
		BOMEX	BRUCIL
	Rs.	Rs.	Rs.
Materials	1,00,000	6,000	4,000
Labour	50,000	20,000	18,000
Overheads	30,000	10,000	6,000
Selling price per unit		98	34
Estimated profit per unit on sale of BRUCIL			4
		Units	Units
No. of units produced		2,000	2,000

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The factory uses reverse cost method of accounting for by-products whereby the sales value of by-products after deduction of the estimated profit, post separation costs and selling and distribution expenses relating to the by-products is credited to the joint process cost account.

You are required to prepare statement showing:

(i) the Joint Cost allocable to BOMEX.

(ii) the product-wise and overall profitability of the factory for April, 2005. *(CA Inter)*

Solution:

(i) Statement of Joint Cost Allocable to BOMEX

Total joint expenses	*Rs.*	*Rs.*
Materials	1,00,000	
Labour	50,000	
Overheads	30,000	
		1,80,000
Less: Joint Cost allocable to the production of 2,000 units of BRUCIL at the split-off point (See Working Note)		32,000
Cost of production of 2,000 units of BOMEX		1,48,000

(ii) Productwise and Overall Profitability Statement for the Month of April 2001

Particulars	*Products*				*Total*
	BOMEX		BRUCIL		Rs.
Sales (Units)	2,000		2,000		
Selling price per unit (Rs.)	98		34		
Total sales (Rs.)	1,96,000		68,000		
Less: Cost of production at the split off point	1,48,000		32,000		
Post Separation Cost	36,000		28,000		
	1,84,000		60,000		
Profit (Rs.)	12,000		8,000		20,000

Working Note:

Computation of the Joint Expenses Chargeable to the By-product BRUCIL

Units produced		2000
Selling price unit (Rs.)		34
Total Sales: (2000 × Rs. 34)	(Rs.)	68,000
Less: Profit (2000 × Rs. 4)	(Rs.)	8,000
Cost of Sales		60,000
Less: Selling and distribution expenses		Nil
Less: Expenses after separation (Rs. 4,000 + Rs. 18,000 + Rs. 6,000)		28,000
Cost of Production at the split-off point		32,000

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Example 11.38

Raw materials AXE costing Rs. 150 per kg. and BXE costing Rs. 90 per kg. are mixed in equal properties for making product *A*. The loss of material in processing works out to 25% of the product. The production expenses are allocated at 40% of direct material cost. The end product is priced with a margin of 20% over the total cost.

Material BXE is not easily available and substitute raw material CXE has been found for BXE costing Rs. 75 per kg. It is required to keep the proportion of this substitute material in the mixture as low as possible and at the same time maintain the selling price of the end product at existing level and ensure the same quantum of profit as at present.

You are required to compute the ratio of the mix of the raw materials AXE and CXE.

(CA, PE, Exam II, Group II, May 2007)

Solution:

Working Notes:

(i) Computation of material mix ratio:

Let 1 kg. of product *A* requires 1.25 kg. of input of materials AXE and BXE

Raw materials are mixed in equal proportions.

Then raw material AXE = $\frac{1.25}{2}$ = .625 kg.

Then raw material BXE = $\frac{1.25}{2}$ = .625 kg.

(ii) Computation of selling price/kg. of product *A*

	Rs.
Raw material AXE .625 kg. × 150 = Rs. 93.75	
Raw material BXE .625 kg. × 90 = Rs. 56.25	150.00
Production expenses (40% of material cost)	60.00
Total cost	210.00
Add: profit 20% of total cost	42.00
Selling price	252.00

(iii) Computation of proportions of materials AXE and CXE in *A*

Let material CXE required in product *A* be *m* kg.

Then for purchasing 1 kg of product *A*, material AXE requirement = (1.25 – *m*) kg.

To maintain same level of profit and selling price as per Working Note (ii), it is required that the total cost of material in 1 kg. of product *A* should not exceed Rs. 150,

that is, *m* kg. × Rs. 75 + (1.25 – *m*) kg. × 150 = Rs. 150

or 75 *m* + 187.5 – 150 *m* = 150

or 75 *m* = 37.5

or *m* = 0.5 kg.

Raw material AXE requirement in product *A* = 1.25 – 5 = 0.75 kg.

So, proportion of materials AXE and CXE

= 0.75 : 50

that is 3 : 2.

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Example 11.39

In a chemical plant four different products viz. *AB*, *BC*, *CD* and *DD* emerge from the input of crude oil. Product *AB* can be sold immediately, but the remaining three products require further processing before they can be marketed.

In a month, 40000 litres of crude oil were procured at a cost of Rs. 30 per litre and processed at a cost of Rs. 3 lakhs. The details of output obtained, further processing cost, selling price per unit etc. are given below.

Product	*Output kg*	*Further processing cost (Rs.)*	*Selling price at the point of sale*
AB	8000 kg		Rs. 45/kg
BC	10000 kg	80,000	Rs. 60/kg
CD	12000 kg	120,000	Rs. 70/kg
DD	5000 litres	60,000	Rs. 80/litre

Prepare:

(i) Statement showing apportionment of joint cost on suitable basis and product-wise profitability statement.

(ii) If the company finds a market for *CD* at Rs. 63/kg without further processing, will it be advisable to accept it? *(ICWA, Inter, Stage 1, Dec. 2006)*

Solution:

Joint cost of manufacture:

(i) Cost of 40,000 litre of crude oil @ Rs. 30 litre	=	Rs. 12,00,000
Processing cost	=	Rs. 3,00,000
	Total	Rs. 15,00,000

Apportionment of joint cost is done at net sales value at split off point as follows:

(In thousand of rupees)

Product (1)	*Output/ Sales* (2)	*Selling price per unit* (3)	*Sales* (4)	*Further Processing cost* (5)	*Net Sales value* (6) (4 – 5)	*Apportionment of joint cost* (7)	*Total cost* (8) (5 + 7)	*Net Profit* (9) (4 – 8)
AB	8000 kg	Rs. 45	360	-	360	278	278	82
BC	10000 kg	60	600	80	520	402	482	118
CD	12000 kg	70	840	120	720	557	677	163
DD	5000 litres	80	400	60	340	263	323	77
			2200	260	1940	1500	1760	440

(ii) If the Company is able to get market for *CD* at Rs. 63/kg. It is worth selling at the split off point, instead of processing further and selling as it is clear from the following details:

Sales value after further processing	Rs. 8,40,000.00
Sales value at split off point at Rs. 63/kg. 1,20,000 kg. × Rs. 63	Rs. 7,56,000.00
Incremental sales value	Rs. 84,000.00
Further processing cost required, if sold @ Rs. 70/kg.	Rs. 1,20,000.00

Further processing cost is more than the incremental revenue by Rs. 36,000. Hence in this case it is better to sell at split off point without further processing.

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Example 11.40

In a chemical manufacturing company, three products *A*, *B* and *C* emerge at a single split off stage in department *P*. Product *A* is further processed in department *Q*, product *B* in department *R* and product *R* and product *C* in department *S*. There is no loss in further processing of any of the three products. The cost data for a month are as under:

Cost of raw materials introduced in department *P*	Rs. 12,68,800
Direct Wages Department	Rs.
P	3,84,000
Q	96,000
R	64,000
S	36,000

Factory overheads of Rs. 4,64,000 are to be apportioned to the departments on direct wage basis.

During the month under reference, the company sold all three products after processing them further as under:

Products	*A*	*B*	*C*
Output sold kg.	44,000	40,000	20,000
Selling Price per kg. Rs.	32	24	16

There are no Opening or Closing Stocks. If these products were sold at the split off stage, that is, without further processing, the selling prices would have been Rs. 20, Rs. 22 and Rs. 10 each per kg respectively for *A*, *B* and *C*.

Required:

(i) Prepare a statement showing the apportionment of joint costs to joint products.
(ii) Present a statement showing product-wise and total profit for the month under reference as per the company's current processing policy.
(iii) What processing decision should have been taken to improve the profitability of the company.
(iv) Calculate the product-wise and total profit arising from your recommendation in (iii) above.

(CA, PE, Exam. II, Group II, May 2002)

Solution:

(i) Statement Showing the Apportionment of Joint Costs to Joint Products

	Products			
	A	*B*	*C*	*Total*
Output sold kg: (I)	44,000	40,000	20,000	
Selling price per kg. at split off (Rs.): (II)	20	22	10	
Sales value at split off (Rs.): (I) × (II)	8,80,000	8,80,000	2,00,000	19,60,000
Joint costs (costs incurred in department *P* (Rs.) (apportionment on the basis of sales value at the point of split off) that is, (22 : 22 : 5)	8,80,000	8,80,000	2,00,000	19,60,000

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(ii) Statement Showing Product-wise and Total Profit for the Month under Reference

(as per the company's current processing policy)

	Products			
	A	*B*	*C*	*Total*
Output kg: (a)	44,000	40,000	20,000	
Selling price per kg. after further processing (Rs.): (b)	32	24	16	
Sales value after further processing (Rs.): (c) = {(a) × (b)}	14,08,000	9,60,000	3,20,000	26,88,000
Joint costs (Rs.): (d) (Refer to b (i) Working Notes and 2 (i)	8,80,000	8,80,000	2,00,000	19,60,000
Further processing costs (Rs.): (e) (Refer to Working Note 2 (ii)	1,72,800	1,15,200	64,800	3,52,800]
Total costs (Rs.): (f) = [(d) + (e)}	10,52,800	9,95,200	2,64,800	23,12,800
Profit / (Loss) (Rs.): [(c) – (f)}	3,55,200	(35,200)	55,200	3,75,200
Alternatively:				
Incremental sales revenue (Rs.)	5,28,000 (44,000 units × Rs. 12	80,000 (40,000 units × 2)		1,20,000 (20,000 units × Rs. 6)
Less: Further processing costs (Rs.): [Refer to Working Note 2 (ii)]	1,72,800	1,15,200		64,800
Incremental net profit / (loss)	3,55,200	(35,200)		55,200

(iii) Processing Decision to Improve the Profitability of the Company.

44,000 units of product *A* and 20,000 units of product *C* should be further processed because the incremental sales revenue generated after further processing is more than the further processing costs incurred. 40,000 units of product *B* should be sold at the point of-split off because the incremental revenue generated after further processing is less than the further processing costs.

(iv) The Productwise and Total Profit Arising from the Recommendation in (iii) above is as follows:

Product	*A*	*B*	*C*	*Total*
Profit (Rs.)	3,55,200	–	55,200	4,10,400

Working Notes:

1. Statement of Department-wise Costs

	P	*Q*	*R*	*S*
	Rs.	*Rs.*	*Rs.*	*Rs.*
Raw materials	12,68,800			
Wages	3,84,000	96,000	64,000	36,000
Overheads (Apportioned on the basis of departmental direct wages that is, 96 : 24 : 16 : 9)	3,07,200	76,800	51,200	28,800
Total Cost	19,60,000	1,72,800	1,15,200	64,800

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2. Joint Costs and Further Processing Costs

(i) Costs incurred in the departments *P* are joint costs of products *A*, *B* and *C* and are equal to Rs. 19,60,000.

(ii) Costs incurred in the departments *Q*, *R* and *S* are further processing costs of products *A*, *B* and *C* respectively. Further processing costs of products *A*, *B* and C thus are Rs. 1,72,800; Rs. 1,15,200 and Rs. 64,800 respectively.

Example 11.41

JKL Limited produces two products – *J* and *K* together with a by-product *L* from a single main process (Process I). Product *J* is sold at the point of separation for Rs. 55 per kg. Whereas product *K* is sold for Rs. 77 per kg. After further processing into product *K* 2 By product *L* is sold without further processing for Rs. 19.25 per kg.

Process I is closely monitored by a team of chemists, who planned the output per 1,000 kg of input materials to be as follows:

Product *J*	500 kg
Product *K*	350 kg.
Product *L*	100 kg.
Toxic waste	50 kg.

The toxic waste is disposed at a cost of Rs. 16.50 per kg and arises at the end of processing.

Process II which is used for further processing of product *K* into product *K*2, has the following cost structure:

Fixed costs	Rs. 2,64,000 per week
Variable cost	Rs. 16.50 per kg. processed

The following actual date relate to the first week of the month:

Process I

Opening work-in-progress	Nil
Material input	40,000 kg costing Rs. 6,60,000
Direct Labour	Rs. 4,40,000
Variable overheads	Rs. 1,76,000
Fixed overheads	Rs. 2,64,000

Outputs:

Product *J*	19,200 kg.
Product *K*	14,400 kg.
Product *L*	4,000 kg.
Toxic waste	2,400 kg.
Closing work-in-progress	Nil

Process II

Opening work-in-progress	Nil
Input of product *K*	14,400 kg.
Output of product *K* 2	13,200 kg.
Closing work-in-progress (50% converted and conversion costs were incurred in accordance with the planned cost structure)	1,200 kg.

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Required

(i) Prepare Process I account for the first week of the month using the final sales value method to attribute the pre-separation costs to join products.
(ii) Prepare the toxic waste account and Process II account for the first week of the month.
(iii) Comment on the method used by the *JKL* Limited to attribute the pre-separation costs to joint products.
(iv) Advise the management of *JKL* Limited whether or not, on purely financial grounds it should continue to process product *K* into product *K* 2.
   (a) If product *K* could be sold at the point of separation for Rs. 47.30 per kg; and
   (b) If the 60% of the weekly fixed costs of Process II were avoided by not processing product *K* further. *(CA, PE, Exam. II, Group II, May 2004)*

Solution:

Process I Account

Particulars	*Qty in kg.*	*Rate / kg. Rs.*	*Amount Rs.*	*Particulars*	*Qty in kg.*	*Rate / kg. Rs.*	*Amount Rs.*
To Material input	40,000	16.50	6,60,000	By Product *L* sales	4,000	19.25	77,000
To Direct Labour			4,40,000	By Normal Loss	2,000	(–) 16.50	(–) 33,000
To Variable Overheads			1,76,000	By Abnormal Loss*	400	44	17,600
To Fixed Overheads			2,64,000	By Joint Product J (Refer to Working Note 2)	19,200		7,21,171
				By Joint product *K* (Refer to Working Note 2)	14,400		7,57,229
	40,000		15,40,000		40,000		15,40,000
Valuation of abnormal loss per kg. (Using physical measure method)				$= \frac{\text{Rs. } 15,40,000 - \text{Rs. } 77,000 + \text{Rs. } 33,000}{40,000 \text{ kg.} \times 0.85}$ = Rs. 14,96,000 / 34,000 kg. = Rs. 44 per kg.			

(ii) Toxic Waste Acount

Particulars	*Qty in in kg.*	*Rate / kg. Rs.*	*Amount Rs.*	*Particulars*	*Qty. in kg.*	*Rate / kg. Rs.*	*Amount Rs.*
To Process I A/c	2,000	16.50	(–) 33,000	By Balance		16.50	(–) 33,000

Process II Account

Particulars	*Qty in kg.*	*Rate / kg. Rs.*	*Amount Rs.*	*Particulars*	*Qty in kg.*	*Rate / kg. Rs.*	*Amount Rs.*
To Process I A/c (Product *K*)	14,400	52.585	7,57,236	By Product *K* 2 Account	13,200		11,73,924
To Variable overheads		16.50	2,37,600	By Closing WIP (Refer to Working Note 3)	1,200		84,912
To Fixed overheads			2,64,000				
			12,58,836				12,58,836

Working Notes:

1. **Calculation of joint cost of the output:**
   = Rs. 15,40,000 – Rs. 77,000 – Rs. (–) 33,000 – Rs. 17,600
   = Rs. 14,78,400
2. **Allocation of joint cost over joint products J and K (By using final sales value method)**

Products	*Quantity (kg)*	*Sales Value Rs.*	*Joint Cost Rs.*
J	19,200	10,56,000 (19,200 kg × Rs. 55)	7,21,171
K	14,400	11,08,800 (14,400 kgs × Rs. 77)	7,57,229
Total		21,64,800	14,78,400

3. **Valuation of 1,200 kg of Closing WIP:**

		Rs.
Material I	100% complete (1200 kg × Rs. 52.5858)	63,103
Fixed and variable overheads	$\left(\frac{\text{Rs. } 5,01,600}{13,800 \text{ units}}\right) \times 600$ units	21,809
Total valuation of 1,200 kgs of closing WIP		84,912

(iii) Comment on the method used by the JKL Ltd:
(To attribute the pre-separation costs to joint products)

For attributing the joint costs over joint products *J* and *K*, JKL Ltd., used the basis of final sales value. This is one of the popular method used in the industry.
Other methods can also be used for the purpose. Some of these are as follows:

- Physical Measure Method (if both the products are equally complex).
- Constant Gross Margin Percentage method.
- Net Realisation Value Method.

(iv) Advise to the management of JKL Ltd.:

	(Rs.)
Incremental sales revenue per kg. from further processing	29.70
Less: Incremental variable cost per kg. of further processing	16.50
Incremental contribution per kg from further processing	13.20
At an output of 14,400 kgs the incremental contribution is:	1,90,080
Less: Avoidable fixed cost (60% × Rs. 2,64,000)	1,58,400
Net benefit (Rs.)	31,680

$$\text{Break-even point} = \frac{\text{Avoidable fixed costs}}{\text{Incremental contribution kg.}} = \frac{\text{Rs. } 1,58,400}{\text{Rs. } 13.20}$$
$$= 12,000 \text{ kg.}$$

Hence further processing should be undertaken if output is expected to exceed 12,000 kgs. per week.

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Example 11.42

ABC Ltd. operates a simple chemical process to convert a single material into three separate items, referred to here as *X*, *Y* and *Z*. All three end products are separated simultaneously at a single split-off point.

Products *X* and *Y* are ready for sale immediately upon split off without further processing or any other additional costs. Product *Z*, however, is processed further before being sold. There is no available market price for *Z* at the split-off point.

The selling prices quoted here are expected to remain the same in the coming year. During 2002–03, the selling prices of the items and the total amounts sold were:

X – 186 tons sold for Rs. 1,500 per tonne
Y – 527 tons sold for Rs. 1,125 per tonne
Z – 736 tons sold for Rs. 750 per tonne

The total joint manufacturing costs for the year were Rs. 6,25,000. An additional Rs. 3,10,000 was spent to finish product *Z*.

There were no opening inventories of *X*, *Y* or *Z* at the end of the year, the following inventories of complete units were on hand:

X 180 tonne
Y 60 tonne
Z 25 tonne

There was no opening or closing work-in-progress.

Required:

(i) Compute the cost of inventories *X*, *Y* and *Z* for Balance Sheet purposes and cost of goods sold for income statement purpose as of March 31, 2003, using:
  (a) Net realizable value (NRV) method of joint cost allocation
  (b) Constant gross-margin percentage NRV method of joint-cost allocation.

(ii) Compare the gross-margin percentages for *X*, *Y* and *Z* using two methods given in requirement (i)

(CA, PE, Exam. II, Group II, May 2003)

Solution:

(i) (a) Statement of Joint Cost Allocation of Inventories of X, Y and Z for Balance Sheet Purposes (By using net realisable value method)

	Products			
	X Rs.	*Y* Rs.	*Z* Rs.	*Total* Rs.
Final sales value of total production (Refer to Working Note 1)	5,49,000 (366 tone × Rs. 1,500)	6,60,375 (587 tone × Rs. 1,125)	5,70,750 (761 tone × Rs. 750)	17,80,125
Less: Additional Cost	–	–	3,10,000	3,10,000
Net realisable value (at split-off point)	5,49,000	6,60,375	2,60,750	14,70,125
Join cost allocated (Refer to Working Note 2)	2,33,398	2,80,748	1,10,854	6,25,000

Cost of Goods Sold for Income Statement Purpose as of March 31, 2003
(By using net realisable value method)

	Products			
	X Rs.	*Y* Rs.	*Z* Rs.	*Total* Rs.
Allocated joint cost	2,33,378	2,80,748	1,10,854	6,25,000
Additional	–	–	3,10,000	3,10,000
Cost of goods available for sale (CGAS)	2,33,398	2,80,748	4,20,854	9,35,000
Less: Cost of ending inventory	1,14,785	28,692	13,846	(1,57,323)
X: 49.18% Y: 10.22% Z: 3.29% × (CGAS)				
(Refer to working note)				
Cost of goods sold	1,18,613	2,52,056	4,07008	7,77,677

Income Statement
(Showing gross margin and gross margin percentage)
(By using net realisable value method)

	Products			
	X Rs.	*Y* Rs.	*Z* Rs.	*Total* Rs.
Sales revenue (Rs.)	2,79,000 (186 tonne × Rs. 1,500)	5,92,875 (527 tonne × Rs. 1,125)	5,52,000 (736 tonne × Rs. 750)	14,23,875
Less: Cost of goods sold (Rs.)	1,18,613	2,52,056	4,07,008	7,77,677
Gross margin (Rs.)	1,60,387	3,40,819	1,44,992	6,46,198
Gross margin (%)	57.49%	57.49%	26.26%	

(b) Statement of Joint Cost Allocation of Inventories of X, Y and Z for Balance Sheet Purposes
(By using constant gross margin percentage net-realisable value method)

	Product			
	X Rs.	*Y* Rs.	*Z* Rs.	*Total* Rs.
Final sales value of total production	5,49,000	6,60,375	5,70,750	17,80,125
Less: Gross margin	2,60,641	3,13,517	2,70,967	8,45,125
(Refer to Working Note 3)	2,88,359	3,46,958	2,99,783	9,35,000
Less: Addition Cost	–	–	3,10,000	3,10,000
Joint Cost allocated	2,88,359	3,46,858	(10,217)	6,25,000

Note

The negative joint cost allocation to product *Z* illustrates one 'unusual' feature of the costant gross margin NRV method.

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Cost of Goods Sold for Income Statement Purpose
(By using constant gross margin percentage net-realisable value method)

	Products			
	X	*Y*	*Z*	*Total*
	Rs.	*Rs.*	*Rs.*	*Rs.*
Allocated joint cost	2,88,359	3,46,858	(10,217)	6,25,000
Joint Cost			3,10,000	3,10,000
Cost of goods available for sale (CGAS)	2,88,359	3,46,858	2,99,783	9,35,000
Less: Cost of ending inventory	1,41,815	35,449	9,863	1,87,127
$X: 49.18\%$ $Y: 10.22\% \times (\text{CGAS})$ $Z: 3.29\%$				
Cost of good sold	1,46,544	3,11,409	2,89,920	7,47,873

Income Statement
(Showing gross margin and gross margin percentage
by using constant gross margin percentage NRV method)

	Product			
	X	*Y*	*Z*	*Total*
	Rs.	*Rs.*	*Rs.*	*Rs.*
Sales revenue (Rs.)	2,79,000	5,92,875	5,52,000	14,23,875
Less: Cost of good sold (Rs.)	1,46,544	3,11,409	2,89,920	7,47,873
Gross margin (Rs.)	1,32,456	2,81,466	2,62,080	6,76,002
Gross margin (%)	47.475%	47.475%	47.478%	47.478%

(ii) Comparative Statement of Gross Percentage for X, Y and Z
(Using net realizable value and Constant gross margin percentage NRV methods)

	Product gross margin percentage		
	X	*Y*	*Z*
	Rs.	*Rs.*	*Rs.*
Net realisable	57.49	57.49	26.26
Constant gross margin percentage NRV	47.48	47.48	47.48

Working Notes

1. Total Production of Three Products for the Year 2002–03

Items/Products	*Quantity sold in tonnes*	*Quantity of ending inventory in tonnes*	*Total production*	*Ending inventory percentage*
(1)	*(2)*	*(3)*	*(4) = [(2) + (3)}*	*(5) = (3)/(4)*
X	186	180	366	49.18
Y	527	60	587	10.22
Z	736	25	761	3.29

2. Joint Cost Apportioned to each Product

$$\frac{\text{Total joint cost}}{\text{Total net realisable value}} \times \text{Net realizable value of each product}$$

$$= \text{Total cost of product } X = \frac{\text{Rs. } 6{,}25{,}000}{\text{Rs. } 14{,}70{,}125} \times \text{Rs. } 5{,}49{,}000$$

Similarly, the joint cost of inventories of products *Y* and *Z* comes to Rs. 2,80,748 and Rs. 1,10,854 respectively.

3. Gross Margin Percentage

		Rs.
Final sales value production		17,80,125
Less: Joint cost and additional costs (Rs. 6,25,000 + Rs. 3,10,000)		9,35,000
Gross margin		8,45,125
Gross margin percentage (Rs. 8,45,125/Rs. 17,80,125) × 100	47.4756%	

Example 11.43

Pokemon Chocolates manufactures and distributes chocolate products. It purchases cocoa beans and processes them into two intermediate products:

- Chocolate powder liquor base
- Milk-chocolate liquor base

These two intermediate products become separately identifiable at a single split off point. Every 500 pounds of cocoa beans yields 20 gallons of chocolate–power liquor base and 30 gallons of milk-chocolate liquor base.

The chocolate powder liquor base is further processed into chocolate powder. Every 20 gallons of chocolate-power liquor base yields 200 points of chocolate powder. The milk-chocolate liquor base is further processed into milk-chocolate. Every 30 gallons of milk-chocolate liquor base yields 340 pounds of milk chocolate

Production and sales data for October, 2004 are:

- Cocoa beans processed — 7,500 pounds
- Costs of processing Cocoa beans at split off point (including purchase of beans) — Rs. 7,12,500

	Production	*Sales*	*Selling price*
Chocolate powder	3,000 pounds	3,000 pounds	Rs. 190 per sound
Milk chocolate	5,100	5,100	Rs. 237.50 per pound

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The October 2004, separable costs of processing chocolate-powder liquor into chocolate powder are Rs. 3,02,812.50. The October 2004 separable costs of processing milk-chocolate liquor base into milk-chocolate are Rs. 6,23,437.50.

Pokemon full processes both of its intermediate products into chocolate powder or milk-chocolate. There is an active market for these intermediate products. In October, 2004, Pokemon could have sold the chocolate powder liquor base for Rs. 997.50 a gallon and the milk-chocolate liquor base for Rs. 1,235 a gallon.

Required:

(i) Calculate how the joint cost of Rs. 7,12,500 would be allocated between the chocolate power and milk-chocolate liquor bases under the following methods:
   (a) Sales value at split off point
   (b) Physical measure (gallons)
   (c) Estimated net realizable value, (NRV) and
   (d) Constant gross-margin percentage NRV.

(ii) What is the gross-margin percentage of the chocolate power and milk-chocolate liquor bases under each of the methods in requirements (i)?

(iii) Could Pokemon have increased its operating income by a change in its decision to fully process both of its intermediate products? Show your computations. *(CA, PE, Exam. II, Group II, Nov. 2004)*

Solution:

(i) **Comparison of Alternative Join-cost Allocation Methods**

Sales Value at Split-off Point Method

	Chocolate powder liquor base	*Milk chocolate liquor base*	*Total*
Sales value of products at split off	Rs. 2,99,250	Rs. 5,55,750	Rs. 8,55,000
Weights	0.35	0.65	1.00
Joint cost allocated	Rs. 7,12,500 × 0.35 = Rs. 2,49,375	Rs. 7,12,500 × 0.65 = Rs. 4,63,125	

- 300 × 997.50 = Rs. 2,99,250
- 450 × 1235 = Rs. 5,55,750

Physical Measure Method

	Chocolate powder liquor base	*Milk chocolate liquor base*	*Total*
Output	300 gallons	450 gallons	750 gallons
Weight	300/750 = 0.40	450/750 = 0.60	1.00
Joint cost allocated	Rs. 7,12,500 × 0.40 = Rs. 2,85,000	Rs. 7,12,500 × 0.60 = Rs. 4.27,5.00	Rs. 7,12,500

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Net Realisable Value Method

	Chocolate powder liquor base	*Milk chocolate liquor base*	*Total*
Final sales value of production	3,000 lbs × Rs. 190 = Rs. 5,70,000	5.100 lbs × Rs. 237.50 = Rs. 12,11,250	Rs. 17,81,250
Less: separable costs	Rs. 3,02,812.50	Rs. 6,23,437.50	Rs. 9,26,250
Net realisable value at split off point	Rs. 2,67,187.50	Rs. 5,87,812.50	Rs. 8,55,000
Weight	2,67,187.50/8,55.000 = 0.3125	5,87,812.5/8,55,000 = 0.6875	
Joint cost allocated	Rs. 7,12,500 × 0.3125 = Rs. 2,22,656.25	Rs. 7,12,500 × 0.6875 = Rs. 4,89,843.75	Rs. 7,12,500

Constant + Gross Margin % NRV Method

	Chocolate powder Liquor base	*Milk chocolate liquor base*	*Total*
Final sales value of production	Rs. 5,70,000 *(Chocolate Powder)*	Rs. 12,11,250 *(Milk Chocolate)*	Rs. 17,81,250
Less: Gross margin 8%	Rs. 45,600	Rs. 96,900	Rs. 1,42,500
Cost of goods available for sale	Rs. 5,24,400	Rs. 11,14,350	Rs. 16,38,750
Less Separable costs	Rs. 3,02,812.50	Rs. 6,23,437.50	Rs. 9,26,250
Joint cost allocated	Rs. 2,21,587.50	Rs. 4,90,912.50	Rs. 7,12,500

Calculation of Gross Margin %

Final sales value of total production = Rs. 17,81,250
Less joint and separable cost = Rs. 712500 + Rs. 926250
= Rs. 16,38,750
Gross Margin = Rs. 1,42,500
Gross margin % = $\frac{\text{Rs. } 1,42,500}{\text{Rs. } 17,81,250} = 8\%$

(ii) Chocolate Powder Liquor Base (calculations in Rs)

	Sales value at Split off	*Physical Measure*	*Estimated net Realizable Value*	*Constant gross Margin NRV*
Final sale value of Chocolate powder	5,70,000	5,70,000	5,70,000	5,70,000
Less: Separable costs	3,02,812.50	3,02,812.50	3,02,812.50	3,02,812.50
Less: Joint costs	2,49,375	2,85,000	2,22,656.25	2,21,587.50
Gross Margin	17,812.50	(17,812.50)	44,531.25	45,600
Gross Margin %	3.125%	(3.125%)	7.8125%	8%

Milk Chocolate Liquor Base (calculations in Rs.)

	Sales value at Split off	*Physical Measure*	*Estimated net Realisable*	*Constant Gross margin NRV*
Final sale value of milk chocolate	12,11,250	12,11,250	12,11,250	12,11,250
Less: separable costs	6,23,437.50	6,23,437.50	6,23,437.50	6,23,437.50
Less: Joint costs	4,63,125	4,27,500	4,89,843.75	4,90,912
Gross Margin	1,24,687.50	1,60,312.50	97,968.75	96,900.50
Gross Margin %	10.29%	13.23%	8.08%	8%

(iv) Further Processing of Chocolate Powder Liquor base into Chocolate Powder (calculations in Rs.)

Incremental revenue (5,70,000 – (997.50 × 300)	2,70,750
Incremental costs	3,02,812.50
Incremental operating income	(32,062.50)
Further processing of Milk chocolate liquor base into milk chocolate (calculations in Rs.)	
Incremental revenue ((12,11,250 – 5,55,750)	6,55,500
Incremental cost	6,23,437.50
Incremental operating income	32,062.50

The above computations show that Pokemon Chocolates could increase operating income by Rs. 32,062.50 if chocolate liquor base is sold at split off point and milk chocolate liquor base is processed further.

Example 11.44

Inorganic Chemicals purchases salt and processes it into more-refined products such as caustic soda, chlorine, and PVC (Polyvinyl chloride). During the month of April, 2000. Inorganic Chemicals purchased salt for Rs. 10,00,000. Conversion cost of Rs. 15,00,000 were incurred upto the split-off point, at which time two saleable products were produced. Caustic soda and chlorine can be further processed into PVC. The April production and sales information are as follows:

	Production	*Sales*	*Sales Price per Tonne*
Caustic Soda	1,200 tonne	1,200 tonne	Rs. 1,250
Chlorine	800 tonne		
PVC	500 tonne	500 tonne	Rs. 5,000

All 800 tons of chlorine were futher processed, at an incremental cost of Rs. 5,00,000 to yield 500 tone of PVC. There were no byproducts or scrap from this further processing of chlorine. There were no beginning or ending inventories of caustic soda, chlorine or PVC in April.

There is an active market for chlorine. Inorganic Chemicals could have sold all its April production of chlorine at Rs. 1,875 a ton.

Required:

(i) Calculate, how the joint costs of Rs. 25,00,000 would be allocated between Caustic Soda and Chlorine under each of the following methods:
   (1) sales value at split off
   (2) physical measure (tonne); and
   (3) estimated net realisable value

(ii) What is the gross margin percentage of Caustic Soda and PVC under the three methods cited in requirement (i)?

(iii) Lifetime Swimming Pool Products offer to purchase 800 tonne of Chlorine in May, 2000 at Rs. 1,875 a tonne. This sale would mean that no PVC would be produced in May. How would accepting the offer affect May Operating Income? *(C.A.Inter May 2000)*

Solution:

(i) **(1) Statement of Joint Costs Allocation between Caustic Soda and Chlorine by using Sales Value Method at Split Off**

Products	*Caustic Soda*	*Chlorine*	*Total*
Sales value at split off (Rs.)	15,00,000 (1,200 tonne × Rs. 1,250)	15,00,000 (800 tonne × Rs. 1,250)	30,00,000
Weightage	0.5	0.5	
Joint costs allocated (Rs.)	12,50,000 (Rs. 25,00,000 × 0.5)	12,50,000 (Rs. 25,00,000 × 0.5)	25,00,000

(2) Statement of Joint Costs Allocation between Caustic Soda and Chlorine by using Physical Measure (tonne) Method

Products	*Caustic Soda*	*Chlorine*	*Total*
Physical measure (tonne)	1,200	800	2,000
Weightage	0.6	0.4	
Joint costs allocated (Rs.)	15,00,000 (Rs. 25,00,000 × 0.6)	10,00,000 (Rs. 25,00,000 × 0.4)	25,00,000

(3) Statement of Joint Costs Allocation between Caustic Soda and Chlorine by Using Estimated Net Realisable Value Method

Products	*Caustic Soda*	*Chlorine*	*Total*
Expected sales value of production (Rs.)	15,00,000 (1,200 tonne × Rs. 1,250)	25,00,000 (500 tonne × Rs. 5,000)	40,00,000
Less: Further processing cost (Rs.)	—	5,00,000	5,00,000
Estimated net realisable value at split off point (Rs.)	15,00,000	20,00,000	35,00,000
Weightage	3/7	4/7	
Joint cost allocated (Rs.)	10,71,429 $\left(\frac{3}{7} \times \text{Rs. } 25,00,000\right)$	14,28,571 $\left(\frac{4}{7} \times \text{Rs. } 25,00,000\right)$	25,00,000

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(ii) Statement of Gross Margin Percentage of Caustic Soda and PVC under Sales Value, Physical Measure and Estimated Net Realisable Value Methods

	Sales value (at split off)	*Physical measure*	*Estimated net realisable value*
Caustic soda:			
Sales (Rs.)	15,00,000	15,00,000	15,00,000
Less: Joint costs allocated (Rs.)	12,50,000	15,00,000	10,71,429
Gross margin (Rs.)	2,50,000	0	4,28,571
Gross margin (in %)	16.67	0	28.57
	$\left(\frac{\text{Rs. } 2,50,000}{\text{Rs. } 15,00,000} \times 100\right)$		$\left(\frac{\text{Rs. } 4,28,571}{\text{Rs. } 15,00,000} \times 100\right)$
PVC:			
Sales (Rs.) (500 tons × Rs. 5,000)	25,00,000	25,00,000	25,00,000
Less: Joint cost allocated (Rs.)	12,50,000	10,00,000	14,28,571
Further processing cost (Rs.)	5,00,000	5,00,000	5,00,000
Gross margin (Rs.)	7,50,000	10,00,000	5,71,429
Gross margin (in %)	30	40	22.86
	$\left(\frac{\text{Rs. } 7,50,000}{\text{Rs. } 25,00,000} \times 100\right)$	$\left(\frac{\text{Rs. } 10,00,000}{\text{Rs. } 25,00,000} \times 100\right)$	$\left(\frac{\text{Rs. } 5,71,429}{\text{Rs. } 25,00,000} \times 100\right)$

(iii) Incremental revenue from further processing of Chlorine into *PVC*

500 tons × Rs. 5,000 – 800 tonne × Rs. 1,875: (*A*)	Rs. 10,00,000
Incremental costs of further processing of chlorine into PVC: (*B*)	Rs. 5,00,000
Incremental operating income from further processing: {(*A*) – (*B*)}	Rs. 5,00,000

Decision: The operating income of Inorganic Chemicals which converts Chlorine into PVC after further processing will be reduced by Rs. 5,00,000 in May, if it accepts the offer of Lifetime Swimming Pool Products, of selling to them 800 tons of Chlorine at Rs. 1875 per tonne.

THEORY QUESTIONS

1. Discuss the distinguishing features of a process cost system?
2. Compare the cost accumulation and summarising procedures of a job order cost system and a process cost system.
3. What is equivalent production? What is its effect on computed unit cost?
4. Discuss the possible effects on a department's unit costs when materials are added to work-in-progress.
5. How is opening work-in-progress handled in average costing?
6. What are some of the disadvantages of the FIFO costing method?
7. What is the meaning of the term "split-off"? What is its significance in product costing?
8. What are joint costs? What problems are created by joint costs?
9. Explain the difference between a main product and a by-product.
10. How can the income from the sale of by-products be shown on the income statement?
11. Does the showing of income from by-products on the income statement influence the unit cost of the main product?

12. What is the difference between physical quantity method and sales value method?

13. Define and explain the term "joint products and by-products". Enumerate the method which may be employed in costing "joint product". *(B. Com. (Hons), Delhi, 2005)*

14. Define joint products and by-products. Explain the various bases available for apportionment of joint costs to joint products. *(CA Inter)*

15. Explain with an example the concept of 'equivalent production' for valuation of work-in-progress. *(B. Com. (Hons), Delhi)*

16. (i) What are the three most common methods of allocating joint product cost? Write a brief explanatory note on each. *(B. Com. (Hons), Delhi)*

(ii) Explain the procedure of accounting for by-products.

17. Distinguish between normal and abnormal wastage of materials with specific reference to their accounting treatment and control. *(B.Com.(Hons) Delhi, 2004)*

18. What are equivalent units of production? Mention two principal methods of calculating equivalent units. *(ICWA, Inter, Stage 1, June 2006, June 2007)*

19. Explain briefly the procedure for the valuation of work-in-progress. *(CA, PE, Exam. II, Group II, Nov. 2002)*

20. Mention the different methods of by-product cost accounting. *(ICWA, Inter, Stage 1, Dec. 2006)*

21. Distinguish between joint products and by-products. *(ICWA, Inter, Stage I, Dec. 2006)*

SELF EVALUATION QUESTIONS

Choose the correct answer for the following multiple choice question:

(i) When should process costing method be used in assigning costs of products.
- (a) If the product is manufactured on the basis of each order received.
- (b) When production is only partially completed during the accounting period.
- (c) If the product is composed of mass-produced homogeneous units.
- (d) In situations in which standard costing techniques should not be used.

(ii) Which of the following characteristics applies to process costing but not to job-order costing?
- (a) Identifiable batches of production
- (b) Equivalent units of production
- (c) Averaging process
- (d) Use of standard costs

(iii) Which is the best cost accumulation procedure to use when there is a continuous mass production of like units.
- (a) Actual
- (b) Standard
- (c) Job order
- (d) Process

(iv) Which of the following is a characteristic of a process costing method?
- (a) Work-in-progress inventory restated in terms of completed units
- (b) Costs are accumulated by order
- (c) It is used by a company manufacturing on customers' orders
- (d) Standard costs are not applicable

(v) Normal wastage and abnormal wastage should be classified as:

	Normal	*Abnormal*
(a)	Period cost	Period cost
(b)	Product cost	Period cost
(c)	Period cost	Product cost
(d)	Product cost	Product cost

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(vi) Normal wastage is properly classified as:

(a) An extraordinary item
(b) Period cost
(c) Product cost
(d) Deferred charge

(vii) If the amount of wastage in a manufacturing process is abnormal, it should be classified as:

(a) Deferred charge
(b) Joint cost
(c) Period cost
(d) Product cost

(viii) The type of wastage that should not affect the recorded costs of closing inventories is:

(a) Abnormal wastage
(b) Normal wastage
(c) Seasonal wastage
(d) Standard wastage

(ix) Each of the following is a method by which to allocate joint costs except

(a) Relative sales value
(b) Relative profitability
(c) Relative weight, volume
(d) Average unit cost

(x) When two products are produced during a common process, what is the factor that determines whether the products are joint products or one principal product and a by-product?

(a) Potential marketability for each product
(b) Amount of work expended in the production of each product
(c) Relative total sales value
(d) Management policy

(xi) Joint costs are most frequently allocated based upon relative

(a) Profitability
(b) Conversion costs
(c) Sales value
(d) Prime costs

(xii) In order to compute equivalent units of production using FIFO method of process costing, work for the period must be broken down to units.

(a) Completed during the period and units in ending inventory.
(b) Completed from the beginning inventory, started and completed during the month and units in closing inventory.
(c) Started during the period and units transferred out during the period.
(d) Processed during the period and units completed during the period.

(xiii) From the industries listed below, choose the one most likely to use process costing in accounting for production costs:

(a) Road builders
(b) Electrical contractor
(c) Newspaper publisher
(d) Automobile repair shop

(xiv) What are transferred-in costs as used in a process cost accounting system?

(a) labour that is transferred from another department within the same plant instead of hiring temporary workers from the outside.

(b) cost of the production of a previous internal process that is subsequently used in a succeeding internal process
(c) supervisory salaries that are transferred from an overhead-cost centre to a production-cost centre
(d) ending work-in-process inventory of a previous process that will be used in a succeeding process

(xv) Purchased materials added in the second department of a three department process that do not increase the number of units produced in the second department would

(a) not change the amount transferred to the next department
(b) decrease total work-in-process inventory.
(c) increase the factory overhead portion of the ending work-in-process inventory.
(d) increase total unit cost.

(xvi) The units transferred in from the first department to the second department should be included in the computation of the equivalent-units divisor for the second department for which of the following methods of process costing?

	First-In, First-Out	*Weighted Average*
(a)	yes	yes
(b)	yes	no
(c)	no	yes
(d)	no	no

(xvii) Purchased materials added in the second department of a three-department process that increase the number of units produced in the second department would always

(a) change the direct labour cost percentage in the ending work-in-process inventory.
(b) cause no adjustment to the unit cost transferred in from the first department.
(c) increase total unit costs.
(d) decrease total ending work-in-process inventory.

(xviii) The percentage of completion of the beginning work-in-process inventory should be included in the computation of the equivalent units of production for which of the following methods of process costing?

	First-in, First-out	*Weighted Average*
(a)	yes	no
(b)	yes	yes
(c)	no	yes
(d)	no	no

(xix) In the computation of manufacturing cost per equivalent unit, the weighted-average method of process costing considers

(a) current costs only.
(b) current costs plus cost of ending work-in-process inventory.
(c) current costs less cost of beginning work-in-process inventory.
(d) current costs plus cost of beginning work-in-process inventory.

(xx) In a given process-costing system, the equivalent-units divisor is computed for the weighted-average method. With respect to conversion costs, the percentage of completion for the current period only is included in the calculation of the

	Beginning Work-in-process Inventory	*Ending Work-in-Process Inventory*
(a)	no	no
(b)	no	yes
(c)	yes	no
(d)	yes	yes

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(xxi) The first-in, first-out method of process costing differs from the weighted-average method in that the first-in, first-out method

(a) considers the stage of completion of beginning work-in-process inventory in computing equivalent units of production, whereas the weighted-average method does *not*.
(b) does not consider the stage of completion of beginning work-in-process inventory in computing equivalent units of production, whereas the weighted-average method does.
(c) is applicable only to those companies using the first-in, first-out inventory pricing method, whereas the weighted-average method may be used with any inventory pricing method.
(d) allocates costs based on whole units, whereas the weighted-average method uses equivalent units.

PROBLEMS

Process costing having no process loss and no opening and closing work-in-progress

1. Prepare process cost accounts from the following data:

Rs.

Items	*Total*	*Process*		
		I	*II*	*III*
Direct material	4,40,000	3,60,000	60,000	20,000
Direct wages	80,000	20,000	40,000	20,000
Direct expenses	1,00,000	60,000	—	40,000

Production overhead incurred is Rs. 1,60,000 and is recovered on 200% of direct wages. Production during the period was 20,000 units. There was no opening or closing work-in-progress.

Ans:

	Cost per unit (Rs.)	*Amt. (Rs.)*
Process I A/c	24.00	4,80,000
Process II A/c	33.00	6,60,000
Process III A/c	39.00	7,80,000

2. From the following Figures, prepare process accounts indicating the cost of process and the total cost. The production was 480 articles per week.

	Process I	*Process II*	*Process III*
Materials	Rs. 3,000	Rs. 1,000	Rs. 400
Labour	1,600	4,000	1,200
Factory Overheads	520	1,440	500

Office overheads amounting to Rs. 1,700 should be apportioned on the basis of wages. Ignore stock in hand and work-in-progress at the beginning and end of the work. *(B.Com. Delhi)*

Ans: Process I—Transfer to Process II Rs. 5,520.
Process II —Transfer to Process III Rs. 12,960.
Process III—Transfer to finished stock Rs. 15,360

Process costing having process losses or gains (Normal loss, Abnormal loss, Abnormal gain)

3. The following data are available pertaining to a product after passing through two processes *A* and *B*: Output transferred to process *C* from process *B*, 9120 units for Rs. 49,263

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Expenses incurred in Process C:

Sundry materials	Rs.	1,480
Direct labour	Rs.	6,500
Direct expenses	Rs.	1,605

The wastage of process *C* is sold at Re 1.00 per unit. The overhead charges were 168% of direct labour. The final product was sold at Rs. 10.00 per unit fetching a profit of 20% on sales.
Find the percentage of wastage in process *C* and prepare Process C Account.

(B.Com. (Hons), Delhi 1999)

Ans: Percentage of wastage 5%. Transfer to finished goods stock A/c Units 8,664, Rs. 69,312.

4. In a certain process, material is mixed and cooked in batches of 1,000 lbs each. Cooking results in 10 percent loss of weight of the mixture. Since the cooking requires considerable skill and constant watching, there is generally a further loss for spoilage which is not discovered until processing has been completed. Also, past experience shows that normally two batches out of every ten started in the process are spoiled in this way.
In a given month, the production records show:

(i) Production started in the process — 50 batches of 1,000 lbs each.
(ii) Production completed and transferred to finished goods is 34,200 lbs.
(iii) There is no inventory of work-in-process at the beginning or end of the month.

Costs recorded during the month amounted to Rs. 45,000. Prepare the Process Account for the month and determine the cost per pound of finished product. *(B.Com. (Hons), Delhi 2000)*

Ans: Finished stock A/c, Rs. 43,971

5. The input to a purifying process was 16,000 kg of basic material purchases @ Rs. 1.20 per kg. Process wages amounted to Rs. 720 and overhead was applied @ 240% of the labour cost. Indirect materials of negligible weight were introduced into the process at a cost of Rs. 336. The actual output from the process weighed 15,000 kg. The normal yield of the process is 92%. Any difference in weight between the input of basic material and output of purified material (product) is sold @ Re. 0.50 per kg.

The process is operated under a licence which provides for the payment of royalty @ Re. 0.15 per kg. of the purified material produced.

Prepare:

(i) Purifying Process Account
(ii) Normal Wastage Account
(iii) Abnormal Wastage/Yield Account
(iv) Royalty Payable Account *(CA Inter, May 1996)*

Ans: Purifying Process A/c - Transfer to stock A/c 15,000 Kg, Amt. Rs. 24,000.
Royalty Payable A/c, Balance 15,000 kg Amt. Rs. 2250

6. The finished product of a manufacturing company passes through three Processes, viz., I, II and III. The normal wastage in each process is 5%, 7% and 10% for the Processes I, II and III respectively (calculated with reference to the number of units fed into each process). The scrap generated out of wastage has a sale value of 70 paise per unit, 80 paise per unit and Re. 1 per unit in the Process I, II and III respectively. The output of each process is transferred to the next Process and the finished output emerges from the process III and transferred to stock. There was no stock of work-in-progress in any process in a particular month. The details of cost data for the month are given below:

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Particulars	*Processes*		
	I	*II*	*III*
Materials used (Rs.)	1,20,000	40,000	40,000
Direct Labour Cost (Rs.)	80,000	60,000	60,000
Production Expenses (Rs.)	40,000	40,000	28,000
Output in Units (actuals)	38,000	34,600	32,000

Process I was fed with 40,000 units of raw input at cost of Rs. 3,20,000.
Prepare the Process Accounts.

(ICWA Inter, June 1996, ICWA., Inter, Stage 1, Dec. 2003)

Ans: Process I A/c, Transfer to Process II, Units 38,000, Rs. 5,58,600.
Process II A/c, Transfer to Process III, Units 34,600, Rs. 6,81,888.
Process III – Transfer to finished stock A/c, Units 32,000, Rs. 8,28,700.

7. A product passes through three processes—*P*, *Q*, and *R*. The details of expenses incurred on three processes during the year 1996 were as under:

Particulars	*P*	*Q*	*R*
Units issued	10,000		
Cost per unit	100		
Sundry Materials	Rs. 10,000	15,000	5,000
Labour	Rs. 30,000	80,000	65,000
Direct Expenses	Rs. 6,000	18,150	27,200
Sale Price of output per unit	Rs. 120	165	250

Management expenses during the year amounted to Rs. 80,000 and selling expenses were Rs. 50,000. Both these are not allocable to the processes.
Actual output of the three processes was as under:
Process *P*—9,300 units; Process *Q*—5,400 units; Process *R*—2,100 units.
Two-thirds of the output of process *P* and one half of the output of process *Q* was passed on to the next process and the balance was sold. The entire output of process *R* was sold.
The normal wastage of the three processes calculated on the input of every process was:
Process *P*—5 per cent; Process *Q*—15 per cent; Process *R*—20 per cent.
The wastage of Process *P* was sold at Rs. 2 per unit, that of Process *Q* at Rs. 5 per unit and that of Process *R* at Rs. 10 per unit.
Prepare the three Process Accounts and a Statement of Income for 1994 showing fully the accounting treatment of Process Wastage. *(B. Com. (Hons), Delhi 1996)*

Ans: Income statement, Net loss Rs. 32,450.

8. A product passes through three Processes *A*, *B* and *C*. 10,000 units a cost of Rs. 1.10 were issued to Process-*A*. The other direct expenses were as follows:

	Process-A	*Process-B*	*Process-C*
Sundry materials	Rs. 1,600	Rs. 1,500	Rs. 1,500
Direct labour	4,500	8.000	6,500
Direct expenses	1,000	1,000	1,503

The wastage of Process-*A* was 5% and in Process-*B* 4%. The wastage of Process-*A* was sold at Re. 0.25 per unit and that of *B* at Re. 0.50 per unit and that of *C* at Re. 1.00 per unit. The overhead charges were 160% of direct labour. The final product was sold at Rs. 10 per unit fetching a profit of 20% on sales, find out the percentage of wastage in Process-*C*. *(ICWA, Inter)*

Ans: Normal wastage in Process *C*, 696 units, Process *C*, Transfer to finished stock A/c, 8424 units, Rs. 67,392.

9. An article passes through three successive operations from the raw material to the finished product stage. The following data are available from the production records of a particular month:

Operation no.	*No. of pieces input*	*No. of pieces rejected*	*No. of pieces output*
1	60,000	20,000	40,000
2	66,000	6,000	60,000
3	48,000	8,000	40,000

(a) Determine the input required to be introduced in the first operation in number of pieces in order to obtain finished output of 100 pieces after the last operation.

(b) Calculate the cost of raw material required to produce one piece of finished product, given the following:

- Weight of the finished piece is 0.10 kg and
- The price of raw material is Rs. 20 per kg. *(CA, Inter)*

Ans: (a) 19.80 Kg (b) Rs. 3.96

10. Department I of Coromandel Chemicals conducts a process which requires mixing of materials and cooking of the mixture in batches of 1,000 lbs each. Cooking results in 10 per cent loss of weight of the mixture. Also, past experience shows that two batches out of every ten started in the process are spoiled.
The production records for May, 2008 show the following:

(i) Production started in the Process: 50 batches of 1,000 lbs each.
(ii) Production completed and transferred to finished goods: 34,200 lbs.
(iii) There is no inventory of work-in-process at the beginning or at the end of the month.
Costs recorded during the month totalled Rs. 45,000. Prepare the account of the process conducted by Department I. *(B. Com. (Hons), Delhi)*

Ans: Abnormal loss 800 lbs, Rs. 1,029. Finished goods 34,200 lbs, Rs 43,971

11. Product Z is obtained after it passes through three distinct processes. The following information is obtained from the accounts for the month ending December 31, 2008.

Rs.

Items	*Total*	*Process*		
		I	*II*	*III*
Direct material	7,542	2,600	1,980	2,962
Direct wages	9,000	2,000	3,000	4,000
Production overhead	9,000			

1,000 units at Rs. 3 each were introduced to Process *I*. There was no stock, material or work-in-progress at the beginning or end of the period. The output of each process passes direct to the next process and finally to finished stores. Production overhead is recovered at 100% of direct wages. The following additional data are obtained:

Process	*Output during the month*	*Percentage of normal loss to input*	*Value of scrap per unit*
Process I	950	5%	Rs. 2
Process II	840	10%	4
Process III	750	15%	5

Prepare the process cost accounts and abnormal gain or loss accounts. *(B. Com. (Hons), Delhi)*

Ans: Process I 950 units Rs. 9,500 II 840 units Rs. 16,800 III 750 units Rs. 28,500
Abnormal loss Process II–15 units Rs. 300
Abnormal gain Process III–36 units, Rs. 1,368

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12. The finished product of a factory has to pass through three Processes *A*, *B* and *C*. The normal wastage of each process is 2% in *A*, 5% in *B* and 10% in *C*. The percentage of waste is computed on the number of units entering each process.

The scrap value of wastage of Process *A*, *B* and *C* are Rs. 10, Rs. 40, Rs. 20 per 100 units respectively.

The output of each process is transferred to the next process and the finished products are transferred from Process *C* into stock. The following further information is obtained:

	Processes		
	A	*B*	*C*
	Rs.	Rs.	Rs.
Materials consumed	12,000	4,000	4,000
Direct labour	8,000	6,000	6,000
Manufacturing expenses	2,000	4,000	2,000

2,000 units were put into Process *A* at a cost of Rs. 16,000. The output of each process has been *A*–19,600 units, *B*–18,400 units and *C*–16,700 units.

There was no stock of work-in-progress in any process.

Prepare the process accounts. *(B. Com. (Hons), Delhi)*

Ans: Process *A*, units 19,600 Rs. 37,960 Process *B*, units 18,400 Rs. 50,959, Abnormal loss (Process *B*) 220 units, Rs. 609 Process *C*, finished goods units 16,700 Rs. 63,120 Abnormal gain Process *C* 140 units Rs. 529

13. Product ZENU is made by three sequential Processes I, II, III. In process III, a by-product arises and after further processing in process *XY*, at a cost of Rs. 2 per unit, by-product *XYZ* is produced. Selling and distribution expenses of Re. 1 per unit are incurred in marketing *XYZ* at a selling price of Rs. 9 per unit.

	Process I	*Process II*	*Process III*
Standards provided for:			
Normal loss in process of input, of	10%	5%	10%
Loss in process, having a scrap value per unit, of	Re. 1	Rs. 3	Rs. 5

For the month of April 2005 the following data are given:

	Process I	*Process II*	*Process III*	*Process XY*
Output (in units)	8,800	8,400	7,000 of ZENU	420 of *XYZ*
Costs:				Total
Direct Materials:				
Introduced (10,000 units)	Rs. 20,000			20,000
Direct Materials added	6,000	Rs. 12,640	Rs. 23,200	41,840
Direct Wages	5,000	6,000	10,000	21,000
Direct Expenses	4,000	6,200	4,080	14,280

Budgeted production overhead for the month was Rs. 84,000.

Absorption is based on a percentage of direct wages.

There are no stocks at the beginning or end of the month. You are required, using the information given, to prepare accounts for:

(a) each of Process I, II and III; and (b) Process *XY*. *(ICWA, Inter)*

Ans:

Process I – Transfer to Process II, 8800 units, Rs. 52,800

Process II – Transfer to Process III, 8400 units, Rs. 1,00,800

Process III – Net sales value, 420 units, Rs. 2,520.

XY Process A/c, Finished goods stock A/c, units 420, Rs. 3780.

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14. A product, which uses 100 tons as input per month passes through two Processes. The details of cost in Process 1 for April 2003 are:

Process 1	*Cost per tonne*
Direct material cost	Rs. 26,100
Direct labour cost	7,800
Overhead	13,500

The total loss in Process 1 is 2% of input, and the scrap is 8% of input with a value of Rs. 12,000 per ton.
The material to Process 2 is transferred at cost. The Process direct labour cost at Process 2 is Rs. 9,000 per ton of input. The overhead is 60% of direct labour cost. The scrap at Process-2 is 20% of input with a value of Rs. 12,000 per ton. Draw up a cost sheet to present the manufacturing cost of the product showing clearly the cost of scrap and waste at each stage of manufacturing. *(CS, Inter)*

Ans:	*Process 1*	*Process 2*
Loss	2 tonne	—
Scrap	8 tonne, Rs. 96,000	18 tonne, Rs. 2,16,000

15. The product of a manufacturing concern passes through two Processes *A* and *B* and then to finished stock. It is ascertained that in each process 5% of the total weight is lost and 10% is scrap, which from processes *A* and *B* realises Rs. 80 per kg and Rs. 200 per kg respectively.
The following are the figures relating to both the processes:

	Process A	*Process B*
Materials kg	1,000	70
Cost of materials (Rs. per kg)	125	200
Wages (Rs.)	28,000	10,000
Manufacturing expenses (Rs.)	8,000	5,250
Output (kg)	830	780

Prepare the process cost account showing cost per kg of each process. There was no stock or work-in-process in any process. *(B. Com. (Hons), Delhi)*

Ans:	Process A	Process B
Abnormal loss	20 kg, Rs. 3,600	—
Abnormal gain	—	15 kg, Rs. 3,150
Transfer to process *B*	830 kg, Rs 1,49,400	—
Transfer to finished stock	—	780 Kgs, Rs. 1,63,800

16. XYZ Ltd. manufactures and sells three chemicals produced by consecutive processes known as *X*, *Y* and *Z*. In each process, 2% of the total weight put in is lost and 10% is scrap, which from processes *X* and *Y* realised Rs. 100 a units and from *Z* Rs. 200 a units. The products of the three processes are dealt with as follows:

	X	*Y*	*Z*
Sent to warehouse for sale	25%	—	100%
Passed on to next process	75%	100%	—

The following particulars relate to the month of March:

Materials used (units)	100	140	1,348
Cost per units of materials (Rs.)	120	200	80
Manufacturing expenses (Rs.)	30,800	25,760	1,810

Prepare an account of each Process, showing the cost per unit of each process. *(B. Com. (Hons), Delhi)*

Ans:

	X	*Y*	*Z*
Cost of production (Rs.)	Rs. 41,800	83,050	1,62,114.40

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17. A Product passes through three processes. Figure relating to production for the 6 months of 2005 are as follows:

	Process I	*Process II*	*Process III*
Raw materials used	1,000 kg.		
Cost per kg.	Rs. 200		
Manufacturing wages and expenses	Rs. 72,500	Rs. 40,800	Rs. 10,710
Weight lost	5%	10%	20%
Scrap-sold at Rs. 50 per kg	50 kg	30 kg	51 units
Sales price per kg	Rs.350	Rs. 500	Rs. 800

Management expenses were Rs. 17,500, selling expenses Rs. 10,000 and interest on borrowed capital Rs. 4,000.

Two thirds of Process I and one-half of Process II are passed on to the next process and the balances are sold.

You are required to prepare process cost accounts in a form suitable for presentation to the directors at their next board meeting when the production policy of the company will be discussed. *(B. Com. (Hons), Delhi)*

Ans: Net profit Rs. 5,940.

Process Costing Having opening and closing Work-in-Progress with or without Normal Loss, Abnormal Loss and Abnormal Gain

18. (Normal Loss at Beginning of or during a Process)

AB Ltd. is engaged in the process engineering industry. During the month of April 2002, 2,000 units were introduced in Process *X*. The normal loss was estimated at 5% of input. At the end of the month 1,400 units had been produced and transferred to Process *Y*, 460 units were incomplete units and 140 units during the process had to be scrapped. The incomplete units had reached the following stage of completion:

Material	75%	Completed
Labour	50%	”
Overhead	50%	”

Following is further information in Process *X*:

	Rs.
Cost of the 2,000 units	58,000
Additional direct material	14,400
Direct labour	33,400
Direct overhead	16,700
Units scrapped realised Rs. 10 each	

Prepare a statement of equivalent production, statement of cost, statement of evaluation and the Process X account. *(ICWA Inter)*

Ans: Apportionment of cost, Abnormal loss Rs. 2,800, Finished production Rs. 98,000, Work-in-progress Rs.20,700, Cost per unit Rs. 70.

19. (Normal Loss at the End of a Process)

The finished products of a factory pass through two processes, the entire material being placed in process at the beginning of the first process. From the following production and cost data relating to the first process, prepare a statement of equivalent production, statement of cost, and process account. Spoilage of 1,000 units occur at the end of the first process.

Process costs	Rs.
Materials	60,000
Labour	33,600
Overhead	22,400
Units put into Process I	12,000
Transferred to Process II	10,000
Closing inventory (20% complete)	1,000

Ans: Cost per unit Rs. 10 Completed units transferred Rs. 1,10,000 Work-in-progress Rs. 6,000

20. (FIFO)

The accountant of a chemical company provides you the following data:

	Units	*Amount (Rs.)*
Work-in-process, beginning of period	2,000	
Direct materials		4,200
Direct labour and manufacturing overhead		1,950
Addition to work-in-process in April	4,000	
Direct materials		9,000
Direct labour and manufacturing overhead		7,500
Total		22,650
Work-in-process, end of period	1,500	

Further, work-in-process at the beginning of the period is complete to the extent: materials 100% and labour and manufacturing overhead 75%. Work-in-process at the end of the period is complete to the extent: materials 100% and direct labour and manufacturing overhead only 50%.

You are required to:

(i) Calculate the number of units of product transferred to finished-goods stock during the period. Assume no units are lost in process.

(ii) Calculate the number of equivalent whole units of work completed during the period.

(iii) Calculate the unit cost for materials during the month of April using First-in, First-out method of inventory issue. *(B. Com. (Hons), Delhi)*

Ans: (i) 4,500 (ii) 3750 (iii) Rs. 2.25

21. (Average Costing)

Prepare a statement of equivalent production, statement of cost, process account from the following information using the average method:

Opening Stock	20,000	units
Material	Rs. 10,000	
Labour	Rs. 4,000	
Overhead	Rs. 5,000	
Units Introduced	Rs. 80,000	units
Material	Rs. 40,000	
Wages	Rs. 31,000	
Overhead	Rs. 30,000	

During the period 60,000 units were completed and transferred to Process II.

Closing stock 40,000 units, degree of completion.

Material	100%
Wages and overhead	25%

Ans: Equivalent production 70,000 units, Cost per unit of equivalent production Rs. 1.50, Units completed and transferred Rs. 90,000 Closing work-in-progress Rs. 30,000

22. (Average Costing)

The beginning inventory in Process No. 2 at the beginning of a period was valued at Rs. 2,950 made up of Rs. 1,400 towards materials, Rs. 1,000 towards labour and Rs. 550 towards overheads for 100 units. The value added during the period was Rs. 53,600 towards an introduction of 4,100 units from the previous process besides Rs. 40,800 towards labour and Rs. 19,400 towards overheads. Out of 3,600 units completed, 3,300 units were transferred to the next process leaving the balance in stock. 400 units were held back in process with half completion towards labour and overheads while 200 units were loss in processing considered normal and hence should be borne by the entire inventory. Prepare a cost of production statement using average cost basis. *(ICWA Inter)*

Ans: Cost of units transferred Rs. 99,000; Cost of units held in stock Rs. 9,000; Cost of WIP Rs. 8,75; Cost per unit Material Rs. 13.75, Labour Rs. 11.00; Overheads Rs. 5.25.

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23. Roy and Johnson (P) Ltd. gives the following particulars relating to Process *A* in its plant for the month of December 1997:

		Cost	Rs.
Work-in-progress (opening balance) on 1.12.1997—500 units:			
		Material	4,800
		Labour	3,200
		Overheads	6,400
			14,400
Units introduced during the month		19,500	
Processing costs incurred during the month:			
Materials	Rs. 1,86,200		
Labour	72,000		
Overheads	1,06,400		Rs. 3,64,600
Output: Units transferred to Process *B*	18,200		
Units scrapped (completely processed)	1,400		
Work-in-process (closing balance)	400		
[Degree of completion: Materials 100%			
Labour and overhead 50%]			

Normal loss in processing is 5% of total input and normal scrapped units fetch Re. 1 each.
Prepare the following statements for Process *A* for December 1997:
(a) Statement of Equivalent Production;
(b) Statement of Cost;
(c) Statement of Evaluation;
(d) Process *A* Account. *(ICWA Inter, June 1998)*

Ans: Output completed and transferred Rs. 3,64,000; Abnormal loss Rs. 8,000; Closing work in progress Rs. 6,000; Cost per unit, material Rs. 10; Labour Rs. 4, Overhead Rs. 6.

24. The following data pertains to Process 1 for March 2008 of Beta Ltd.:

Opening Work-in-progress	1,500 units at	Rs. 15,000
Degree of completion:		
Material 100%; Labour and Overheads $33\frac{1}{4}$ %		
Input of materials	18,500 units at	Rs. 52,000
Direct labour		Rs. 14,000
Overheads		Rs. 28,000
Closing in work-in-progress	5,000 units	
Degree of completion: Material 90% and Labour and Overhead 30%		

Normal Process Loss is 10% of total input
(Opening work-in-progress units + Units put in)
Scrap value Rs. 2.00 per unit.
Units transferred to the next process: 15,000 units.

You are required to:
(a) Compute equivalent units of production.
(b) Compute cost per equivalent unit for each cost element, that is, materials, labour and overheads.
(c) Compute the cost of finished output and closing work-in-progress.
(d) Prepare the process and other accounts.

Assume: (i) FIFO Method is used by the Company.
(ii) The cost of opening work-in-progress is fully transferred to the next process.

(CA Inter, B. Com. (Hons), Delhi)

Ans: Cost per equivalent units Rs. 6, Cost of 15,000 units of finished output Rs. 99,000; Cost of closing WIP Rs. 18,000

25. (Average Costing)

From the following details prepare statement of equivalent production, statement of cost and find the value of

(a) Output transferred, and

(b) Closing work-in-progress applying average method of valuation of process stock and FIFO method.

Opening work-in-progress	2,000 units
Materials (100% complete)	Rs. 7,500
Labour (60% complete)	3,000
Overheads (60% complete)	1,500
Units introduced into this process	8,000

There are 2,000 units in process and the state of completion is estimated to be:

Materials	100%
Labour	50%
Overheads	50%

8,000 units are transferred to next process.

The process costs for the period are:

Materials	Rs. 1,00,000
Labour	78,000
Overhead	39,000

(CA Inter)

Ans: Equivalent units: Materials 10,000, labour and overheads 9,000 each: (a) Rs 1,99,784, (b) Rs 35,723

26. The following details relate to an intermediary process in a factory:

	% Degree of completion	*No. of units*	*Cost Rs.*
Opening work-in-progress:		300	12,300
(a) Materials	50%		
(b) Labour	80%		
(c) Overheads	80%		
Transfer from previous process	100%	3,800	1,36,800
Process material added			7,900
Direct wages			37,400
Overheads			14,960
Transfer to next progress (finished)	100%	3,500	
Closing work-in-progress:		600	
(a) Material	100%		
(b) Labour	80%		
(c) Overheads	80%		

Prepare:

(a) Process cost accounts for the intermediary process.

(b) Statement of equivalent units (on FIFO basis).

(c) Statement of distribution of cost on the basis of equivalent units.

Ans: Transfer to next process 3,500 units Rs 1,79,840; Closing stock 600 units Rs 29,520

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27. (Average Cost Method)

The following details are given in respect of a manufacturing unit for the month of April 1995:

(i) Opening work-in-progress 5,000 units

	Rs.
(a) Materials (100% complete)	18,750
(b) Labour (60% complete)	7,500
(c) Overheads (60% complete)	3,750

(ii) Units introduced into the process 17,500 units

(iii) 17,500 units are transferred to the next process

(iv) Process cost for the period are

Material	Rs. 2,50,000
Labour	Rs. 1,95,000
Overheads	Rs. 97,500

(v) The stage of completion of units in closing WIP are estimated to be: Material 100%, Labour 50% and Overheads 50%.

You are required to prepare a statement of equivalent unit of production, statement of cost. Also find the value of

(i) Output transferred

(ii) Closing work-in-progress, using average cost method. *(C.A. Inter June 1995)*

Ans: Average cost per equivalent unit Rs. 27.132, value of output transferred Rs. 474810, value of closing WIP Rs. 97,690

28. (Average Cost Method)

Process 2 receives units from Process 1 and after carrying out work on the units transfers them to Process 3. For the accounting period the relevant data were as follows:

Opening WIP 200 units (25% complete) valued at	Rs. 5,000
800 units received from Process I valued at	Rs. 8,600
840 units were transferred to Process 3	
Closing WIP 160 units (50% complete)	

The costs of the period were Rs. 33,160 and no units were scrapped.

Required:

Prepare the Process Account for Process 2 using the Average Cost Method of valuation. *(C.A. Inter Nov. 1995)*

Ans: Average cost per complete unit Rs. 50.826

cost of production	
840 complete units	Rs. 42,694
160 WIP units	Rs. 4,066

29. (Opening and Closing Work-in-Progress)

The following data relate to Process *Y* for accounting period 2.

At the beginning of period 2, there were 800 units partly completed which had the following values:

	Value (Rs.)	*Percentage complete*
Input material (from Process *X*)	8,200	100
Material introduced	5,600	55
Labour	3,200	60
Overheads	2,400	45

During the period 4,300 units were transferred from Process *X* at a value of Rs. 46,500 and other costs were:

	Rs.
Material introduced	24,000
Labour	19,500
Overhead	18,200

At the end of the period, the closing WIP was 600 units which were at the following stage of completion:

Input material	100% complete
Material introduced	50% complete
Labour	45% complete
Overheads	40% complete

The balance of 4,500 units was transferred to finished goods.
Calculate the value of units transferred to Finished Goods and the value of WIP and prepare the Process account using

(i) the FIFO method and
(ii) the average cost method. *(CA, Inter)*

Inter Process Profit

30. The manufacturing operations of JK Ltd. involve three distinct processes in connection with the same unit. The output of Process *P* is charged to Process *Q* at a profit of 25% on cost, and the output of Process *Q* is charged to Process *R* on similar basis. The completed product is transferred into stock at a price which gives Process *R* a profit of 25% on transfer price. From the following particulars prepare process cost accounts and finished goods account. Stock in each process has been valued at prime cost.

Process	*P*	*Q*	*R*
Materials consumed	Rs. 14,000	Rs. 21,000	Rs. 7,000
Labour	21,000	14,000	28,000
Closing stock	7,000	14,000	21,000

Sales Rs. 1,26,000.
Closing stock of finished products amount to Rs. 14,000. Show also the actual realised profit to be taken to the credit of the Profit and Loss Account.

Ans: Profit, Process *P* Rs. 7,000, Process *Q* Rs. 14,000, Process *R* Rs. 28,000, Finished stock A/c Rs. 28,000, Actual realised profit Rs. 66,220, cost of closing stock:

Process *Q* Rs. 12,600, Process *R* Rs. 17,080, Finished stock Rs. 8,540.

31. Cheap Sweets Ltd. has divided its manufacture into two processes, *A* and *B*. After leaving Process *B*, the product is passed into finished stock.
The output of Process *A* is transferred to Process *B* at a price which gives process *A* a Profit of 25% thereon, and the output of Process *B* is transferred to finished goods at a price which gives Process *B* a profit of 20% thereon.
The following information is provided in respect of the year ended 31st December, 2002:

	Process A	*Process B*
Stock on Ist January, 2002	Rs. 3,200	2,000
Materials used	6,400	2,700
Direct labour	12,500	8,500
Overheads	2,500	1,700
Stock on 31st December, 2002	2,100	900

Process stocks consist of products which have passed through the process completely and are valued at prime cost to the process concerned.

Finished goods were in stock on Ist January, 2002 to the value of Rs. 10,200 and on 31st December, 2002 to the value of Rs. 6,200. Both the opening and closing stocks were valued at the price at which they were transferred from Process *B*.

Sales amounting to Rs. 68,400 were effected during the year and included all the goods in stock at the beginning of the year.

The reserves on Ist January, 2002 for unrealised profit included in stock valuation were: Process *B*— Rs. 350; Finished goods Rs. 3,430.

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Prepare the Process Accounts, Finished Goods Account and Trading Account for the year ended 31st December, 2002.

Ans: Profit Process *A* Rs. 7,500, Process *B* Rs. 11,000, Finished goods stock A/c Rs. 9,400, Trading A/c Profit Rs. 29,413.

32. Product *A* passes through three processes before it is transferred to finished stock. The following information is obtained for the month of July:

	Process I Rs.	*Process II* Rs.	*Process III* Rs.	*Finished stocks* Rs.
Opening stock	5,000	8,000	10,000	20,000
Direct materials	40,000	12,000	15,000	—
Direct wages	35,000	40,000	35,000	—
Manufacturing overhead	20,000	24,000	20,000	—
Closing stock	10,000	4,000	15,000	30,000
Profit % on transfer price to next process	25%	20%	10%	—
Inter-process profit for opening stock	—	1,395	2,690	6,534

Stocks in processes are valued at prime cost and finished stock has been valued at the price at which it is received from Process III. Sales during the period were Rs. 4,00,000.

Prepare and compute:

(a) Process cost accounts showing profit element at each stage,
(b) Actual realised profit, and
(c) Stock valuation for balance sheet purpose.

Ans: Profit Process I Rs. 30,000, Process II Rs. 50,000, Process III Rs. 35,000, Finished goods stock Rs. 60,000 Actual realised profit:

Process I	Rs. 30,000
Process II	Rs. 50,697
Process III	Rs. 33,655
Finished stock	Rs. 56,732

Stock valuation for balance sheet =

Process I	Rs.	10,000
Process II	Rs.	3,302
Process III	Rs.	10,965
Finished	Rs.	20,198
Total:	Rs.	44,465

Joint Product and By-Products

33. Calculate the estimated cost of production of by-products *X* and *Y* at the point of separation from the main product.

	By-product *X*	By-product *Y*
Selling price per unit	Rs. 12	Rs. 24
Cost per unit after separation from the main product	Rs. 3	Rs. 5
Units produced	500	200

Selling expenses amount to 25% of total works cost, that is, including both pre-separation and post-separation work cost.

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Selling prices are arrived at by adding 20% of total cost, that is, the sum of works cost and selling expenses.

Ans: Total cost By-product *X* Rs. 2500, By-product *Y* Rs. 2,200, Cost per unit *X* Rs. 5, *Y* Rs. 11

34. A vegetable oil refining company obtains four products whose cost details are:

Joint costs of the four products: Rs. 8,29,600

Outputs: *A* 5,00,000 litres, *B* 10,000 litres, *C* 5,000 litres, and *D* 9,000 kg.

Further Processing Costs: *A* Rs. 2,40,000, *B* Rs. 48,000, *C* Rs Nil, and *D* Rs. 8,030.

The products can be sold as intermediates, that is, at split-off point without further processing. The sale prices are:

	As finished product	*As intermediate*
A Rs per litre	1.84	1.20
B Rs per litre	8.00	4.00
C Rs per litre	6.40	6.40
D Rs per kg	26.67	24.00

(a) Calculate the product-wise profit allocating joint costs on net realisable values.

(b) Compare the profitability in selling the products with and without further processing.

Ans: (a) Profit Product *A* Rs. 39,459, Product *B* Rs. 2,631, Product *C* Rs. 2,105, Product *D* Rs. 14,205 (b) Profit with further processing *A* Rs. 1,19,452, *B* loss Rs. 5,369, *D* Rs 30,205.

Profit with not further processing *A* 39,459 *B* Rs. 2,631, *D* Rs. 14205

It is beneficial to further process Products *A* and *D* but not Product *B*.

35. In an oil mill, four products emerge from a refining process. The total cost of input during the quarter ending March 2002 is Rs. 1,48,000. The output, sales and additional processing costs are as under:

Product	*Output in litres*	*Additional processing* cost after split-off point (Rs)	*Sales value* Rs
AOXE	8,000	43,000	1,72,500
BOXE	4,000	9,000	15,000
COXE	2,000		6,000
DOXE	4,000	1,500	45,000

In case these products were disposed off at the split-off points, that is, before further processing, the selling price would have been:

AOXE Rs. 15.00; BOXE Rs. 6.00; COXE Rs. 3.00; DOXE Rs. 7.50.

Prepare a statement of profitability based on the following facts:

1. If the products are sold after further processing is carried out in the mills.
2. If they are sold at the split-off point. *(CA Inter)*

Ans: 1. Profit AOXE Rs. 30,833, BOXE Rs. 13,733 Loss, COXE Rs. 1,067, DOXE Rs. 18,833. 2. Profit AOXE Rs. 21,333, BOXE Rs. 4,267, COXE Rs. 1,067, DOXE Rs. 5,333.

36. *B* Ltd. manufacturers Product *A* which yield two by-products *B* and *C*. The actual joint expenses of manufacture for a period were Rs. 8,00,000.

It was estimated that the profits on each product as a percentage of sales would be 30%, 25% and 15% respectively. Subsequent expenses were:

	A	*B*	*C*
Materials	Rs. 10,000	Rs. 7,500	Rs. 2,500
Direct wages	20,000	12,500	5,000
Overheads	15,000	12,500	7,500
	45,000	32,500	15,000
Sales were	Rs. 6,00,000	Rs. 4,00,000	Rs. 2,50,000

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Prepare a statement showing the apportionment of the joint expenses of manufacture over the different products.

(B. Com. (Hons), Delhi)

Ans:

	A	*B*	*C*
Share of joint costs (Rs.)	3,55,800	2,54,700	1,89,500

37. Two products *P* and *Q* are obtained in a crude form and require further processing at a cost of Rs. 5 for *P* and Rs. 4 for *Q* per unit before sale. Assuming a net margin of 25 per cent on cost, their sale prices are fixed at Rs. 13.75 and Rs. 8.75 per unit respectively. During the period, the joint cost was Rs. 88,000 and the outpurs were:

P 8,000 units
Q 6,000 units

Ascertain the joint cost per unit. *(B. Com. (Hons), Delhi), 2002;CA Inter May 1998)*

Ans:

	P	*Q*
Joint cost per unit (Rs.)	8	4

38. Bright Chemicals Ltd. electrolyses common salt to obtain three joint products—caustic soda, chlorine and hydrogen. During a costing period, the expenditure relating to the inputs for the common process amounted to Rs. 3,50,000. After separation, expenses amounting to Rs. 1,60,000, Rs. 75,000, and Rs. 10,000 were incurred for caustic soda, chlorine and hydrogen respectively. The entire production was sold and Rs. 3,75,000; Rs. 2,50,000; and 60,000 were realised for caustic soda, chlorine and hydrogen respectively. The selling expenses were estimated at 5% of realisations from sale. The management expected profits @ 15%; 10% and 5% of realisations from sale of caustic soda, chlorine and hydrogen respectively.

Draw a columnar statement showing the apportionment of joint costs and the profitability of each product.

(ICWA Inter)

Ans:

	Caustic soda	Chlorine	Hydrogen
Profit (Rs.)	44,000	12,700	Loss (950)

39. In manufacturing the main product *A*, a company processes the resulting waste material into two by-products M_1 and M_2. Using the method of working back from sales value to an estimated cost, you are required to prepare a comparative profit and loss statement of the three products from the following data:

(i) Total cost upto separation point was Rs. 1,36,000.

	A	M_1	M_2
(ii) Sale (all production)	Rs. 3,28,000	Rs. 32,000	Rs. 48,000
(iii) Cost after separation	–	Rs. 9,600	Rs. 14,400
(iv) Estimated net profit percentage to sale value	–	20%	30%
(v) Estimated selling expenses as percentage of sale value	20%	20%	20%

(ICWA Inter)

Ans:

	Main Product	By-Products	
	A	M_1	M_2
Net profit (Rs.)	1,45,600	6,400	14,400

40. In a concern engaged in process industry, four products emerge from a particular process of operation. The total cost of input for the period ended 30th September, 2005 is Rs. 2,53,500. The details of output, additional cost after "split-off point" and sales value of the products are given below.

Product	*Output*	*Additional processing cost after split-off point*	*Sales value*
	kg	*Rs.*	*Rs.*
A	8,000	60,000	1,68,000
B	5,000	10,000	1,10,000
C	3,000	–	60,000
D	4,000	20,000	90,000

If the products are sold at "split-off point" without further processing, the sales value would have been

	Rs.
A	1,15,000
B	90,000
C	55,000
D	80,000

You are required to prepare a statement of profitability based on the products being sold:

(i) after further processing, and
(ii) at the split-off point. *(ICWA Inter)*

Ans:

	A	*B*	*C*	*D*
Profit after further processing	(Rs.) 27,000	25,000	15,000	17,500
Profit at the splitoff point	(Rs.) 29,257	22,897	13,993	20,353

41. A company manufactures products *A*, *B*, and *C* from a joint process. Additional data are as follows:

	Product			
	A	*B*	*C*	*Total*
Units produced	8,000	4,000	2,000	14,000
Joint costs	Rs. 72,000	*a*	*b*	Rs. 1,20,000
Sales value at split-off	*c*	*d*	Rs. 30,000	2,00,000
Additional costs to process further	14,000	10,000	6,000	30,000
Sales value if processed further	1,40,000	60,000	40,000	2,40,000

Derive the values for the lettered spaces.

Ans: (a) Rs. 30,000; (b) Rs. 18,000; (c) Rs. 1,20,000; (d) Rs. 50,000

42. JB Limited produces four joint products, *A*, *B*, *C* and *D*, all of which emerge from the processing of one raw material. The following are the relevant data:
Production for the period:

Joint Product	*Number of units*	*Selling price per unit (Rs.)*
A	500	18.00
B	900	8.00
C	400	4.00
D	200	11.00

The company budgets for a profit of 10% on sales value. The other estimated costs are:

	Rs.
Carriage inwards	1,000
Direct wages	3,000
Manufacturing overhead	2,000
Administration overhead	10% of the sales value

You are required to:

(a) Calculate the maximum price that may be paid for the raw material.
(b) Prepare a comprehensive cost statement for each of the products allocating the materials and other costs based upon.

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(i) Number of units
(ii) Sales value *(CA Inter,)*

Ans: (a) Rs. 10,000
(b) (i) Total cost *A*, Rs. 4,500; *B*, Rs. 8,100; *C*, Rs. 3000; *D*, Rs. 1,800
(ii) Total cost *A*, Rs. 8,100; *B*, Rs. 6,480; *C*, Rs. 1,440; *D*, Rs. 1,980

43. A manufacturing unit imports raw material and processes it to produce three different products, viz. bright, light and white. The raw material has F.O.B. value of Rs. 5 per kg. Freight and insurance are charged at 10% of F.O.B. price Customs duty a 120% of C.I.F. is levied at the time of import. Auxiliary duty at 20% is also charged on C.I.F. price. Countervailing duty is charged on C.I.F. plus duty at 10%. The landed cost includes 5% for clearing charges. Bright and light are joint products while white emerges as a by-product. The value of by-product after deducting 30% (10% being notional profit and 20% for selling expenses) from sale value is credited to process account. The unit consumed 4,000 kg of raw materials during a year. The relevant data is as follow:

	Bright	*Light*	*White*
Production and sale (kg)	1,400	1,600	1,000
Selling price (Rs. per kg)	30	26	12
Further processing cost (Rs.)	1,500	1,000	–

Assuming additional cost other than material at Rs. 15,800 for all product (includes Rs. 800 for white), prepare a statement showing:

(a) Credit to process A/c for by-product sale;
(b) Allocation of joint costs on relative sales value basis; and
(c) Profit on each product. *(ICWA, Inter)*

Ans: (a) Joint costs to be credited to process A/c Rs. 7,600
(b) Bright Rs. 34,356. Light Rs. 34,028.
(c)

	Bright	Light	White
Profit (Rs.)	6,144	6,572	1,200

44. A company processes a raw material in its department 1 to produce three products, viz, *A*, *B* and *X* at the same split-off stage. During a period 1,80,000 kg of raw materials were processed in Department 1 at a total cost of Rs. 12,88,000 and the resultant output of *A*, *B* and *X* were 18,000 kg, 10,000 kg. and 54,000 kg respectively. *A* and *B* were further processed in Department 2 at a cost of Rs. 1,80,000 and Rs. 1,50,000 respectively.
X was further processed in Department 2 at a cost of Rs. 1,80,000. There is no waste in further processing. The details of sales effected during the period were as under:

Particulars		*A*	*B*	*X*
Quantity Sold	(kg)	17,000	5,000	44,000
Sales Value	(Rs.)	12,24,000	2,50,000	7,92,000

There were no opening stocks. If these products were sold at split-off stage, the selling prices of *A*, *B* and *X* would have been Rs. 50, Rs. 40 and Rs. 10 per kg respectively.

Required:

(i) Prepare a statement showing the apportionment of joint costs to *A*, *B* and *X*.
(ii) Present a statement showing the cost per kg of each product indicating joint cost, further processing cost and total cost separately.
(iii) Prepare a statement showing the product wise and total profit for the period.

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(iv) State with supporting calculations as to whether any or all the products should be further processed or not.

(C.A. Inter Nov. 1996)

Ans:

		A	*B*	*X*
(i)	Apportionment of joint costs (Rs.)	6,30,000	2,80,000	3,78,000
(ii)	Total cost per kg (Rs.)	45	43	9
(iii)	Profit (Rs.)	4,59,000	35,000	3,96,000
(iv)	Product *B* should not be further processed.			

45. Sunmoon Ltd. produces 2,00,000; 30,000; 25,000; 20,000 and 75,000 units of its five products *A*, *B*, *C D* and *E* respectively in a manufacturing process and sells them at Rs. 17, Rs. 13, Rs. 8, Rs. 10 and Rs. 14 per unit. Except product *D,* remaining products can be further processed and then can be sold at Rs. 25, Rs. 17, Rs. and Rs. 20 per unit in case of *A*, *B*, *C* and *E* respectively.

Raw material costs Rs. 35,90,000 and other manufacturing expenses cost Rs. 5,47,000 in the manufacturing process which are absorbed on the products on the basis of their 'Net realisable value'. The further processing costs of *A*, *B*, *C* and *E* are Rs. 12,50,000; Rs. 1,50,000; Rs. 50,000 and Rs. 1,50,000 respectively. Fixed costs are Rs. 4,73,000. You are required to prepare the following in respect of the coming year:

(a) Statement showing income forecast of the company assuming that none of its products are to be further processed.

(b) Statement showing income forecast of the company assuming that products *A*, *B*, *C* and *E* are to be processed further.

Can you suggest any other production plan whereby the company can maximise its profits. If yes, then submit a statement showing income forecast arising out of adoption of that plan. *(C.A. Inter Nov. 1997)*

Ans: (a) Forecast income Total Rs. 6,30,000 (b) Forecast income Total Rs. 13,00,000

46. A company purchases raw materials worth Rs. 11.04 lakhs and processes them into four products *P*, *Q*, *R* and *S*, which have a unit sale value of Rs. 3, Rs 9, Rs. 16 and Rs. 60 respectively at split-off point, as they could be sold as such to other processors. However, during a year, the company decided to further process and sell products *P*, *Q* and *S*, while *R* was not to be processed further but sold at split-off point to other processors. The processing of raw materials into the four products cost Rs. 28 lakhs to the company. The other data for the year were as under:

Product	*Output (units)*	*Sales (Rs. in lakhs)*	*Additional processing Cost after split-off (all variable costs) (Rs. in lakhs)*
P	10,00,000	46.00	12.00
Q	20,000	4.00	2.40
R	10,000	1.60	–
S	18,000	12.000	0.40

You are required to work out the following information for managerial decision-making:

(a) If the joint costs are allocated amongst the four products on the basis of 'Net realisable Value' at split-off point, what would be the company's annual income?

(b) If the company had sold off all the other three products at split-off stage, identify the increase/decrease in the company's annual income as compared to (a) above.

(c) What sales strategy could the company have planned to maximise its profit in the year?

(d) Identify the net increase in income if the strategy at (c) is adopted, as compared to (a) above.

(I.C.W.A. Inter Dec. 1996)

Ans: (a) Rs. 9.76 lakhs (b) Annual income will decline by Rs. 4.60 lakhs (d) Overall income will increase by Rs. 0.20 lakhs.

SERVICE COSTING

12

Learning Objectives

After reading this chapter, you should be able to:

1. understand service costing;
2. explain transport costing—its nature and composition of costs involved, and
3. describe the nature of power house costing and canteen costing.

SERVICE COSTING

Service costing, also known as operating costing, is especially used where services are rendered and articles are not produced. According to the Institue of Cost and Management Accountants (UK) operating costing is "that form of operation costing which applies where standardised services are provided either by an undertaking or by a service cost centre within an undertaking". Service costings are particulary suitable for the costing of road and rail transport services, electricity undertakings and hospitals, etc. The following cost units are usually applied in different service undertaking:

Nature of Business	*Cost Unit*
Public carriers, trucks, goods trains	Per tonne km or per km
Electricity supply	Per kilowatt hour
Passenger buses and trains	Per km
Hospitals	Per patient day
	Per bed, per operation
Road maintenance	Per km of road
Hotels	Per room
Road lighiting	Per lamp
Canteen	Per meal

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NATURE OF SERVICE COSTING

Service cost are usually collected under the following headings:

1. Fixed or standing charges.
2. Semi-fixed or maintenance charges.
3. Variable or running charges.

An important feature of service costing is that mostly such costs are fixed in nature. For example, the costs of operating a theatre are usually not influenced by the size of the audience.

TRANSPORT COSTING

In transport undertakings the cost unit is normally the tonne-mile or passenger-mile but the organisation of transport undertakings varies according to the nature of the undertakings. For example, rail transport is more complicated than road transport as provision has to be made not only for the vehicles but also for the maintenance of the permanent way, the station, signalling facilities, yards, engines, wagons, etc. For the railway, separate cost centres need to be established.

Composition of Costs

In transport operating costing, the total costs consist of: (i) standing charges, (ii) running (variable) charges, and (iii) maintenance charges.

Standing Charges

In motor transport costings the following are commonly the standing charges:

1. Licence duty and insurance
2. Garage costs and administrative expenses
3. Drivers' wages
4. Depreciation
5. Tax

Running (Variable) Costs

The following variable costs are found in motor transport costings:

1. Petrol
2. Oil
3. Grease

Maintenance Charges

1. Repairs and maintenance
2. Tyres
3. Garage charges

Cost Units

In transport costing, passenger-kilometre or tonne-kilometre is generally the cost unit. After collecting total cost, the cost per unit (per passenger km or tonne-km) is determined. The cost per unit is calculated as follows:

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No. of vehichles × Capacity × Distance travelled × Days × Passenger/ Weight actually carried.

Ascertainment of Costs

Accumulation and control of costs in transport costing are achieved through a daily log sheet and operating cost sheet. A daily log report is a document which contains information regarding each journey, for example, passenger or weight carried, starting and returning time, distance covered, oil or petrol used. Figure 12.1 gives a proforma of a Daily Log Sheet.

Daily Log Sheet

Vehicle No. _____ Date _____
Dirver's Name _____ Starting time _____
Licence No. _____ Returning time _____

Particulars of Journey

Trip No.	*Starting*	*Arriving*		*Goods Carried*	
Place	*Time*	*Place*	*Time*	*Out Collected en route*	*Distance*
Petrol consumption:		Time lost:		Worker's time	
At start _____		Loading _____		Driver _____	
Recd./purchased during the journey _____		Unloading _____			
		Traffic _____		Mechanic _____	
At finish _____					
Total consumption _____		Accident _____		Cleaner _____	
Oil _____					
Grease _____					

Fig. 12.1 Daily Log Sheet

The operating cost sheet or cost statement is also known as the performance statement for each vehicle. Such cost sheets (Fig. 12.2) accumulate relevant costs regarding a vehicle from different sources, such as daily log sheet, wage book, purchase register or summary, repairs details, etc. Operating costs on a cost sheet are usually divided into three headings:

1. Running (variable) charges
2. Standing (fixed) charges
3. Maintenance charges

The operating cost sheet acts as a cost control device. The total and per unit cost calculated can be compared with past figures and performance can be evaluated.

POWER HOUSE COSTING

Power house costing is applied in those undertakings which are engaged in the production of steam and generation of electricity. In large firms, a power house (boiler house) is generally a service department assisting the production department. Operating cost statement in this case can be prepared after collecting data about the costs of producing the steam and costs of generating the electricity. The unit of cost for

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production of steam may be 'Per 1b' and for generation of electricity 'per kilowatt'. A composite unit of cost may be used that is, the kilo Watt-hour. A proforma of a power house operating cost sheet is given in Fig. 12.3. This operating cost sheet shows also different elements of cost of steam production and generation of electricity.

(ABC Transport Company)
Cost Sheet (Monthly)

Vehicle No. _____ Month _____
Registration No. _____ Days operated _____

Charges	*Amount Rs.*
(A) Running Charges:	
Petrol	
Oil	
Grease	
Total	
(B) Standing charges:	
Depreciation	
Insurance	
Interest	
Tax	
Licence fees	
Driver's salary	
Total	
(C) Maintenance charges:	
Repairs	
Tyres	
Spares	
Garage charges	
Total	
Total charges	Rs. _____
Total tonne-km/passenger	km _____
Cost per tonne-km/passenger	km _____

Fig. 12.2 Cost Sheet

CANTEEN COSTING

In most organisations, canteen facilities are provided at subsidy so that food and other items can be provided at minimum price. The costs are accumulated on a cost sheet which gives the total cost incurred. From the total cost the subsidy is deducted to arrive at the net cost of operating the canteen. After camparing the net cost with the sales proceeds, profit/loss is calculated. A specimen of canteen cost sheet is given in Fig. 12.4.

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Power House Cost Sheet

Month _____ Total steam consumption _____
Total steam produced _____ Electricity generated _____

	Items	*Cost per unit (Cost per 1,000 lb)*	*Total cost*
(A)	Fixed overheads:		
	Rent, rates, etc.		
	Depreciation of plant		
	Depreciation of building		
	Insurance		
(B)	Maintenance charges:		
	Meters		
	Furnance		
	Service materials		
	Tools and accessories		
(C)	Labour charges:		
	Coal handlers		
	Ash removers		
(D)	Fuel:		
	Fuel		
	Power		
(E)	Water charges:		
	Water purchased		
	Water softening		
(F)	Supervision and other charges:		
	Foremen		
	Engineers		
	General labourer		
	Cleaners		
	Total		

Fig. 12.3 Power House Cost Sheet

Canteen Cost Sheet

Month _____

Items	*Total costs*		*Cost per meal*
	Current month (Rs)	*Previous month (Rs)*	
(A) Provisions:			
Bread			
Biscuits			
Cakes			
Eggs			
Meat			

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	Fish	
	Vegetables	
	Milk	
	Fruit	
	Others	
(B)	Labour and supervision:	
	Supervisor	
	Cooks	
	Helpers	
	Counter clerks	
	Cleaners	
	Sweepers	
(C)	Maintenance:	
	Crockery	
	Glassware	
	Towels	
	Rent	
	Light	
	Gas	
	Insurance	
	Comsumable stores	
	Total cost	
Less:	Subsidy	
	Net cost	
	Sales	
	Profit/Loss	

Fig. 12.4 Canteen Cost Sheet

Example 12.1

A City Municipality arranges for the removal of its garbage by means of motor vehicle transport. The following vehicles are maintained:

No. of Vehicles	*Specification*
20	5 tonne lorries
30	4 tonne lorries
50	3 tonne lorries
40	2 tonne lorries

On an average each lorry makes six trips a day and in each trip covers an average distance of five km. Each lorry carries garbage of 60% its capacity. On an annual average, 20% of the lorries are laid up for repairs. The conservancy work is carried out daily. Calculate tonne-km utilised for removal of garbage per month.

(B.Com. (Hons), Delhi, 2007)

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Solution:

Calculation of Tonne-km

No. of Vehicles	*Specification*	*Total Capacity*
20	5	100
30	4	120
50	3	150
40	2	80
		450

Tonne-km

Total Capacity × Trip per day × Distance × Capacity utilisation × Effective use × No. of days in a month.

$$450 \times 6 \times 5 \times \frac{60}{100} \times \frac{80}{100} \times 30 = 1{,}94{,}400 \text{ tonne-km}$$

Example 12.2

A bus started from Delhi for Mussoorie with 50 passengers on board. 20 passengers got off at Dehradun and the bus proceeded with the remaining passengers. In the evening the same bus left Mussoorie with 50 passengers, 10 passengers got off at Dehradun and the bus resumed its journey with remaining passengers for Delhi. The distance between Delhi and Dehradun is 280 km and between Dehradun to Mussoorie it is 20 km

Compute the cost per passenger km, if the total cost of running the bus comes out to be Rs. 5,000.

(B. Com. (Hons), Delhi, 2003)

Solution:

Total passengers kilometres covered :

(i) Delhi to Dehradun = 50 passengers × 280 km	14,000
(ii) Dehradun to Mussoorie = 30 passengers × 20 km (20 passengers got off at Dehradun)	600

Back Journey in the Evening

(i) From Mussoorie = 50 passengers × 20 km	1,000
(ii) From Dehradun to Delhi = 40 passengers × 280 km	11,200
(10 passengers got off at Dehradun)	26,800

Total cost of running the bus = Rs. 5,000

Total passenger kilometres covered = 26,800 km

$$\text{Cost per passenger km.} = \frac{\text{Rs. } 5{,}000}{\text{km } 26800}$$

$$= \text{Rs. } 0.186$$

Example 12.3

From the following information calculate the bus fare to be charged from each passenger for the journeys:

(a) Delhi to Agra ;
(b) Delhi to Bhiwani;
(c) Delhi to Chandigarh:

(i) Delhi to Agra 200 km
Delhi to Bhiwani 120 km
Delhi to Chandigarh 250 km
(ii) Effective passenger-km 3,72,000
(iii) Total operating costs (excluding conductor's commission @15% and passenger tax @ 5% of total taking) Rs. 1,48,800.
(iv) Desired profit—30% on total taking.

(B.Com. (Hons), Delhi, 2002)

Solution:

Effective passenger–km = 3,72,000

Total operating cost (excluding Conductor's Commission and Passenger Tax) 1,48,800

Conductor's Commission

(15% of Total taking, that is, Rs. 2,97,600) = 44,640

Passenger Tax (W.N. (ii))

(5% of Total taking that is, Rs. 2,97,600) = 14,880 (W.N. (iii))

Desired Profit (30% of Total Takings that is, 2,97,600) = 89,280 (W.N. (iv))

Total Takings = 2,97,600

Effective Passenger km = 3,72,000

$$\text{Rate per passenger-km} = \frac{2,97,600}{3,72,000} \times 100 = \text{Rs. } 0.80$$

Proposed fare to be charged per passenger km.

Delhi to Agra = Rs. 0.80 × 200 km

= Rs. 160

Delhi to Bhiwani = Rs. 0.80 × 120 km = Rs. 96

Delhi to Chandigarh = Rs. 0.80 × 250 km = Rs. 200

Working Notes:

(i) Conductor's Commission = 15% of Total takings

Passenger's Tax = 5% of Total Takings

Desired Profit = 30% of Total takings

Commission + Passenger Tax + Profit = 50% of Total takings

Cost (Balance)	50%	Operating Cost	= 1,48,800
Total Takings	100%	100% of this	= 1,48,800
			2,97,600

(ii) $$\text{Conductor's, Commission} = \frac{2,97,600 \times 15}{100} = \text{Rs. } 44,640$$

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(iii) Passenger Tax = $\frac{2,97,600 \times 5}{100}$ = Rs. 14,880

(iv) Profit = $\frac{2,97,600 \times 30}{100}$

Total = Rs. 89,280

Example 12.4

Mr. Singh started transport business with a fleet of 10 taxis. Expenses of operating the fleet are given below:

(i)	Cost of each taxi	Rs. 3,80,000
(ii)	Salary of office and garage staff	Rs. 38,000 p.m.
(iii)	Rent of garage	Rs. 12,000 p.m.
(iv)	Driver's salary per taxi	Rs. 4,000 p.m.
(v)	Insurance, tax and sundry expenses per taxi	Rs. 55,200 per yr.

The life of a taxi is 3,00,000 kms at the end of which it is estimated to be sold at Rs. 20,000. A taxi is expected to run on an average 4,000 kms per month. Petrol consumption is 12 kms per litre of petrol costing Rs. 30 per litre. You are required to:

(i) Calculate the cost of running taxi per km by preparing a statement of operating cost; and

(ii) Find out the profit Mr. Singh may expect to earn during the first month of operations if the hire charge is Rs. 10 per km. Assume that during the month each taxi runs on an average 4,000 km of which 800 km it runs empty. *(B.Com. (Hons), Delhi, 2004)*

Solution:

(i) Calculation of cost of running a taxi per km

Total Running = 4,000 km

Effective Running = 4,000 km – 800 km = 3,200 km.

	Amt. p.m. (each taxi)	*Rs.*
Standing Charges:		
Salary of office and garage staff (38,000 ÷ 10) =	3,800	
Rent of garages (12,000 ÷ 10) =	1,200	
Driver's Salary	4,000	
Insurance, Tax and Sundry Exp. (55200 ÷ 12)	4,600	
	13,600	
Fixed charges per taxi per km 13600 ÷ 3200		4.25
Variable expenses:		
Depreciation = $\frac{3,80,000 - 20,000}{3,00,000} \times 4,000$ =	4,800	
Petrol Cost = $\frac{400 \times 30}{12}$	10,000	
	14,800	
Variable cost per taxi per km.	14800 ÷ 3200	4.625
Total cost per km per taxi		**8.875**

(ii) Profit during the month

	Rs.
Hire Charges per km	10.00
Less: Total cost per km	8.875
Profit per km	1.125

Total Profit per Taxi = 1.125 × 3200 km = Rs. 3600
Total Profit for 10 taxis = 3600 × 10 = Rs. 36,000 p.m.

Example 12.5

A transport company is running four buses between Delhi and Alwar, covering a distance of 100 km. The seating capacity of each bus is 40 passengers. The following particulars are obtained from its books for the month of October 2003:

	Rs.
Wages of drivers, conductors	9,600
Salaries of office staff	3,000
Honorarium of accountant	1,000
Diesel, oil etc	16,000
Repairs and maintenance	3,200
Road tax and insurance	6,400
Depreciation	10,400
Interest and other charges	8,000

Actual passengers carried were 75% of the seating capacity. All the buses ran for 30 days. Each bus made one round trip per day.

Find out the fare the company should charge per passenger/km if it wants a profit of 20% on the taking.

(B. Com. (Hons), Delhi, 2004)

Solution:

Cost Statement

Period: October, 2003
Passenger km = 7,20,000

	Rs.	Total Rs.
(a) Standing charges:		
Salaries of office staff	3,000	
Honorarium of Accountant	1,000	
Road Tax and insurance	6,400	
Depreciation	10,400	
Interest and other charges	8,000	
Total (a)		28,800
(b) Maintenance charges		
Repairs	3,200	
Total (b)		3,200
(c) Running charges		
Wages of drivers and conductors	9,600	
Diesel oil etc.	16,000	
Total (c)		25,600
Total of (a + b + c) Rs.		57,600

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(d) Total Passenger km for the month (km)	720000	
(e) Cost per passenger km. Rs. (57,600 ÷ 7,20,000 kms)	0.08	
Passenger km.		
100 × kms. × 2 ways × 4 buses × 30 days × 40 passengers =		960000
Less: 25% empty (or 75% capcity) =		240000
		720000
Total cost	Rs. 57,600	
Profit to be added		
20% of Taking or 25% of cost	Rs. 14,400	
Expected Revenue	72,000	
Total No. of passengers in a month:		
40 passengers × 2 ways × 4 buses × 30 days =		9600
Less: 25% Empty or 75% capacity		2400
		7200
Fare per passenger per trip		
Rs. 72,000 ÷ 7200 = Rs. 10		

Example 12.6

Hira Singh owns a taxi, a bus and a truck. The bus is 50 seater. The maximum capacity of the truck is 10 tonnes. The taxi runs on a average 3,000 km. in a month out of which 20% is normal running without fare. Variable cost of running the taxi is Rs. 8 per kilometre.

The bus and the truck run between Delhi and Jaipur, one way distance being 300 km. The bus makes 25 round trips in a month and is generally 90% occupied. Variable cost of running a bus is Rs. 13.50 per kilometre. The truck makes 20 round trips in a month and is fully loaded on outward journey but only 90% loaded on return. Variable cost of running a truck is Rs. 9.50 per kilometre.

You are required to calculate:

(i) Total variable cost per month and variable cost per effective kilometre for the taxi;
(ii) Total variable cost per month and variable cost per effective passenger-kilometre for the bus; and
(iii) Total variable cost per month and variable cost per effective tonne-kilometre for the truck.

(B.Com.(Hons.), Delhi, 2005)

Solution:

Computation of total variable cost per month and variable cost per effective km for the Taxi:

(A) *Total variable cost per month:*

= Rs. 3,000 × 8

= Rs. 24,000 per month.

(B) *Variable cost per effective km:*

$$= \frac{\text{Total variable cost}}{\text{Average km in a month with fare}}$$

$$= \frac{24,000}{1,800}$$

= Rs. 13.33 per effective km

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(ii) Computation of total variable cost per month and variable cost per effective passenger km for bus:

(A) Total variable cost per month:

$$= \text{Total km of 25 trips} \times \text{Rate of VC}$$
$$= (300 \times 2 \times 25) \times 13.50$$
$$= \text{Rs. } 2,02,500.$$

(B) Variable cost per effective passenger km

$$\text{Passenger km} = (300 \times 2 \times 25) \times 50 \times 90\%$$
$$= 15000 \times 50 \times \frac{90}{100}$$
$$= 6,75,000 \text{ passenger km}$$

$$\text{Variable cost per effective passenger km} = \frac{202,500}{6,75,000} = 0.30 \text{ per passenger p. km.}$$

(iii) Total Variable cost per month of the truck:

$$= (300 \times 2 \times 20) \times 9.50$$
$$= \text{Rs. } 1,14,000$$

(C) Variable cost per effective tonne-kilometre:

Effective tonne-kilometre

$$= (300 \times 1 \times 20 \times 10)\ 100\% + (300 \times 1 \times 20 \times 10) \times 90\%$$
$$= (60,000) \times \frac{100}{100} + 60,000 \times \frac{90}{100}$$
$$= 60,000 + 54,000$$
$$= 1,14,000 \text{ ton kilometres.}$$

$$\text{Rate} = \frac{\text{VC}}{\text{tonne km}} = \frac{1,14,000}{1,14,000} = \text{Rs. } 1 \text{ per tonne km}$$

Example 12.7

Global Transport Ltd. charges Rs. 90 per tonne for its 6 tonne truck lorry load from city *A* to city *B*. The charges for the return journey are Rs. 84 per tonne. No concession or reduction in these rates is made for any delivery of goods at intermediate station *C*. In January, 1997 the truck made 12 outward journeys for city *B* with full load out of which 2 tonne were unloaded twice in the way at city *C*. The truck carried a load of 8 tons in its return journey for 5 times but was once caught by police and Rs. 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city *C*. The distance from city *A* to city *C* and city *B* are 140 km and 300 km respectively.

Annual fixed costs and maintenance charges are Rs. 60,000 and Rs. 12,000 respectively. Running charges spent during January, 1997 are Rs. 2,944.

You are required to find out the cost per absolute ton-kilometre and the profit for January, 1997.

(B.Com.(Hons), Delhi, 2006, C.A. Inter, May 1997)

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Solution:

Global Transport Ltd.
Operating Cost and Profit Statement During January, 1997

	Amount
	Rs.
Fixed Costs (Rs. 60,000/12)	5,000
Maintenance Charges (Rs. 12,000/12)	1,000
Running Costs	2,944
Total operating cost	8,944
Cost per absolute ton-km (Rs. 8,944/44, 720 absolute tonne km)	0.20
Net Revenue received (WN 4)	12,168
Less: Total Operating Costs (as given above)	8,944
Profit	3,224

Working Notes:

1. *Absolute tonne-km for outward journeys:*

(i) From city *A* to city *B*:		
10 journeys × 300 km × 6 tonne	=	18,000 tonne-km
(ii) From city *A* to city *C*:		
2 journeys × 140 km × 6 tonne	=	1,680 tonne-km
(iii) From city *C* to city *B*:		
2 journeys × 160 km × 4 tonne	=	1,280 tonne-km
Total:		20,960 tonne-km

2. *Absolute kms for return journeys:*

(i) From city *B* to city *A*:		
5 journeys × 300 km × 8 tonne	=	12,000 tonne-km
6 journeys × 300 km × 6 tonne	=	10,800 tonne-km
(ii) From city *B* to city *C*:		
1 journey × 160 km × 6 tonne	=	960 tonne-km
Total		23,760 tonne-km

3. *Total Absolute Tonne-km of outward and return journeys:*
   = 20,960 tonne-km + 23,760 tonne-km = 44,720 tonne-km.

4. *Net Revenue received during January, 1997:*

	Rs.
12 trucks × 6 tonne × Rs. 90 (from city *A* to city *B*)	6,480
5 trucks × 8 tonne × Rs. 84 (from city *B* to city *A*)	3,360
6 trucks × 6 tonne × Rs. 84 (from city *B* to city *A*)	3,024
1 truck × 6 tonne × Rs. 84 (from city *B* to city *C*)	504
Total Revenue:	13,368
Less: Fine paid	1,200
Net Revenue received	12,168

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Example 12.8

Sai Travels owns a bus and operates a tourist service on daily basis. The bus starts from Newcity to Restvillage and returns back to Newcity the same day. Distance between Newcity and Restvillage is 250 km. This trip operates for 10 days in a month. The bus also plies for another 10 days between Newcity and Shivapur and returns back to Newcity the same day; distance between these two places is 200 km. The bus makes local sightseeing trips for 5 days in a month, covering a total distance of 60 km per day.

The following data are given:
Cost of Bus Rs. 3,50,0000
Depreciation 25%
Driver's salary Rs. 1,200 p.m.
Conductor's salary Rs. 1,000 p.m.
Part-time clerk's salary Rs. 400 p.m.
Insurance Rs. 1,800 p.a.
Diesel consumption 4 km per litre @ Rs. 8 per litre.
Token tax Rs. 2,400 p.a.
Permit fee Rs. 1,000 p.m.
Lubricant oil Rs. 100 for every 200 km
Repairs and maintenance Rs. 1,500 p.m.
Normal capacity 50 persons.

While plying to and from Restvillage the bus occupies 90% of the capacity and 80% when it plies between Newcity to Shivapur (both ways). In the city the bus runs full capacity. Passenger Tax is 20% of net takings of the travels' firm. Calculate the rate to be charged to Restvillage and Shivapur from Newcity per passenger, if the profit required to be earned is 33% of net takings of the firm.

(CA Inter, June 1995)

Solution:

Basic Calculations

(i) *Total km covered per month*		km
Restvillage and Back $2 \times 250 \times 10$ days		5,000
Shivapur and back $2 \times 200 \times 10$ days		4,000
Local Trips @ 60 km for 5 days		300
		9,300
(ii) *Fuel Cost*		
(a) Diesel required	$\frac{9,300}{4} \times 8$	= 18,600
(b) Oil required	$\frac{9,300}{200} \times 100$	= 4,650
		23,250
(iii) *Total effective passenger-km per month*		
Restvillage $2 \times 250 \times 50 \times 10 \times 90/100$		= 2,25,000
Shivapur $2 \times 200 \times 50 \times 10 \times 80/100$		= 1,60,000
Local trips $5 \times 60 \times 50$		= 15,000
		4,00,000

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(iv) *Compulation of Operating Cost*

Operating Cost Statement for the Month

Fixed Charges:	*Rs.*		*Rs.*
Driver's Salary	1,200		
Conductor's Salary	1,000		
Clerk's Salary	400		
Insurance 1,800/12	150		
Token Tax 2,400/12	200		
Permit Fee	1,000	=	3,950
Running Charges :			
Depreciation			
$3,50,000 \times \frac{25}{100 \times 12}$	7,292		
Repairs and Maintenance	1,500		
Fuel Cost	23,250	=	32,042
Total Cost		=	35,992

Computation of Charges Per Passenger km

Total Cost (as per above)	Rs.	35,992
Profit on Takings (WN 1)	Rs.	53,719
Add: 20% for Passenger Tax (WN 2)	Rs.	10,744
Total Fare	Rs.	64,463

$$\text{Rate per Passenger km} = \frac{\text{Total Fare}}{\text{Effective Passenger km per month}}$$

$$= \frac{\text{Rs. } 64,463}{4,00,000} = \text{Re } 0.161$$

Charges per Passenger

(a) From Newcity to Restvillage : $250 \times 0.161 = \text{Rs. } 40.25$
(b) From Newcity to Shivapur : $200 \times 0.161 = \text{Rs. } 32.20$

Working Notes:

1. *Computation of Net Takings*
   Let total takings be x
   Profit is 33% of Net Takings (that is before passenger tax) = $0.33x$

$$x = 35,992 + 0.33x$$

or $$0.67x = 35,992$$

or $$x = \text{Rs. } 53,719$$

2. *Computation of Passenger Tax* (20% of Net Takings)

$$53,719 \times 20/100 = \text{Rs. } 10,744$$

Example 12.9

A transport company has a fleet of three trucks of 10 tonne capacity each plying in different directions for transport of customer's goods. The trucks run loaded with goods and return empty. The distance travelled, number of trips made and the load carried per day by each truck are as under:

Truck No.	*One way Distance km*	*No. of trips per day*	*Load carried per trip/day tonne*
1	16	4	6
2	40	2	9
3	30	3	8

The analysis of maintenance cost and the total distance travelled during the last two years is as under

Year	*Total distance travelled*	*Maintenance Cost Rs.*
1	1,60,200	46,050
2	1,56,700	45,175

The following are the details of expenses for the year under review:

Diesel	:	Rs. 10 per litre. Each litre gives 4 km per litre of diesel on an average.
Driver's salary	:	Rs. 2,000 per month
Licence and taxes	:	Rs. 5,000 per annum per truck
Insurance	:	Rs. 5,000 per annum for all the three vehicles.
Purchases Price per truck	:	Rs. 3,00,000 Life 10 years. Scrap value at the end of life is Rs. 10,000.
Oil and sundries	:	Rs. 25 per 100 km run.
General Overhead	:	Rs. 11,084 per annum

The vehicles operate 24 days per month on an average.

Required

(i) Prepare an Annual Cost Statement covering the fleet of three vehicles.
(ii) Calculate the cost per km run.
(iii) Determine the freight rate per tonne km to yield a profit of 10% on freight.

(CA, PE, Exam. II, Group II, Nov. 2001)

Solution:

(i) Annual Cost Statement of three vehicles

	Rs.
Diesel (Refer to Working Note I) (1,34,784 km/4 km) × Rs. 10)	3,36,960
Oil and sundries (1,34,784 km/100 km) × Rs. 25	33,696
Maintenance (Refer to Working Note 2) {(1,34,784 km × 0.25) + Rs. 6,000}	39,696

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	Rs.
Driver's salary (Rs. 2,000 × 12 months) × 3 trucks	72,000
Licence and taxes	15,000
Insurance	5,000
Depreciation (Rs. 2,90,000/10 years) × 3 trucks	87,000
General overhead	11,084
Total annual cost	6,00,436

(ii) Cost per km run

$$\text{Cost per kilometer run} = \frac{\text{Total annual cost of three vehicles}}{\text{Total kilometre travelled annually}}$$

(Refer to Working Note 1)

$$= \frac{\text{Rs. } 6,00,436}{1,34,784 \text{ km}} = \text{Rs. } 4.4548$$

(iii) Freight rate per tonne km (to yield a profit of 10% on freight)

$$\text{Cost per tonne km} = \frac{\text{Total annual cost of three vechicles}}{\text{Total effective tonnes km per annum}}$$

$$\text{(Refer to working note 1)} = \frac{\text{Rs. } 6,00,436}{5,25,312 \text{ km}} = \text{Rs. } 1.143$$

$$\text{Freight rate per tonne km} = \text{Rs. } 1.27$$

$$\left(\frac{\text{Rs.}1.143}{9}\right) \times 10$$

Working Notes:

1. Total kilometre travelled and tonnes kilometre (load carried) by three trucks in one year

Truck number	*One way distance in km*	*No. of trips*	*Total distance covered in km per day*	*Load carried per trip/day in tonnes*	*Total effective tonnes km*
1	16	4	128	6	384
2	40	2	160	9	720
3	30	3	180	8	720
Total			468		1824

Total kilometre travelled by three trucks in one year 1,34,784
(468 km × 24 days × 12 months)
Total effective tonnes kilometre of load carried by three trucks during one year 5,25,312
(1,824 tonnes km × 24 days × 12 months)

2. Fixed and variable component of maintenance cost:

$$\text{Variable maintenance cost per km} = \frac{\text{Difference in maintenance cost}}{\text{Difference in distance travelled}}$$

$$= \frac{\text{Rs. } 46{,}050 - \text{Rs.}45{,}175}{1{,}60{,}200 \text{ km} - 1{,}56{,}700 \text{ km}}$$

$$= \text{Rs. } 0.25$$

Fixed maintenance cost = Total maintenance cost – Variable maintenance cost

= Rs. 46,050 – 1,60,200 km × 0.25

= Rs. 6,000

Example 12.10

EPS is a Public School having 25 buses each plying in different directions for the transport of its school students. In view of large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The workload of the students has been so arranged that in the morning, the first trip picks up senior students and the second trip plying an hour later picks up junior students. Similarly, in the afternoon, the first trip takes the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus, one way is 16 km. The school works 24 days in a month and remains closed for vacation in May and June. The bus fee, however, is payable by the students for all the 12 months in a year.

The details of expenses for the year 2003–2004 are as under:

Driver's salary — payable for all in 12 months	Rs. 5,000 per month per driver.
Cleaner's salary payable for all the 12 months (one cleaner has been employed for every five buses).	Rs. 3,000 per month per cleaner
Licence Fees, Taxes etc.	Rs. 2,300 per bus per annum
Insurance Premium	Rs. 15,600 per bus per annum
Repairs and Maintenance	Rs. 16,400 per bus per annum
Purchase price of the bus	Rs. 16,50,000 each
Life of the bus	16 years
Scrap value	Rs. 1,50,000
Diesel cost	Rs. 18.50 per litre

Each bus gives an average of 10 km per litre of diesel. The seating capacity of each bus is 60 students. The seating capacity is fully occupied during the whole year.

The school follows differential bus fees based on distance travelled as under:

Students picked up and dropped within the range of distance from the school	*Bus fee*	*Percentage of students availing this facility*
4 km	25% of Full	15%
8 km	50% of Full	30%
16 km	Full	55%

Ignore interest. Since the bus fees has to be based on average cost, you are required to

(i) prepare a statement showing the expenses of operating a single bus and the fleet of 25 buses for a year.

(ii) work out average cost per student per month in respect of:

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(a) Students coming from a distance of upto 4 km from the school.
(b) Students coming from a distance of upto 8 km from the school; and
(c) Students coming from a distance of upto 16 km from the school.

(CA, PE, Exam. II, Group II, May 2004)

Solution:

(a) (i)

EPS Public School
Statement showing the expenses of operating a single bus and the fleet of 25 buses for a year

Particulars	*Per bus per annum (Rs.)*	*Fleet of 25 buses per annum (Rs.)*
Running costs: (A)		
Diesel (Refer to Working Note 1)	56,832	14,20,800
Repairs and maintenance costs: (*B*)	16,400	4,10,000
Fixed charges:		
Driver's salary	60,000	15,00,000
Cleaner's salary	7,200	1,80,000
Licence fee, taxes etc.	2,300	57,500
Insurance	15,600	3,90,000
Depreciation	93,750	23,43,750
Total fixed charges: (*C*)	1,78,850	44,71,250
Total expenses: (*A* + *B* + *C*)	2,52,082	63,02,050

(ii) **Average cost per student per month in respect of students coming from a distance of:**

(a) 4 km from the school — Rs. 59.34
(Rs. 2,52,082/354 students × 12 monts)
(Refer to Working Note 2)

(b) 8 km from the school — Rs. 118.68
(Rs. 59.34 × 2)

(c) 16 km from the school — Rs. 237.36
(Rs. 59.34 × 4)

Working Notes:

1. *Calculation of diesel cost per bus:*

No. of trips made by a bus each day	4
Distance travelled in one trip both ways (16 km × 2 trips)	32 km
Distance travelled per day by a bus (32 km × 4 shifts)	128 km
Distance travelled during a month (128 km × 24 days)	3,072 km
Distance travelled per year (3,072 km × 10 months)	30,720 km
No. of litres of diesel required per bus per year (30,720 km/10 kms)	3,072 litres

Cost of diesel per bus per year (3,072 litres × Rs. 18.50)	Rs. 56.832
2. *Calculation of number of students per bus:*	
Bus capacity of 2 trips	120 students
$1/4^{th}$ fare students (15% × 120 students)	18 students
$\frac{1}{2}$ fare 30% students (equivalent to $1/4^{th}$ fare students)	72 students
Full fare 55% students (equivalent to $1/4^{th}$ fare students)	264 students
Total $1/4^{th}$ fare students	354 students

Example 12.11

A company runs a holiday home. For this purpose, it has hired a building at rent of Rs. 10,000 per month alongwith 5% of total taking. It has three types of suites for its customers, viz., single room, double rooms and triple rooms.
Following information is given:

Type of suite	*Number*	*Occupancy percentage*
Single room	100	100%
Double rooms	50	80%
Triple rooms	30	60%

The rent of double rooms suite is to be fixed at 2.5 times of the single room suite and that of triple room suite as twice of the double rooms suite.

The other expenses for the year 2006 are as follows:

	Rs.
Staff salaries	14,25,000
Room attendant's wages	4,50,000
Lighting, heating and power	2,15,000
Repairs and renovation	1,23,500
Laundry charges	80,500
Interior decoration	74,000
Sundries	1,53,000

Provide profit @ 20% on total taking and assume 360 days in a year.
You are required to calculate the rent to be charged for each type of suite.

(CA, PE, Exam. II, Group II, May 2007)

Solution:

(i) Total Equivalent Single Room Suites

Nature of suite	*Occupancy*	*Equivalent single room suites*
Single room suites	100 × 360 × 100% = 36,000	36,000 × 1 = 36,000
Double rooms suites	50 × 360 × 80% = 14,400	14,400 × 2.5 = 36,000
Triple rooms suites	30 × 360 × 60% = 6,480	6,480 × 5 = 32,400
		Total 1,04,400

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(ii) Statement of Total Cost:

	Rs.
Staff salaries	14,25,000
Room attendant's wages	4,50,000
Lighting, heating and power	2,15,000
Repairs and renovation	1,23,500
Laundry charges	80,500
Interior decoration	74,000
Sundries	1,53,000
	25,21,000
Building rent 10,000 × 12 + 5% on total taking	1,20,000
	+ 5% on takings
Total cost	26,41,000 + 5% on total takings

Profit is 20% of total takings

$\therefore$ Total takings = Rs. 26,41,000 + 25% of total takings

Let x be rent for single room suite

Then $1{,}04{,}400\,x = 26{,}41{,}000 + 25\%$ of $(1{,}04{,}400\,x)$

or $1{,}04{,}400\,x = 26{,}41{,}000 + 26{,}100\,x$

or $78{,}300\,x = 26{,}41{,}000$

or $x = 33.73$

(ii) Rent to be charged for single room suite = Rs. 33.73
Rent for double rooms suites Rs. 33.73 × 2.5 = Rs. 84.325
Rent for triple rooms suites Rs. 33.73 × 5 = Rs. 168.65

Example 12.12

A Club runs a library for its members. As part of club policy, an annual subsidy of upto Rs. 5 per member including cost of books may be given from the general funds of the club. The management of the club has provided the following figures for its library department.

Number of Club members	5000
Number of Library members	1000
Library fee per member per month	Rs. 100
Fine for late return of books	Re. 1 per book per day
Average No. of books returned later per month	500
Average No. of days each book is returned late	5 days
Number of available old books	50,000 books
Cost of new books	Rs. 300 per book
Number of books purchased per year	1,200 books
Cost of maintenance per old book per year	Rs. 10

Staff details	No.	Per Employee Salary per month (Rs.)
Librarian	01	10,000
Assistant Librarian	03	7,000
Clerk	01	4,000

You are required to calculate:

(i) the cost of maintaining the library per year excluding the cost of new books;
(ii) the cost incurred per member per month on the library excluding cost of new books; and
(iii) the net income from the library per year.

If the club follows a policy that all new books must be purchased out of library revenue (a) What is the maximum number of books that can be purchased per year (b) How many excess books are being purchased by the library per year?

Also, comment on the subsidy policy of the club.

(CA, PE, Exam. II, Group II, May 2007)

Solution:

Computation of total revenue

No. of library members		1,000
Library fees per month	Rs.	1,00,000
Late fees per month (500 × 5 × 1)	Rs.	2,500
Total Revenue per month	Rs.	1,02,500
Total Revenue per annum (1,02,500 × 12)	Rs.	12,30,000

Computation of total cost

Staff details	*No.*	*Salary per month*	*Total cost*
		Rs.	Rs.
Librarian	1	10,000	10,000
Assistant Librarian	3	7,000	21,000
Clerk	1	4,000	4,000
Total Staff cost per month			35,000
Total Staff cost per year (35,000 × 12)			4,20,000
	No.	Cost per book	
Books maintenance cost	50,000	Rs. 10	5,00,000
Total maintenance cost per annum excluding cost of new books (4,20,000 + 5,00,000)			9,20,000
Cost incurred per library member per annum (Rs9,20,000/1,000)		Rs.	920
Cost incurred per member per month on the library excluding cost of new books (920/12)		Rs.	76.67
Cost incurred per club member per annum (9,20,000/5,000)		Rs.	184
Cost incurred per club member per month (184/12)		Rs.	15.33
Net income from the library per annum (12,30,000 – 9,20,000)		Rs.	3,10,000
Cost per new book		Rs.	300
Maximum number of new books per annum (3,10,000/300)			1033.333
Present number of books purchased			1200

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Excess books purchased (1200 – 1033.333)		166.6667
Subsidy being given per annum	Rs.	50,000
Subsidy per library member per annum (50,000/1,000)	Rs.	50
Subsidy per club member per annum (50,000/5,000)	Rs.	10

Comment: The club is exceeding its subsidy target to members by Rs. 45 (Rs. 50 – 5) per library member and Rs. 5 (Rs. 10 – 5) per club member.

Example 12.13

PQ Limited plans to start a lodging house at a tourist centre with a capacity of 32 single occupancy rooms. Cost per day per room have been estimated as under:

	Cost per day per room (Rs.)
(A) **When occupied:**	
(a) Electricity and utilities	4
(b) Linen, laundry and sanitary supplies	9
When unoccupied:	
(c) Dusting, sweeping and cleaning	2
	15

(B) Over and above these costs, the following expenses represent the estimate of fixed charges per annum that is 365 days)

Staff expenses	Rs. 3,20,000
Other office expenses	64,000
Taxes, insurance, maintenance and depreciation	42,320
	Rs. 4,26,320

PQ Limited defines 100% occupancy to mean all the 32 rooms to fetch revenue for all the 365 days. You are required to answer the following, using a planning period of one year:

(a) What should be the tariff per day per room in order to reach break-even at an occupancy level of 50%?

(b) What would be the profits, if the occupancy level reaches (a) 60%; (b) 70%; and (c) 80% respectively?

(c) What would be the profits, if the tariff per day is reduced by 10% from the answer in (a) above and the occupancy level is 100%?

(CA, Inter)

Solution:

(a) 100% occupancy = 32 × 365 days = 11,680 room-days
50% occupancy = 0.5 × 11,680 = 5,840 room-days
60% occupancy = 0.6 × 11,680 = 7,008 room-days
70% occupancy = 0.7 × 11,680 = 8,176 room-days
80% occupancy = 0.8 × 11,680 = 9,344 room-days

(i) Tariff to break-even at 50% occupancy level

Fixed cost	Rs. 4,26,320
Expenses when unoccupied Rs. 2 × 11,680	23,360
Expenses when occupied Rs. 13 × 5,840	75,920
	5,25,600

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Tariff per day to break-even: Rs. 5,25,600/5,840 = Rs. 90

(ii) Profit at various occupancy level

Contribution margin = (Rs. 90 – Rs. 13) = Rs. 77

Profit = (Man-days occupied – BEP man-days) × Contribution margin

Therefore,

Profit at 60% occupancy level = (7,008 – 5,840) × Rs. 77 = Rs. 89,936

Profit at 70% occupancy level = (8,176 – 5,840) × Rs. 77 = Rs. 1,79,872

Profit at 80% occupancy level = (9,344 – 5,840) × Rs. 77 = Rs. 2,69,808

(iii) Contribution margin at reduced tariff = (0.90 × Rs. 90 – 13) = Rs. 68

Profit at 100% occupancy level = Contribution – Fixed costs

= Rs. 11,680 × Re. 0.68 – Rs. 4,26,320 – Rs. 23,360 = Rs. 3,44,560

Example 12.14

A Mineral is transported from two mines—*A* and *B* and unloaded at plots in a Railway Station. Mine *A* is at a distance of 10 km and *B* is at a distance of 15 km from railhead plots. A fleet of lorries of 5 tonne carrying capacity is used for the transport of mineral from the mines. Records reveal that the lorries average a speed of 30 km per hour, when running and regularly take 10 minutes to unload at the railhead. At mine *A* loading time averages 30 minutes per load while at a mine *B* loading time averages 20 minutes per load.

Drivers' wages, depreciation, insurance and taxes are found to cost Rs. 9 per hour operated. Fuel, oil, tyres, repairs and maintenance cost Rs. 1.20 per km.

Draw up a statement, showing the cost per tonne-kilometer of carrying mineral from each mine.

(C.A. Inter Nov. 2000)

Solution:

Statement Showing the Cost per Tonne-kilometre of Carrying Mineral from Each Mine

	Mine A Rs.	*Mine B* Rs.
Fixed cost per trip: (Driver's wages, depreciation, insurance and taxes)		
A:1 hour 20 minutes @ Rs. 9 per hour	12	
B: 1 hour 30 minutes @ Rs. 9 per hour (Refer to Working note 1)		13.50
Running and maintenance cost: (Fuel, oil, tyres, repairs and maintenance)		
A: 20 km Rs. 1.20 per km.	24	
B: 30 km Rs. 1.20 per km		36.00
Total cost per trip	36	49.50
Cost per tonne-km (Refer to Working Note 2)	0.72 (Rs. 36/50 tonnes-km)	0.66 (Rs. 49.50/75 tonnes-km)

3. A transport service company is running five buses between two towns which are 50 km apart. Seating capacity of each bus is 50 passengers. The following particulars were obtained from their books for April, 1998:

	Rs.
Wage of drivers, conductors and cleaners	24,000
Salaries of office staff	10,000
Diesel oil and other oil	35,000
Repairs and maintenance	8,000
Taxation, insurance etc.	16,000
Depreciation	26,000
Interest and other expenses	20,000
	1,39,000

Actual passengers carried were 75 per cent of seating capacity. All buses ran on all days of the month. Each bus made one round trip per day.

Find out the cost per passenger km. *(C.A. Inter Nov. 1998)*

Ans: Cost per passenger km Re. 0.2471

4. Anami Transport Company has given a route 40 km long to run bus. The bus costs the company a sum of Rs. 1,00,000. It has been insured at 3% p.a and the annual tax will amount to Rs. 2,000. Garage rent is Rs. 200 p.m. Annual repairs will be Rs. 2,000 and the bus is likely to last for 5 years. The driver's salary will be Rs. 300 p.m. and the conductor's salary will be Rs. 200 p.m. in addition to 10% of takings as commission (to be shared by the driver and the conductor equally).

Cost of stationery will be Rs. 100 p.m. Manager-cum-Accountant's salary is Rs. 700 p.m.

Petrol and oil will be Rs. 50 per 100 km. The bus will make 3 up and down trips carrying, on an average, 40 passengers on each trip. Assuming 15% profit on takings, calculate the bus fare to be charged from each passenger. The bus will run on an average 25 days in a month. *(I.C.W.A Inter Dec 1998)*

Ans: Fare per passenger Rs. 1.50

5. Mr. *X* own bus which runs according to the following schedule:

(i) Delhi to Chandigarh and back, the same day.
Distance covered: 150 km one way
Number of days run each month: 8
Seating capacity occupied 90%

(ii) Delhi to Agra and back, the same day
Distance covered: 120 km one way
Number of days run each month: 10
Seating capacity occupied 85%

(iii) Delhi to Jaipur and back, the same day
Distance covered: 270 km one way
Number of days run each month: 6
Seating capacity occupied 100%

(iv) Following are the other details:

Cost of the bus	Rs. 6,00,000
Salary of the driver	Rs. 2,800 p.m.
Salary of the conductor	Rs. 2,200 p.m.
Salary of the part-time accountant	Rs. 200 p.m.
Insurance of the bus	Rs. 4,800 p.a.
Diesel consumption 4 km per litre at	Rs. 6 per litre
Road tax	Rs. 1,500 p.a.
Lubricant oil	Rs. 10 per 100 km
Permit fee	Rs. 315 p.m.

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Repairs and maintenance	Rs. 1,000 p.m.
Depreciations of the bus	@ 20% p.a.
Seating capacity of the bus	50 persons

Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 30% on total takings. The fares are to be indicated per passenger for the journeys:

(i) Delhi to Chandigarh
(ii) Delhi to Agra
(iii) Delhi to Jaipur

(CA, Inter)

Ans: Fare to be charged

(i)	Delhi to Chandigarh	Rs. 24
(ii)	Delhi to Agra	Rs. 19.20
(iii)	Delhi to Jaipur	Rs. 43.20

6. The Kangaroo Transport Ltd. operates a fleet of lorries. The records for lorry L-14 reveal the following information for September 2003:

Days maintained	30
Days operated	25
Days idle	5
Total hours operated	300
Total km covered	2,500
Total tonnage carried	200(4 tonne-load per trip, return journey empty)

The following further information is made available:

(a) Opening costs for the month: petrol Rs. 400, oil Rs. 170, grease Rs. 90, wages to driver Rs. 550, wages to khalasi Rs. 350.
(b) Maintenance costs for the month: Repairs Rs. 170, overhaul Rs. 60, tyres Rs. 150, garage charges Rs. 100.
(c) Fixed cost for the month based on the estimates for the year; insurance Rs. 50, licence, tax etc., Rs. 80, interest Rs. 40, other overhead Rs. 190.
(d) Capital costs: cost of acquisition Rs. 54,000; residual value at the end of 5 years life is Rs. 36,000.

Prepare a cost-sheet and performance statement showing:

(a) Cost per day maintained;
(b) Cost per day operated;
(c) Cost per kilometre;
(d) Cost per hour;
(e) Cost per commercial ton-km. *(ICWA, Inter)*

Ans: (a) Rs. 90 (b) Rs. 108 (c) Rs. 1.08 (d) Rs. 9.00 (e) Re. 0.54

7. A cement company transports its requirement of limestone from a quarry situated at a distance of 6 km from the factory. Presently, the company engages transport contractors for the purpose. The company has invited tenders from the local transport contractors and the lowest quotation received is Rs. 18 per tonne of limestone.
The management is concerned about the increasing cost of transport and has, therefore, under its consideration, a proposal for the purchase of a fleet of trucks for being used departmentally for the transport of limestone. You have been furnished with the following data to examine the feasibility of the proposal.

(i) The company has two options regarding purchase of a trucks, they are: (a) buy 10 tonne capacity trucks or (b) buy 8-tonne capacity trucks.

(ii) Operating cost data (Rs.)

	10-tonne capacity truck	*8-tonne capacity truck*
Purchase price of each truck (Rs.)	4,30,000	4,00,000
Life in years	5	5
Sale value at the end of 5th year of life (Rs.)	82,000	40,000
Kilometre per litre of diesel	3	4
Repair and maintenance per annum per truck (Rs.)	47,100	38,400
Road tax per quarter per truck (Rs.)	600	600
Miscellaneous fixed expenses per month (Rs.)	3,000	3,000
Oil and sundries per 100 km run (Rs.)	10	10

(iii) Each truck will make 5 trips (to and fro) on an average for 24 days per month.
(iv) Cost of diesel Rs. 10 per litre.
(v) Salary of drivers Rs. 1,600 per month, two extras drivers will be employed to work as relievers.
(vi) Other staff required: One machine @ Rs. 2,000 per month
One filter @ Rs. 1,600 per month
One supervisor @ Rs. 3,200 per month
(vii) The capacity of the cement plant is 24,000 ton per month of limestone crushed.

Required:

(i) Present a comparative cost sheet on the basis of the aforesaid data showing the transport cost per tonne of operating 10 tonne and 8 ton capacity trucks at full capacity utilisation of the cement plant for an average month classifying the expenses into
(a) varying with kilometre run
(b) varying with number of trucks and
(c) fixed and suggest the best alternative out of the three choices available mainly, selection from two capacity trucks and hiring of transportation.

(ii) Apart from cost analysis as in (i) above, what other factors may be considered by the management before accepting the proposal for purchase of trucks. *(ICWA, Inter)*

Ans: Cost per tonne.
10 tonne trucks Rs. 14.27
8 tonne trucks Rs. 15.90
The best alternative is to use 10 tonne capacity trucks

8. Elegant Hotel has a capacity of 100 single rooms and 20 double rooms. It has a sport centre with a swimming pool, which is also used by persons other than residents of the hotel. The hotel has a shopping area at the basement and restaurant at the roof top. The following information is available:

(i) Average occupancy: 75% for 365 days of the year
(ii) Current costs are:

	Variable cost Rs. per day	Fixed cost Rs. per day
Single room	400	200
Double rooms	500	250

(iii) Average sales per day of restaurant Rs. 1,00,000; contribution is at 30%. Fixed cost Rs. 10,00,000 per annum.
(iv) The sports centre swimming pool is likely to be used by 50 non-residents daily; average contribution per day non-resident is estimated at Rs. 50; fixed cost is Rs. 5,00,000 per annum.
(v) Average contribution per month from the shopping arcade is Rs. 50,000; fixed cost is Rs. 6,00,000 per annum.

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You are required to find out:

(a) Rent chargeable for single and double room per day, so that there is a margin of safety of 20 per cent on hire of rooms and that the rent for a double room should be kept at 120% of a single room.

(b) Evaluate the profitability of restaurant, sports centre and shopping area separately. *(CA, Final Year)*

Ans: (a) Rent per day for single room Rs. 756
Rent per day for double room Rs. 907
(b) Profit–Nil

9. Mr Harry is a travelling inspector for the Environment Protection Agency. He uses his own car and the agency reimburses him at Rs. 1.80 per kilometre. Mr Harry claims he needs to be paid Rs. 2.20 per kilometre just to break even. A scrutiny of his expenses by the agency reveals the following:

	Rs.
Oil charge every 4,800 km	120
Maintenance (other than oil) every 9,600 km	1,800
Yearly insurance (comprehensive with accident benefits)	4,000
Cost of car, with an average residual value of Rs. 60,000 and with a useful life of 3 years.	1,08,000

Petrol is Rs. 5 a litre and Harry gets 8 km per litre for his car. When Harry is on the road, he averages 192 kilometres a day. He works 5 days a week, has 10 days vacation in a year besides 6 holidays and spends 15 working days a month in the office.

You are required to determine:

(a) An equitable rate of reimbursement on the basis of the schedule he presently follows and (b) the number of kilometres a year he would have to travel, to break-even at the current rate of re-imbursement.

(ICWA Inter)

Ans: (a) Rs. 2.44 (b) 20,780 km

10. *SMC* is a public school having five buses each plying in different directions for the transportation of its students. In view of a large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the school. The workload of the students has been so arranged that in the morning the first trip picks up senior students and the second trip plying an hour later picks up the junior students.

Similarly, in the afternoon the first trip drops the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus one way is 8 km. The school works 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by students for all the 12 months in a year.

The details of expenses for a year are as under:

	Rs.	
Driver's salary	450	per month
Cleaner's salary	350	per month
(Salary payable for all 12 months)		
(One cleaner employed for all the five buses)		
Licence fee, taxes, etc.	860	per bus p.a.
Insurance	1,000	per bus p.a
Repairs and maintenance	3,500	per bus p.a
Purchase price of the bus	1,50,000	each
Life 12 years		
Scrap value	30,000	
Diesel cost	2.00	per litre

Each bus gives an average mileage of 4 km per litre of diesel.
Seating capacity of each bus is 50 students.
The seating capacity is fully occupied during the whole year.
Students picked up and dropped within a range of upto 4 km of distance from the school are charged half fare and 50% of the students travelling in each trip are in this category. Ignore interest. Since the charges are to be based on average cost you are required to:

(i) Prepare a statement showing the expenses of operating a single bus and a fleet of five buses for a year.
(ii) Work out the average cost per student per month in respect of:
  (a) Students coming from a distance of upto 4 km form the school, and
  (b) Students coming from a distance beyond 4 km from the school.

(CA Inter, B. Com. (Hons), Delhi, 1995)

Ans:

	per bus	fleet of 5 buses
Cost per month	Rs. 2,400	Rs. 12,000

11. A lodging home is being run in a small hill station with 50 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full-room rent is charged. The management's profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending 31st March, 1996 (assume a month to be of 30 days):

(a) Occupancy during the season is 80%, while in the off season is 40% only;
(b) Expenses:

	Rs.
(i) Staff Salary (excluding room attendants)	2,75,000
(ii) Repairs to Buildings	1,30,500
(iii) Laundry and Linen	40,000
(iv) Interior and Tapestry	87,500
(v) Sundry Expenses	95,400

(c) Annual depreciation is to be provided for buildings at 5% and on furniture and equipments at 15% on straight line basis:
(d) Room attendants are paid Rs. 5 per room day on the basis of occupancy of the rooms in a month;
(e) Monthly lighting charges are Rs. 120 per room, except in four months of winter when it is Rs. 30 per room and this cost is on the basis of full occupancy for a month; and
(f) Total investments in the home is Rs. 100 lakhs of which Rs. 80 lakhs relate to buildings and balance for furniture and equipments.

You are required to work out the room rent chargeable per day for both during the season and the off season months, on the basis of the foregoing information. *(I.C.W.A. Inter Dec. 1995)*

Ans: Room rent during season Rs. 197, during off season Rs. 98.50

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Working Notes:

	Mine *A*	Mine *B*
1. Total operating time taken per trip		
Running time to and fro	40 minutes $\left(20 \text{ km} \times \frac{60 \text{ minutes}}{30 \text{ km}}\right)$	60 minutes $\left(30 \text{ km} \times \frac{60 \text{ minutes}}{30 \text{ km}}\right)$
Unloading time	10 minutes	10 minutes
Loading time	30 minutes	20 minutes
Total operating time	80 minutes or 1 hour 20 minutes	90 minutes or 1 hour 30 minutes
2. Effective tonnes-km	50 (5 tonne × 10 km)	75 (5 tonnes × 15 km)

Example 12.15

(a) The Holiday Hotel has 40 bedrooms with a maximum occupancy of 490 sleeper nights per week. Average occupancy is 60% throughout the year. Meals provided to guests have been costed and the average food cost per person per day is as follows:

	Rs.
Breakfast	3.60
Lunch	11.00
Dinner	13.40

Direct wages and staff meals per week are as under:

Restaurants and kitchens	3,430
Housekeeping	1,952
General	1,760

Direct expenses per annum are Rs. 45,760 for housekeeping and Rs. 52,000 for the restaurant.

Indirect expenses amount to Rs. 3,41,120, which should be based on floor area occupied by various cost centres. The floor areas are:

	sq. m
Bedrooms	3,600
Restaurant	1,200
Service area	600

A net profit of 10% each must be made on the restaurant takings and accommodation takings. You are required to calculate what inclusive terms per person should be charged per day. Show the split between meals and accommodation charges.

(b) There is also a proposal to take on hire an adjoining building available and covert it into a pastry shop. The annual cost estimates are:

	Rs.
Rates and taxes	12,000
Wages	54,000
Replacement of utensils	2,400
Depreciation of fixed assets	3,600
Fuel cost	10% of the cost of pastries

Sales are expected to average at Rs. 1,50,000 per annum. The monthly figures vary according to seasons. Prices shown on the tags are arrived at by marking up the costs by 150%. Calculate the estimated annual profit. Also draw an estimate of cost and profit for the month when the sales are expected to be Rs. 15,000.

(ICWA, Inter)

Solution:

(a)

1. Cost sheet: estimated cost per week

Particulars	*Basis*	*Cost per week (Rs.)*		
		Total	*Meal*	*Accommodation*
Food:	Allocated			
Breakfast 294 × Rs. 3.60		1,058.40	1,058.40	–
Lunch 294 × Rs. 11.00		3,234.00	3,234.00	–
Dinner 294 × Rs. 13.40		3,939.60	3,939.60	–
Sub-total		8,232.00	8,232.00	–
Direct wages: restaurant and kitchen	Allocated	3,430.00	3,430.00	–
House keeping	Allocated	1,952.00	–	1,952.00
General	Apportioned—direct wages 3430 : 1952	1,760.00	1,121.66	638.34
Sub-total		7,142.00	4,155.66	2,590.34
Direct expenses:	Allocated			
Restaurant 52,000/52		1,000.00	1,000.00	
Housekeeping 45,760/52		880.00	–	880.00
Sub-total		1,880.00	1,000.00	880.00
Indirect expenses: 3,41,120/52	Apportioned floor area 1,800 : 3,600	6,560.00	2,186.67	4,373.33
Total cost		23,814.00	15,970.33	7,843.67
Profit 10% of sales price or 1/9th of cost		2.646.00	1,774.48	871.52
Sales value		26,460	17,744.81	8,715.19

Tariff: Rate per sleeper night:	
Meal: Rs. 17,744.81/294	Rs. 60.36
Accommodation: Rs. 8,715.19/294	Rs. 29.74
	Rs. 90.00

Notes:

1. Normal capacity: 50% of 490, that is 294 sleeper nights per week.
   (a) Floor area of restaurant should include service area. Thus, total floor area for restaurant is (1,200 + 600) that is, 1,800 sq. m.
   (b) Estimated profit if adjoining building is taken on hire for pastry shop. Mark-up is 150% of cost. Therefore, selling price is 2.5 times of cost. Cost of pastry when sales value is Rs. 1,50,000 : Rs. 1,50,000/2.5 = Rs. 60,000.

2. Cost sheet: costs per annum

	Rs.
Cost of pastry:	60,000
Fuel cost (10% of the cost of pastry)	6,000
Wages	54,000

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Rent and rates		12,000
Replacement of utensils		2,400
Depreciation of fixed assets		3,600
		1,38,000
Profit (balancing Figure)		12,000
Sales value		1,50,000

3. Estimated cost and profit for one month

(a) Expected sales		Rs. 15,000
(b) Variable costs:		
Cost of pastry Rs. 15,000/2.5	Rs. 6,000	
Fuel cost (10% of cost of pastry)	600	
Wages (Rs. 54,000/1,50,000) × 15,000	5,400	(12,000)
(b) Period costs:		
Rent and taxes Rs. 12,000/12	1,000	
Replacement of utensils Rs. 2,400/12	200	
Depreciation 3,600/12	300	(1,500)
Profit		Rs. 1,500

Notes:

Cost per unit should always be normal cost. Therefore, tariff rates are calculated on the basis of normal occupancy and not on the basis of maximum occupancy.

THEORY QUESTIONS

1. What do you understand by operating costing? In what industries is this costing applied?
2. Write notes on (i) Transport-costing (ii) Power house costing and (iii) Canteen costing.
3. Distinguish between operating costing and operation costing.

(B.Com. (Hons) Delhi, 2006)

PROBLEMS

1. A Truck starts with a load of 10 tonnes of goods from station *P*. It unloads 4 tonnes at station *Q* and rest of the goods at station *R*. It reaches back directly to station *P* after getting reloaded with 8 tonnes of goods at station *R*. The distances between *P* to *Q*, *Q* to *R* and then from *R* to *P* are 40 km, 60 km and 80 km respectively. Compute Absolute tonne-km and commercial tonne-km. *(B. Com. (Hons), Delhi 1998)*

   Ans: Absolute tonne-km 1,400
   Commercial tonne-km 1,440

2. A transport company maintains a fleet of lorries for carrying goods from Delhi to Panipat, 100 km off. Each lorry, which operates 25 days on an average in a month, starts every day from Delhi with a load of 4 tonne and returens from Panipat with a load of 2 tonnes. Calculate the total commercial tonne-km and cost per commercial tonne-km when the total monthly charges for a lorry are Rs. 27,000. What rate per tonne should the company charge if it plans to earn a gross profit of 20% on the freightage? *(B. Com. Hons, Delhi 2000)*

   Ans: Rate per tonne-km Rs. 2.25

COST CONTROL ACCOUNTS

13

Learning Objectives

After reading this chapter, you should be able to:

1. explain non integrated system;
2. describe the procedure of accounting for cost items, and
3. discuss different journal entries for various transactions in cost control accounts.

NON-INTEGRATED SYSTEM

In cost accounting the cost books are basically maintained under the following two systems:

1. Non-integral or non-integrated cost accounting.
2. Integral or integrated cost accounting.

The system is called non-integral when cost and financial transactions are kept separately. On the contrary, when cost and financial transactions are integrated, the accounting system is known as integrated or integral. Under the system of non-integral accounting, separate ledgers are maintained for cost and financial transaction. The financial accountants look after financial transactions and the cost accountants are responsible for cost accounting transactions. The financial accounting department maintains the following financial ledgers:

1. *General ledger* It contains all real, nominal and personal accounts except trade debtors and creditors account.
2. *Debtors ledger* It has personal accounts of trade debtors.
3. *Creditors ledger* It has personal accounts of trade creditors.

The cost accounting department maintains the following cost ledgers:

1. *Stores ledger* This ledger contains all stores accounts.
2. *Work-in-progress ledger* All costs of material, wages and overhead for each job or manufacturing in progress are posted to the respective job accounts in this ledger.
3. *Finished goods/stock ledger* This ledger records details of finished goods and jobs.
4. *Cost ledger* This is main ledger and records impersonal accounts, that is, accounts relating to income and expenditure. The following accounts are maintained in cost ledger.

(i) Cost Control Accounts—These accounts are maintained to exercise control over the three subsidiary ledgers discussed above and also to complete double entry in cost accounts. They summarise all detailed information contained in the subsidiary ledgers and also help in reconciliation of cost and financial accounts.

The impbortant cost control accounts are as follows:

(a) Stores ledger control account—The purpose of stores ledger is to maintain item-wise record of raw materials and other stores. In cost ledger, a Stores Ledger Control Account is prepared relating to this subsidiary ledger. The total materials received in stores (which can be found in Purchases Journal also) is shown on the debit side of Stores Ledger Control Account and the total materials issued out of Stores (which can be found in Materials Abstract) is credited in the Account. The balance of this account shall talley with the total of the balances of the individual stores account in the Stores Ledger. Sometimes separate ledgers are kept for raw materials and other stores. In that case, there will be two separate control account namely Materials Ledger Control Account and Stores Ledger Control Account.

(b) Work-in-progress ledger control account—For every job, product or process, materials, labour and factory expenses are incurred. All such costs are debited in different accounts relating to different jobs or products. These accounts are kept in a job or work-in-progress ledger. A Work-in-progress Ledger Control Account is prepared in the Cost Ledger. The cost of production of completed jobs will be credited to this account and the total expenses incurred on all the jobs will be debited so as to show the total work-in-progress at any time. The balance of this account must be equal to the total of individual balances of Job or Process accounts in the Job Ledger. The Work-in-progress Ledger Control account is referred to as Work-in-progress Account also.

(c) Finished goods ledger control account—In Finished Goods Ledger, a separate account is opened for recording the quantity and price of each finished product manufactured or job completed. In Cost Ledger, a Finished Goods Ledger Control Account is maintained. It is also known as Stock Ledger Control Account. It gives the total value of finished goods in stock at a particular time.

(d) General ledger adjustment account—In Cost Ledger a General Ledger Adjustment Account is opened to record all items of income and expenditure. This account is also referred to as Cost Ledger Control Account (in costing books). Personal Accounts are shown in financial accounts and not in cost accounts. The General Ledger Adjustment Account completes the double entry in the cost ledger and hence all such accounts which pertain to fixed assets or cash or outsiders are posted to this account. All expenditures are shown on the credit side of this account; and the result (benefits) of such expenditure in the form of sale is shown on the debit side of this account. The balance represents the value of stores, stock-in-hand and the amount of work-in-progress.

Cost Ledger Control Account (in financial books)—Since the Costing Department does not act in isolation from the Financial Department and all the purchases and sales are recorded through financial books, a Cost Ledger Control Account must be opened in the financial books. This is only a memorandum account. In this account all the items of revenue and expenditure affecting Cost Accounts are recorded. This account is just the reverse or contrast of the General Ledger Adjustment Account in the Cost Ledger and, therefore, the balance of this account should tally with the balance of its counterpart in the Cost Ledger.

(ii) Other Accounts—They include all other impersonal accounts (real as well as nominal) which effect costs, for example, wages control account, factory overhead account, administration overhead account, selling and distribution overhead account, cost of sales account, etc. Sometimes, following additional accounts are also opened:

(a) Overheads suspense account—Sometimes, while valuing semi-finished jobs, factory overheads are not included. Similarly while valuing closing stock of finished goods, office and

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administrative overheads are not included. In such cases normally, at the end of an accounting period, the estimated amount of such overheads is debited to Works or Office Overheads Suspense Account and credited to Works or Office Overheads Account, as the case may be. In the beginning of next accounting period, the entries are reversed to close the suspense accounts.

(b) Capital orders—For each item of capital nature work to be performed in the factory itself, for example, producing tools and equipments, certain expenditures shall be incurred in the form of materials, wages and other expenses. Such expenditures should be recorded in Capital Order Account and later on capitalised.

(c) Service orders—If repairs and maintenance work is done in the factory, the cost is debited to Repairs and Maintenance Account and later transferred to various overheads account, because the expenditure might have been incurred on production, administration and selling and distribution departments.

No separate account is maintained for direct expenses since they are directly charged to work-in-progress account.

When the finished goods are sold, they are transferred to Cost of Sales Account. In the last, a Costing Profit and Loss Account can be prepared with the help of all the above accounts.

ACCOUNTING FOR COST ITEMS

Materials

Some transactions relating to materials, such as purchase of materials and purchase returns influence both financial and cost ledgers. Some transactions namely, issues of materials from stores, transfer of materials from one job to another, return of excess material to stores, influence cost ledgers only.

Labour Cost

All wages are recorded in the cost accounting books through the wages control account and the general ledger adjustment account.

Overhead

The overhead—production, administration and selling and distribution—are absorbed to products or jobs on some equitable basis. Production overhead is absorbed on the basis of direct materials cost, direct labour cost or labour hours or machine hours or rate per unit. The production overhead account is credited with the amount of overhead absorbed and the work-in-progress account is debited. The administration overhead account is credited and the finished goods account is debited to recover administrative overhead for the production. Alternatively, administrative overhead is directly transferred to the profit and loss account and is not charged to production. Similarly, selling and distribution overhead may be charged to production by crediting selling and distribution overhead and debiting the cost of sales account.

The amount of under-absorption and over-absorption is transferred to the costing profit and loss account. Alternatively, it may be carried forward to the next accounting period.

JOURNAL ENTRIES

The use of double entry system in costing records will help in the preparation of trial balance for the costing transactions. The entries for various transactions which can be made with the help of control accounts are mentioned below:

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(1) Receipts of materials into stores (cash and credit purchases)
In Cost books
Cost Ledger: Stores Ledger Control Account Dr.
To General Ledger Adjustment A/c
Stores Ledger: Individual stores accounts shall be debited.
In Financial Books
For credit purchases:
Purchases A/c Dr.
Cost Ledger Control A/c (memorandum)
To Creditors A/c
For cash purchases:
Purchases A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash A/c

(2) Returns to suppliers
In Cost Books
Cost Ledger: General Ledger Adjustment A/c Dr.
To Stores Ledger Control A/c
Stores Ledger: Individual Stores accounts shall be credited.
In Financial Books
Creditors A/c Dr.
To Purchase Returns A/c
To Cost Ledger Control A/c (memorandum)

(3) Receipt of materials for direct issue
In Cost Books
Cost Ledger: Work-in-progress Ledger Control A/c Dr.
To General Ledger Adjustment A/c
Job Ledger: Debit individual jobs for which materials have been received.
In Financial Books
Purchase A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash or Suppliers A/c

(4) Wages/salaries paid
In Cost Books Dr.
Cost Ledger: Wages Control A/c
To General Ledger adjustment A/c
In financial Books
Wages/Salaries A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash

(5) For payment of works, office and selling and distribution expenses
In Cost Books
Cost ledger:
Works Overheads A/c Dr.
Office Overheads A/c Dr.
Selling & Distribution Overheads A/c Dr.
To General Ledger Adjustment A/c

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Overheads Ledger: Individual expenses accounts (if maintained) to be debited.

In Financial Books:

Expenses A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash

The following entries are made in cost books only and the financial account shall not be affected. The entries are merely for the transactions or transfers in Cost Ledger.

(6) For issue of direct material

In Cost Ledger:

Work-in-progress Ledger Control A/c Dr.
To Stores Ledger Control A/c
(Total as per materials abstract)

In Job and Stores Ledgers: Individual jobs for which materials have been received shall be debited and individual stores accounts in stores ledger shall be credited.

(7) For issue of indirect materials charging of indirect wages

In Cost Ledger: Dr.
Works/Office/Selling and Distribution Overheads A/c
To Stores Ledger Control A/c/Wages Control A/c

In Stores Ledger: Credit the individual Stores Accounts.

(8) For returns of materials from production to stores

In Cost Ledger: Dr.
Stores Ledger Control A/c
To Work-in-progress Ledger Control A/c

In Stores Ledger: Debit individual stores accounts.

In Job Ledger: Credit individual job accounts.

(9) Allocation of direct wages to production

In Cost ledger: Dr.
Work-in-progress Ledger Control A/c
To Wages Control A/c
(As per wages abstract)

In Job Ledger: Individual job accounts will be debited.

(10) Materials transferred from job No. 1 to job No. 2

In Job or Work-in-progress Ledger:

Job No. 2 A/c Dr.
To Job No. 1 A/c

(No entry is required in Work-in-progress Control A/c or Stores Ledger Control A/c)

(11) Allocation of overheads to jobs

(a) Works Overheads:

In Cost Ledger:

Work-in-progress Ledger Control A/c Dr.
To Works Overheads A/c

In Job Ledger:

Individual Job accounts to be debited.

(b) Office overheads:

In Cost ledger:

Finished Goods Ledger Control A/c

To Office Overheads A/c Dr.
In Finished Goods Ledger:
Individual Job/product accounts to be debited.

(12) For normal wastage of stores and normal idle time wages
In Cost Ledger:
Work Overheads A/c Dr.
To Stores Ledger Control A/c
To Wages Control A/c
In Overheads Ledger: Individual expense accounts (if maintained) to be debited.
In Stores Ledger: Individual stores accounts to be credited.

(13) For abnormal loss of material and abnormal idle time
In Cost Ledger:
Costing Profit and Loss A/c Dr.
To Stores Ledger Control A/c
To Wages Control A/c
In stores Ledger: Individual stores accounts to be credited.

(14) For cost of production of finished artcles
In Cost Ledger:
Finished Goods Ledger Control A/c Dr.
To Work-in-progress Ledger Control A/c
In Finished Goods Ledger: Individual product accounts to be debited.
In Job Ledger: Individual job accounts to be credited.

(15) For cost of goods sold
In Cost Ledger:
Cost of Sales A/c Dr.
To Finished Goods Ledger Control A/c
In Finished Goods Ledger: Credit individual product accounts.
Following entries shall be made only in the Cost Ledger:

(16) For allocation of selling and distribution overheads
Cost of Sales A/c Dr.
To Selling Overheads A/c

(17) For sales
General Ledger Adjustment A/c Dr.
To Cost of Sales A/c

(18) For overhead on incomplete jobs
Works Overheads Suspense A/c Dr.
Office Overheads Suspense A/c Dr.
To Works Overheads A/c
To Office Overheads A/c.
(or alternatively the balances of works or office overheads may be carried forward)

(19) For transfer of profit
Cost of Sales A/c Dr.
To Costing Profit & Loss A/c

(20) For over-charge of overheads (say, office)
Office Overheads A/c Dr.
To Costing Profit and Loss A/c
(or alternatively, the balance may be carried forward)

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However, if it is desired to charge a supplementary rate (negative), the following entry will be passed:
Office Overheads A/c
To Finished Goods Ledger Control A/c
To Cost of Sales A/c
(the two accounts will be credited in proportion to the value of finished goods in hand and cost of goods sold)

(21) For under-charge of overheads (say, works)
Costing Profit and Loss A/c Dr.
To Works Overheads A/c
(or alternatively the balance may be carried forward or treated as in case of Entry 20)

(22) For transfer of net profit
Costing Profit and Loss A/c
To General Ledger Adjustment A/c Dr.

Example 13.1

Pass journal entries in the cost books (non-integrated system) for the following transactions:

(i) Materials worth Rs. 25,000 returned to stores from job.

(ii) Gross total wages paid Rs. 48,000. Employer's contribution to PF and State Insurance amount to Rs. 2,000. Wages analysis book detailed Rs. 20,000 direct labour, Rs. 12,000 towards indirect factory labour, Rs. 10,000 towards salaries to office staff and Rs. 8,000 for salaries to selling and distribution staff. *(B.Com. (Hons Delhi) 1999)*

Solution:

Journal Entries

Particulars		*Dr.* Rs.	*Cr.* Rs.
(i) Stores Ledger Control A/c	Dr.	25,000	
To WIP, Control A/c			25,000
(Being material returned from stores)			
(ii) Wages Control A/c	Dr.	50,000	
To General Ledger and Adjustment A/c			48,000
To Provident Fund and Employees' State Insurance Account			2,000
(Being gross total wages paid)			
Work-in-Progress Control A/c	Dr.	20,000	
Factory Overheads Control A/c	Dr.	12,000	
Office Overheads Control A/c	Dr.	10,000	
Selling Overheads Control A/c	Dr.	8,000	
To Wages Control A/c			50,000
(Being wages allocated)			

Example 13.2

During the physical verification of stores of *X* Ltd. it was found that 100 units of raw material 'Wye' returned to the supplier has not been recorded. Its purchase invoice price is Rs. 5 per unit while the current standard cost is Rs. 4.80 per unit. Pass necessary journal entry to record the adjustment in the cost ledger of *X* Ltd. *(CA Inter Nov. 1997)*

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Solution:

		Dr. Rs.	*Cr.* Rs.
General Ledger adjustment A/c	Dr.	500	
To Stores Ledger Control A/c			480
To Material Price Variance A/c			20
(Being recording of materials returned to supplier, earlier ignored)			

Example 13.3

Pass journal entries in the cost books, maintained on non-integrated system, for the following:

(i)	Issue of materials:	Direct Rs. 5,50,000; Indirect Rs. 1,50,000
(ii)	Allocation of wages:	Direct Rs. 2,00,000; Indirect Rs. 40,000
(iii)	Under/Over absorbed overheads:	Factory (over) Rs. 20,000; Administration (under) Rs. 10,000

(CA Inter Nov. 2000)

Solution:

Journal Entries in Cost Books maintained on non-integrated system

			Rs.	*Rs.*
(i)	Work-in-Progress Ledger Control A/c	Dr.	5,50,000	
	Factory Overhead Control A/c	Dr.	1,50,000	
	To Stores Ledger Control A/c			7,00,000
	(Being issue of materials)			
(ii)	Work-in-Progress Ledger Control A/c	Dr.	2,00,000	
	Factory Overhead Control A/c	Dr.	40,000	
	To Wages Control A/c			2,40,000
	(Being allocation of wages and salaries)			
(iii)	Factory Overhead Control A/c	Dr.	20,000	
	To Costing Profit & Loss A/c			20,000
	(Being transfer of over absorption of overhead)			
	Costing Profit & Loss A/c	Dr.	10,000	
	To Administration overhead Control A/c			10,000
	(Being transfer of under absorption of overhead)			

Example 13.4

The Profit and Loss account as shown in the financial books of a company for the year ended, 30.9.2007 together with a statement of reconciliation between the profit as per financial and cost accounts is given below:

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Profit & Loss Account for the Year Ended 30.9.2007

	Rs.	Rs.		Rs.	Rs.
Opening stock:			Sales		15,00,000
Raw material	90,000		Closing stock:		
Work-in-progress	50,000		Raw material	98,000	
Finished goods	70,000	2,10,000	Work-in-progress	53,000	
Raw material purchases		5,00,000	Finished goods	72,000	
Direct wages		2,00,000			2,23,000
Factory overheads		2,00,000	Miscellaneous Receipts		45,000
Administration expenses		1,70,000			
Selling and distribution expenses		2,20,000			
Preliminary expenses written off		75,000			
Debenture interest		30,000			
Net profit		1,63,000			
		17,68,000			17,68,000

Statement of Reconciliation of Profit as per Financial and Cost Accounts

		Rs.	Rs.
	Profit as per financial accounts		
(a)	Difference in valuation of stock		1,63,000
	Add: Raw materials-closing stock	1,200	
	Work in progress-opening stock	1,300	
	Finished goods-opening stock	2,000	
	Closing stock	1,000	
	Total (A)	5,500	
	Less: Raw materials-opening stock	1,650	
	Work in progress-closing stock	750	
	Total (B)	2,400	
	(A)–(B)		3,100
(b)	Other items		
	Add: Preliminary expenses written off	75,000	
	Debenture interest	30,000	
		1,05,000	
	Less: Miscellaneous receipts	45,000	60,000
	Profit as per Cost Accounts		2,26,100

You are required to prepare the following accounts as they would appear in the Costing Ledger:

(i) Raw Material Control A/c
(ii) Work-in-Progress Control A/c
(iii) Finished Goods Control A/c
(iv) Cost of Sales A/c
(v) Costing Profit & Loss A/c *(ICWA Inter)*

Solution:

Basic Calculations
Computation of Items as per Cost Accounts

Particulars	*As per financial accounts Rs.*	*Valuation difference Rs.*	*As per cost accounts Rs.*
Raw Materials			
Opening stock	90,000	+ 1,650	91,650
Closing stock	98,000	+ 1,200	99,200
Work-in-progress			
Opening stock	50,000	– 1,300	48,700
Closing stock	53,000	– 750	52,250
Finished Goods			
Opening stock	70,000	– 2,000	68,000
Closing stock	72,000	+ 1,000	73,000

Raw Material Control Account

To Balance b/d	91,650	WIP Control A/c	4,92,450
To G.L. Adj. A/c	5,00,000	(balancing figure)	
		By Balance c/d	99,200
	5,91,650		5,91,650

WIP Control Account

To Balance b/d	48,700	By Finished goods control A/c	8,88,900
To Raw material control A/c	4,92,450	(balancing figure)	
To Wages control A/c	2,00,000		
To Factory overhead control A/c	2,00,000	By Balance c/d	52,250
	9,41,150		9,41,150

Finished Good Control Account

	Rs.		Rs.
To Balance b/d	68,000	By Cost of Sales A/c	10,53,900
To WIP control A/c	8,88,900	(balancing figure)	
To Admn. overheads control A/c	1,70,000	By Balance c/d	73,000
	11,26,900		11,26,900

Cost of Sales Account

	Rs.		Rs.
To Finished good control A/c	10,53,990	By General ledger adjustment A/c	15,00,000
To Selling and distribution control A/c	2,20,000		
To Profit taken to costing P & L A/c	2,26,100		
	15,00,000		15,00,000

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Costing Profit & Loss Account

	Rs.		Rs.
To Balance transferred to general ledger adjustment A/c	2,26,100	By Cost of sales A/c	2,26,100
	2,26,100		2,26,100

Example 13.5

The following balance were extracted from a company's ledger as on 31st December, 1997:

	Rs.	Rs.
Raw materials control A/c	48,836	
Work-in-progress control A/c	14,745	
Finished stock control A/c	21,980	
Nominal ledger control A/c		85,561
	85,561	85,561

Further transactions took place during the following quarter as follows:

	Rs
Factory overhead—allocated to WIP	11,786
Goods finished—at cost	36,834
Raw materials purchased	22,422
Direct wages—allocated to WIP	18,370
Cost of goods sold	42,000
Raw materials—issued to production	17,000
Raw materials—credited by suppliers	1,000
Inventory audit—raw material losses	1,300
WIP rejected (with no scrap value)	1,800
Customer's returns (at cost) of finished goods	3,000

Prepare all the Ledger Accounts in Cost Ledger. *(C.A. Inter Nov. 1998)*

Solution:

Dr. Raw Materials Control Account Cr.

Particulars	*Amount Rs.*	*Particulars*	*Amount Rs*
To Balance b/d	48,836	By WIP control A/c	17,000
To Nominal Leger Control A/c	22,422	By Nominal Ledger Control A/c	1,000
		By Nominal Ledger Control A/c	1,300
		By Balance c/d	51,958
	71,258		71,258

Dr. Work-in-Progress Control Account Cr.

Particulars	*Amount Rs.*	*Particulars*	*Amount Rs.*
To Balance b/d	14,745	By Finished Stock Control A/c	36,834
To Nominal Ledger Control A/c	11,786	By Nominal Ledger Control A/c	1,800
To Raw Material Control A/c	17,000	By Balance c/d	23,267
To Nominal Ledger Control A/c	18,370		
	61,901		61,901

Dr. **Finished Stock Control Account** **Cr.**

Particulars	*Amount Rs.*	*Particulars*	*Amount Rs.*
To Balance b/d	21,980	By Nominal Ledger Control A/c	42,000
To WIP Control A/c	36,834	By Balance c/d	19,814
To Nominal Ledger Control A/c	3,000		
	61,814		61,814

Dr. **Nominal Ledger Control Account** **Cr.**

Particulars	*Amount Rs.*	*Particulars*	*Amount Rs.*
To Raw Material Control A/c	1,000	By Balance b/d	85,561
To Raw Material Control A/c	1,300	By Raw Material Control A/c	22,422
To Finished Stock Control A/c	42,000	By WIP Control A/c	11,786
To WIP Control A/c	1,800	By WIP Control A/c	18,370
To Balance c/d	95,039	By Finished Stock Control A/c	3,000
	1,41,139		1,41,139

Example 13.6

A company operates on historic job cost accounting system, which is not integrated with the financial accounts. At the beginning of a month, the operating balances in cost ledger were:

Particulars			*Rs. (in lakhs)*
Stores Ledger Control Account			80
Work-in-Progress Control Account			20
Finished Goods Control Account			430
Building Construction Account			10
Cost Ledger Control Account			540
During the month, the following transactions took place:			
Materials	—	Purchased	40
		Issued to production	50
		Issued to general maintenance	6
		Issued to building construction	4
Wages	—	Gross wages paid	150
		Indirect wages	40
		For building construction	10
Work Overheads	—	Actual amount incurred (excluding items shown above)	160
		Absorbed in building construction	20
		Under absorbed	8
Royalty paid			5
Selling Distribution and Administration Overheads			25
Sales			450

At the end of the month, the stock of raw material and work-in-progress was Rs. 55 lakhs and Rs. 25 lakhs respectively. The loss arising in the raw material account is treated as factory overheads. The building under construction was completed during the month. Company's gross profit margin is 20% on sales.

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Prepare the relevant control accounts to record the above transactions in the cost ledger of the company.
(C.A. Inter May 1996)

Solution:

Cost Ledger Control Account *(Rs. in Lakhs)*

Particulars	*Rs.*	*Particulars*	*Rs.*
To Costing P & L A/c	450	By Balance b/d	540
To Building Construction A/c	44	By Stores Ledger Control A/c	40
To Balance c/d	483	By Wages Control A/c	150
		By Works Overhead Control A/c	160
		By Royalty A/c	5
		By Selling, Distribution and Administration Overheads A/c	25
		By Costing Profit & Loss A/c	57
	977		977

Stores Ledger Control Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	80	By WIP Control A/c	50
To Cost Ledger Control A/c	40	By Works Overhead Control A/c	6
		By Building Const. A/c	4
		By Works Overhead Control A/c (Loss)	5
		By Balance c/d	55
	120		120

Work-in-Progress Control Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	20	By Finished Goods Control A/c	333
To Stores Ledger Control A/c	50	By Balance c/d	25
To Wages Control A/c	100		
To Works Overhead Control A/c	183		
To Royalty A/c	5		
	358		358

Finished Goods Control Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	430	By Cost of Goods sold A/c (*See Working Note*)	360
To WIP Control A/c	333	By Balance c/d	403
	763		763

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Cost of Sales Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cost of Goods Sold A/c	360	By Costing P/L A/c	385
To Selling, Distribution and Administration Overheads A/c	25		
	385		385

Costing P & L Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cost of Sales A/c	385	By Cost Ledger Control A/c	450
To Works Overhead Control A/c	8		
To Cost Ledger Control A/c (Profit)	57		
	450		450

Building Construction Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	10	By Cost Ledger Control A/c	44
To Stores Ledger Control A/c	4		
To Wages Control A/c	10		
To Works Overhead Control A/c	20		
	44		44

Works Overhead Control Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Stores Ledger Control A/c	6	By Building Construction A/c	20
To Wages Control A/c	40	By WIP Control A/c	183
To Cost Ledger Control A/c	160	By Costing P & L A/c	8
To Stores Ledger Control A/c (Loss)	5		
	211		211

Wages Control Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cost Ledger Control A/c	150	By Works Overhead Control A/c	40
		By Building Const. A/c	10
		By WIP Control A/c	100
	150		150

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Royalty Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cost Ledger Control A/c	5	By WIP Control A/c	5
	5		5

Cost of Goods Sold Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Finished Goods Control A/c	360	By Cost of Sales A/c	360
	360		360

Selling, Distribution and Administration Overheads Account

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cost Ledger Control A/c	25	By Cost of Sales A/c	25
	25		25

Trial Balance

(Rs.in lakhs)

Particulars	*Dr.*	*C r.*
Stores Ledger Control Account	55	
WIP Control Account	25	
Finished Goods Control Account	403	
Cost Ledger Control Account		483
	483	483

Working Note:

If Selling Price is Rs.100, Cost price is = Rs. 80

If Selling Price is Rs. 450, cost price will be = Rs. $\frac{80}{100} \times$ Rs. 450 = Rs. 360 lakhs

Example 13.7

A fire destroyed some accounting records of a company. You have been able to collect the following from the spoilt papers/records and as a result of consultation with accounting staff in respect of January, 1997;

(i) *Incomplete Ledger Entries:*

Raw-Materials Account

	Rs.		Rs.
Beginning Inventory	32,000		

Work-in-Progress Account

	Rs.		Rs.
Beginning Inventory	9,200	Finished Stock	1,51,000

Creditors Account

	Rs.		Rs.
Closing Balance	19,200	Opening Balance	16,400

Manufacturing Overheads Account

	Rs.		Rs.
Amount Spent	29,600		

Finished Goods Account

	Rs.		Rs.
Opening Inventory	24,000	Closing Inventory	30,000

(ii) *Additional Information:*

(1) The Cash-book showed that Rs. 89,200 have been paid to creditors for raw-material.

(2) Ending inventory of work-in-progress included material Rs. 5,000 on which 300 direct labour hours have been booked against wages and overheads.

(3) The job card showed that workers have worked for 7,000 hours. The wage rate is Rs. 10 per labour hour.

(4) Overhead recovery rate was Rs. 4 per direct labour hour.

You are required to complete the above accounts in the cost ledger of the company.

(C.A. Inter May 1997)

Solution:

Dr. Creditors Account Cr.

Particulars	*Rs.*	*Particulars*	*Rs.*
To Cash and Bank (1)	89,200	By Balance b/d	16,400
To Balacne c/d	19,200	By Purchases (Balancing figure)	92,000
	1,08,400		1,08,400

Dr. Work-in-Progress Account Cr.

Particulars	*Rs.*	*Particulars*		*Rs.*
To Balance b/d	9,200	By Finished stock		1,51,000
To Raw-materials (Balancing figure)	53,000	By Balance c/d: Material (2):	Rs. 5,000	
To Wages (3) (7,000 hrs. × Rs.10)	70,000	Labour (2): (300 hrs. × 10 hrs)	Rs. 3,000	
To Overheads (4)		Overheads (2):	Rs. 1,200	9,200
(7,000 hrs. × Rs. 4)	28,000	(300 hrs. × 4 hrs.)		
	1,60,200			1,60,200

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Dr. Raw-materials Account Cr.

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	32,000	By Work-in-progress	53,000
To Purchases (as above)	92,000	(As above)	
		By Balance c/d	71,000
	1,24,000		1,24,000

Dr. Finished Goods Account Cr.

Particulars	*Rs.*	*Particulars*	*Rs.*
To Balance b/d	24,000	By Cost of Sales	1,45,000
To WIP (as above)	1,51,000	(Balancing figure)	
		By Balance c/d	30,000
	1,75,000		1,75,000

Dr. Manufacturing Overheads A/c Cr.

Particulars	*Rs.*	*Particulars*	*Rs.*
To Sundries	29,600	By WIP (7,000 × Rs.4)	28,000
		By Under-absorbed Overheads A/c	1,600
	29,600		29,600

Example 13.8

How will you transact the following in the material account and the stores ledger?

(a) Material ledger shows 120 units at an average cost of Rs. 10 white the physical count is 110 units, difference due to non-recording of a material requisition note.

(b) Physical units show 200 white the ledger balance shows a shortage due to non-receipt of an invoice for 20 units for a total cost of Rs. 100.

(c) Ledger balance indicates an excess of 50 units over the physical balance effected by atmospheric changes which are normal. The issue rate is Rs. 3.00 per unit.

(d) Physical balance shows a shortage, compared to the ledger balance of 10 units traced to having an effect of excess issue of material to production job. The issue price is Rs. 2.50 per unit.

(ICWA, Inter)

Solution:

(a) The material-requisition note will be recorded in the issue column of the particular material A/c in the stores ledger. The following will be the entry in the cost ledger:

Work-in-progress control A/c	Dr	Rs. 100	
To stores ledger control A/c	Cr		Rs. 100

The particular job A/c in the work-in-progress ledger will debited.

(b) The invoice for 20 units will be posted in the receipt column of the particular material A/c in the stores ledger. The following will be the entry in the cost ledger.

Stores-ledger control A/c	Dr	Rs. 100	
To general ledger adjustment A/c	Cr		Rs. 100

(c) This is a normal loss, hence to be treated as factory overhead. The balance in the particular material A/c in the stores ledger will be corrected by entering the normal loss of 50 units in the issue column. The following will be the entry in the cost ledger.

Factory overhead control A/c	Dr.	Rs. 150	
To stores ledger control A/c	Cr .		Rs. 150

(d) The 10 units issued in excess of the quantity shown in the materials-issue document should be taken back in the stores. No accounting entry will be required.

However, if the material cannot be traced on the shop floor, the value of the material will be charged to the particular job. The excess issue will be entered in the issue column of the particular materials A/c in the stores ledger. The following will be the entry in the cost ledger:

Work-in-progress control A/c	Dr.	Rs. 25	
To stores ledger control A/c	Cr.		Rs. 25

The particular job A/c in the work-in-progress ledger will be debited.

Example 13.9

The following incomplete accounts are furnished to you for the month ended 31st October, 2003:

Stores Control A/c

1.10.2003 To balance	Rs. 54,000		

Work-in-Progress Control A/c

1.10.2003 To balance	Rs. 6,000		

Finished Goods Control A/c

1.10.2003 To balance	Rs. 75,000		

Factory Overheads Control A/c

Total debited for October 2003	Rs. 45,000		

Creditors for Purchase A/c

		1.10.2003 By balance	Rs. 30,000

Additional information:

(i) The factory overheads are applied by using a budgeted rate based on direct labour-hours. The budget for overheads for 2003 is Rs. 6,75,000 and the budget for direct labour hours is 4,50,000.

(ii) The balance in the account of creditors for purchases on 31.10.2003 is Rs. 15,000 and payments made to creditors in October 2003 amounted to Rs. 1,05,000.

(iii) The finished goods inventory as on 31st October 2003 is Rs. 66,000.

(iv) The cost of goods sold during the month was Rs. 1,95,000.

(v) On 31st October 2003, there was only one unfinished job in the factory. The cost records show that Rs. 3,000 (1,200 direct labour-hours) of direct labour cost and Rs. 6,000 of direct material cost has been charged.

(vi) A total of 28,200 direct labour-hours were worked in October 2003. All workers earn same rate of pay.

(vii) All actual factory overheads incurred in October 2003 has been posted.

You are required to find:

(a) Materials purchased during October 2003

(b) Cost of goods completed in October 2003

(c) Overheads applied to production in October 2003

(d) Balance of work-in-progress as on 31st October 2003

(e) Direct materials consumed during October 2003

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(f) Balance of stores control account on 31st October 2003
(g) Over-absorbed and under-absorbed overheads for October 2003. *(C.A. Inter)*

Solution:

(i) Overhead recovery rate: Rs. 6,75,000/4,50,000 = Rs. 1.50 per direct labour hour
(ii) Direct wage rate: Rs. 3,000/1,200 = Rs. 2.50 per hour
(iii) Total direct wages charged to production: 28,200 × Rs. 2.50 = Rs. 70,500

(a) Materials purchased during the year
Payment to creditor + Closing balance – Opening balance
= Rs. 1,05,000 + Rs. 15,000 – Rs. 30,000 = Rs. 90,000

(b) Cost of goods completed in October 2003
Cost of goods sold + Closing finished goods – Opening finished goods
= Rs. 1,95,000 + Rs. 66,000 – Rs. 75,000 = Rs. 1,86,000

(c) Overhead applied to production in October
Direct labour hours × Overhead = 28,200 × Rs. 1.50 = Rs. 42,300

(d) Balance of work-in-progress on 31st October 2003
Direct material cost + Direct labour cost + Overhead
= Rs. 6,000 + Rs. 3,000 + 1200 × Rs. 1.50 = Rs. 10,800

(e) Direct material consumed during October 2003: Rs. 78,000 (Ref: W.I.P. control A/c)

Dr. **Cr.**

Work-in-Progress Control A/c

	(Rs.)		(Rs.)
To Opening balance	6,000	By Finished goods	1,86,000
To Direct wages	70,500	By Closing balance	10,800
To Factory overheads	42,300		
To Stores Control A/c (Balancing figure)	78,000		
	1,96,800		1,96,800

(f) Balance of Stores Control A/c: Rs. 66,000 (Ref: Stores control A/c)

Dr. **Cr.**

Stores Control A/c

	(Rs.)		(Rs.)
To Opening balance	54,000	By W.I.P. control A/c	78,000
Materials purchased	90,000	By Closing balance (Balancing figure)	10,800
	1,44,000		1,44,000

(g) Under-absorbed overheads for October 2003: Rs. 2,700 (Ref: Factory overhead A/c)

Dr. **Cr.**

Factory Overhead A/c

	(Rs.)		(Rs.)
To General Ledger adj. A/c	45,000	By W.I.P. control A/c	42,300
		By Under-absorbed overhead A/c (Balancing figure)	2,700
	45,000		45,000

THEORY QUESTIONS

1. What is non-integral accounting system?
2. What are cost control accounts? Describe their advantages?
3. Mention the principal ledgers maintained in financial accounts and cost accounts.

PROBLEMS

1. During June 2007, the following transactions took place in *XYZ* Co. Ltd.

	Rs.
(i) Materials purchased:	
(a) Credit purchases	18,000
(b) Credit purchases for special job	800
(c) Cash purchases	2,000
(ii) Returns to suppliers	1,000
(iii) Direct materials issued to production	12,000
(iv) Indirect materials issued	1,200
(v) Materials returned from production to stores	200
(vi) Materials transferred from Job No. 20 to Job No. 21	400

You are required to enter the transactions in the financial and cost books.

2. The following figures have been extracted from the cost records of a manufacturing unit:

	Rs.
Stores: Opening balance	30,000
Purchases	1,60,000
Transfers from work-in-progress	80,000
Issues to work-in-progress	1,60,000
Issues to repairs and maintenance	20,000
Deficiencies found in stock taking	6,000
Work-in-progress:	
Opening balance	60,000
Direct wages applied	60,000
Overheads applied	2,40,000
Closing balance	40,000

Finished products: Entire output is sold at a profit of 10% on actual cost from work-in-progress.
Other wages incurred Rs. 70,000; overhead incurred Rs. 2,50,000.
Items not included in Cost Records: Income from investments Rs. 10,000; Loss on sale of capital assets Rs. 20,000.
Draw up Stores control account, Work-in-progress control account, Costing profit and loss A/c, Profit and loss account and Reconciliation statement. *(ICWA Inter)*

3. As at 31st March, the following balances existed in a company's cost ledger:

	Dr.	*Cr.*
Raw materials control A/c	Rs. 60,287	
Work-in-progress control A/c	24,473	
Finished stock control A/c	50,389	
Factory overhead control A/c	—	Rs.2,105
Cost ledger control A/c	—	1,33,044
	Rs.1,35,149	Rs.1,35,149

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During the next three months the following items arose:

		Rs.
Finished output (at cost)		42,167
Factory overhead incurred		18,302
Raw materials purchased	Rs.	24,600
Direct wages payments	10,106	
Indirect labour (salaries)	4,333	14,439
Cost of sales		37,178
Materials issued to production		25,463
Sales returns (at cost)		1,076
Materials returned to and credited by suppliers		580
Factory overhead allocated to production		15,440

You are required to write up the accounts and schedule the closing balances, stating what each balance represents.

4. The cost ledger of a company shows the following balances as on January 1, 2007

	Dr.	Cr
	Rs.	
Work-in-progress control A/c	7,840	
Finished stock ledger control A/c	5,860	
Works overhead suspense A/c	400	
Office and administration overhead suspense A/c	200	
Stores ledger control A/c	10,500	
General adjustment A/c		24,800
Transactions for the year 2007 were:		
Wages (direct labour)		61,200
Wages (indirect labour)		2,800
Works overhead allocated to production		18,700
Office and administration overhead allocated		6,200
Stores issued to production		39,300
Goods finished during the year		1,20,000
Finished goods sold (no stock were left at the year end)		1,32,000
Stores purchased		36,000
Stores issued to factory repair orders		1,500
Carriage inwards on stores issued for production		600
Works expenses		14,000
Office and administration expenses		6,000

You are required to:

(a) Write up the cost ledger accounts recording the above transactions and make necessary transfers to control accounts.

(b) Prepare the Trial Balance as on 31st December, 2007.

5. The Cost Ledger of Motors Ltd. showed the following balances as at 1st July, 2007

	Rs.	Rs.
Stores ledger account	5,250	
Work-in-progress account	3,920	
Finished goods account	2,790	

	Rs.	Rs.
Works overheads account		50
Administration overheads account	30	
General ledger adjustment account		11,940
	11,990	11,990

Further balances resulting from the operations for the year ended 30th June, 2007 were:

Stores purchases	Rs. 18,000
Stores issued to production orders	19,650
Stored issued to repairs	750
Wages	30,750
Productive labour	29,500
Unproductive labour	1,250
Works overhead allocated to production orders	8,950
Carriage inwards	300
Works expenses	7,000
Administration expenses	900
Administration overheads allocated to production orders	920
Goods finished during the year	58,600
Finished goods sold	60,000
Sales expenses	670

Record the entries in the Cost Ledger Accounts for the year ended 30th June, 2007 and prepare a Schedule of Balances as at that date, explaining what each balance represents.

6. In the course of physical verification of stores as on 31st March 2007, following differences are revealed in case of AB Ltd.

Material	*Unit*	*Rate (Rs.)*	*Physical balance*	*Ledger balance*	*Remarks*
A	Nos	7.00	600	680	Wrong counting
B	Litres	12.00	1,100	1,155	Normal evaporation loss
C	Nos	6.00	350	400	Material issues not accounted for
D	Kg	22.00	900	930	Shortage due to pilferage and theft
E	Nos	15.00	1,475	1,325	150 nos. received but not entered in ledger
F	Metres	10.00	291	291	Obsolete materials. Realised sales value Rs. 1,650 awaiting despatch.

Prepare journal entries in the cost ledger to give effect to the above adjustments as called for. *(ICWA, Inter)*

INTEGRATED ACCOUNTING SYSTEM

14

Learning Objectives

After reading this chapter, you should be able to:

1. discuss the meaning and features of integrated accounting system;
2. describe the principal accounts in integral sytsem;
3. explain different journal entries recorded in integral and non-integral accounting system and
4. distinguish between interlocking and integration of cost and financial accounts.

MEANING AND FEATURES OF INTEGRATED ACCOUNTING SYSTEM

In integrated accounting system, the concept of a separate profit and loss account for financial and costing purposes is discarded in favour of a unified account which will serve both financial and costing purposes. Such a system of accounting is referred to as the "integrated" or "integral" cost accounting system. A single book-keeping system which contains both financial and cost accounts is known as an integral accounting system. An integrated accounting system has the following advantages:

1. There is no problem of reconciliation as there will only be one profit amount.
2. This system is economical and easy to understand. Duplication of work and labour are avoided.
3. Cost data can be presented promptly and regularly.
4. All cost data and accounts are automatically checked and thus cost figures are accurate.

The following factors should be considered before establishing an integrated cost accounting system:

1. *Degree of integration* The degree of integration should be determined. Some business firms may integrate up to the stage of prime cost or factory cost. On the other hand, many undertakings integrate the whole of the records.
2. *Control accounts* In place of classifying expenditure according to its nature, control accounts may be prepared for each of the elements of cost, such as:
   - Material Control Account
   - Direct Labour Control Account
   - Factory Overhead Control Account
   - Administrative Overhead Control Account
   - Selling and Distribution Overhead Control Account.

Some of the above control accounts could be separated into fixed and variable depending on the circumstances.

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3. *Cost accumulation purposes* Full details about the cost data are provided to the cost accounting department so as to achieve the following objectives;
   (a) To provide the necessary costing data.
   (b) To form the basis of journal entries so that the control accounts can be cleared to suitable revenue accounts resulting into a cost of sales account.
4. Provisions for accured expenses, prepayments and stocks should be dealt with by transfers to suitable suspense accounts, so that the balance remaining in each control account represent the charges for the period.

PRINCIPAL ACCOUNTS

Under integrated accounting the following accounts are mainly kept.

Stock Control Account

This account is prepared for each of the following cost items:

(i) *Raw material* This account has opening stock and purchases on the debit side and material issues on credit side.

(ii) *Work-in-progress* This account is debited with opening stock and factory overhead and credited with cost of goods finished. The closing stock, if any, will be carried forward to the next year.

(iii) *Finished stock* This account is known as the finished goods account also. It is debited with goods finished and credited with the cost of sales.

The above stock accounts are usually used in place of the stock and purchase account which is maintained in the financial books.

Cost of Sales Account

The cost of goods sold is debited to this account and the finished goods account is credited.

Assets Account

Separate accounts are kept for different assets possessed by the firm, such as plant, furniture, building, etc.These individual assest accounts are prepared in the usual way. Any capital expenditure incurred is debited.

Debtors and Creditors Control Account

The creditors account mentions the transactions and their amounts with creditors and suppliers. The balance in creditors account should talley with the balance in the purchase ledger. Similarly, the debtors control account should talley with the sales ledger.

Prepayments Account and Outstanding Account

An expense account will show the prepaid amount made, if any. The prepaid amount is debited to the prepaid account and credited to overhead control accounts. Thus, the expense which is related to the period is charged to the work-in-progress account. In case of an expense due but not paid, the expense due account is credited and the overhead control account is debited. When the amount is actually paid, the expense due account is debited and cash account is credited or it can be adjusted through the overhead control account.

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Direct Wages and Overhead Costs Control Account

When these costs are incurred, the appropriate control account is debited and the cash account credited. For example, the total direct wages paid will be debited to the direct labour control account. At the end of a period, they are transferred to work-in-progress accounts by crediting the appropriate control accounts and debiting the work-in-progress account. It is possible that actual payments for a period may not talley with the expenditure to be charged for the period and, therefore, adjustments should be made.

Departmental or Cost Centre Account

Under integrated account, an account is kept for each department or cost centre. This helps in knowing the cost of a department and controlling costs associated with different departments.

Cash Account

In this account all cash receipts are debited and cash disbursements are credited.

JOURNAL ENTRIES

Journal entries which are recorded in integral and non-integral accounting systems are given in the following pages.

Distinction between 'Interlocking' and 'Integration' of Cost and Financial Accounts

When independent sets of books are maintained for cost and financial accounts, they are 'interlocked' by control accounts maintained in the two sets of books. Cost Ledger Control Account is maintained in the financial books and a General Ledger Adjustment Account in the costing books. Thus, a link is established between the two sets of books. In costing books, all entries pertaining to fixed assets, cash, or outsiders are posted in General Ledger Adjustment Account. In case it is desired to integrate the two trial balances into one, the Cost Ledger Control Account and General Ledger Adjustment Account can be omitted because they are 'contra' accounts.

Integration requires the maintenance of only one set of books in which all transactions are recorded. By eliminating cost ledger, all the control accounts are maintained in general ledger.

Integration is preferable to interlocking from the point of view of economy but sometimes due to practical difficulties, the maintenance of 'interlocking' system is essential. Although integration (maintaining one set of accounts) offers better scope for economy and efficiency in accounting, sometimes it is desirable to have separate sets of accounts because of organisational problems involved in the maintenance of one set of books. Cost Accounting has assumed considerable significance in the planning and control of business operations and hence the need for a separate costing department is felt by the management. Therefore, generally, 'integral' system can be employed, with advantages, only in small units.

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Items	*Non-integral System*		*Integral System*
	Financial books	*Cost books*	
1. Purchase of materials on credit	Purchases A/c Dr. To Bought Ledger To Bought Ledger Control (or creditors) A/c	Stores Ledger Control A/c Dr. To General Ledger Adjustment A/c	Stores Ledger Control A/c Dr. (or creditors) A/c To Creditors A/c
2. Issue of materials for production	No entry	Work-in-progress Ledger Control A/c Dr. To Stores Ledger Control A/c	Work-in-progress A/c Dr. To Stores Ledger Control A/c
3. Payment of wages	Wages A/c Dr. To Cash To Insurance To Tax	Wages A/c (or Wages Control A/c) Dr. To General Ledger Adjustment A/c	Wages A/c (wages control A/c) Dr. To Cash A/c
4. Analysis and distribution of wages	No entry	Work-in-progress A/c Dr. (for direct labour) Factory Ov. Control A/c Dr. (for factory indirect labour) Adm. Overhead Control A/c Dr. (for office indirect labour) S & D Overhead Control A/c Dr. (for selling and distribution indirect labour) To Wages Control A/c	Work-in-Progress Control A/c Dr. Factory Overhead A/c Dr. Administration Overhead A/c Dr. S & D Overhead A/c Dr. To Wages Control A/c
5. Payment for indirect expenses, for example power, repairs, etc.	Expenses A/c Dr. To Cash To Creditors	Factory/Adm./Selling & Dis. Overhead A/c Dr. To General Ledger adj. A/c	Factory/Office/Selling & Distribution Overhead A/c Dr. To Cash To Creditors
6. Recording of factory overheads at predetermined rates	No entry	Work-in-progress Control A/c Dr. To Factory Overheads Control A/c	Work-in-progress Control A/c Dr. To Factory Overhead Control A/c
7. Factory overheads over-absorbed	No entry	Factory Overhead Control A/c Dr. To Costing P&L A/c (or alternatively the balance may be carried forward)	Factory Overhead A/c Dr. To P&L A/c

(Contd.)

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8. Jobs complete[d]	[illegible]	[illegible] Ledger Control A/c	[illegible]l A/c Dr. To Work-in-progress Ledger Control A/c
9. Interest paid	Interest A/c Dr. To Cash	No entry	Interest A/c Dr. To Cash
10. Rent of own premises	No entry	Works Overhead A/c Dr. To General Ledger Adjustment A/c	Works Overheads A/c Dr. To Rent (notional) A/c
11. Abnormal idle time	No entry	Costing P&L A/c Dr. To Wages A/c (or alternatively the balance may be carried forward)	Profit & Loss A/c Dr. To Wages A/c
12. Sales (credit)	Sales Ledger Control (or Debtors) A/c Dr. To Sales A/c	General Ledger Adjustment A/c Dr. To Cost of Sales A/c	Sales Ledger Control (Debtors) A/c To Sales A/c

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Example 14.1

Give journal entries for the following transactions under Integrated Accounting:

(i) Materials purchased on credit;
(ii) Payment to creditors;
(iii) Issue of direct material for production;
(iv) Payment of wages; and
(v) Charging wages for production.

(B.Com. (Hons), Delhi, 2003)

Solution:

Journal Entries under Integrated Accounting

(i) Material purchased on credit:
Stores Ledger Control A/c Dr.
To Creditors A/c
(For material purchased on credit)

(ii) Payment to creditors:
Sundry Creditors A/c Dr.
To Bank A/c
(Amount paid to creditors)

(iii) Issue of direct materials for production:
Work-in-progress Control A/c Dr.
To Stores Control A/c
(Direct material issued to production)

(iv) Payment of wages:
Wages Control A/c Dr.
To Cash Account
(For wages paid)

(v) Charging wages for production:
Work-in-progress Control A/c Dr.
To Wages Control A/c
(For Wages charged to production)

Example 14.2

The following transactions are extracted from the books of *XYZ* Ltd. You are required to pass journal entries under Integrated Accounts System:

		Rs.
(i)	Purchase of raw materials on credit	4,00,000
(ii)	Carriage inward	3,000
(iii)	Paid to creditors	3,00,000
(iv)	Stores issued	2,50,000
(v)	Productive waged paid	2,00,000
(vi)	Unproductive wages paid	70,000
(vii)	Works overheads incurred	3,60,000
(viii)	Materials issued for repairs	2,000
(ix)	Selling expenses paid	10,000
(x)	Office expenses paid	4,000
(xi)	Works overhead absorbed	4,10,000
(xii)	Cost of completed jobs	8,60,000

(B.Com. (Hons) Delhi, 2007)

Solution:

(i)	Stores Ledger Control A/c To creditors A/c (Being Raw Material Purchased on credit)	Dr	4,00,000	4,00,000
(ii)	Stores Ledger Control A/c To cash A/c (Being carriage inward paid)	Dr	3,000	3,000
(iii)	Creditors A/c To cash A/c (Being cash paid to creditors)		3,00,000	3,00,000
(iv)	Work-in-Progress Control A/c To stores Ledger Control A/c (Being material issued to Production)	Dr	2,50,000	2,50,000
(v)	Wages Control A/c To Cash A/c (Being direct wages paid)	Dr	2,00,000	2,00,000
(vi)	Works Overhead Control A/c To Cash (Being unproductive wages paid)	Dr	70,000	70,000
(vii)	Works Overhead Control A/c To cash (Being work expenses incurred)	Dr	3,60,000	3,60,000
(viii)	Works overhead Control A/c To Stores Ledger Control A/c (Being material issued for repair)	Dr	2,000	2,000
(ix)	Selling and Distribution overhead control A/c To Cash (Being selling Exp. paid)	Dr	10,000	10,000
(x)	Office overhead control A/c To cash (Being office expenses)	Dr	4,000	4,000
(xi)	Work in Progress Control A/c To work overhead control A/c (Being works overhead absorbed)	Dr	4,10,000	4,10,000
(xii)	Finished stock Control A/c To WIP Control A/c (Being cost of completion transfer to finished stock)	Dr	8,60,000	8,60,000

Example 14.3

Journalise the following transactions in the integrated books of accounts:

(a)	Credit purchase	Rs 12,00,000
(b)	Production wages paid	7,00,000
(c)	Stocks issued to production orders	8,00,000
(d)	Work expenses charged to production	4,50,000
(e)	Finished goods transferred from production orders	18,00,000

(f)	Administration expenses charged to production	1,50,000
(g)	Work expenses outstanding	1,20,000
(h)	Work expenses paid	4,60,000

(ICWA Inter Dec. 1996)

Solution:

Journal Entries Under Integral System of Accounting

	Particulars		*Dr. (Rs.)*	*Cr. (Rs.)*
(a)	Stores Ledger Control Account	Dr.	12,00,000	
	To Sundry Creditors Account			12,00,000
	(Being purchases of goods on credit)			
(b)	Wages Control Account	Dr.	7,00,000	
	To Cash/Bank Account			7,00,000
	(Being wages paid in cash/cheque)			
(c)	Work-in-progress Control Account	Dr.	8,00,000	
	To Stores Ledger Control Account			8,00,000
	(Being stores issued against production order)			
(d)	Work-in-progress Control Account	Dr.	4,50,000	
	To Production Overhead Control A/c			4,50,000
	(Being the Work Expenses allocated to Production/Jobs)			
(e)	Finished Goods Ledger Control A/c	Dr.	1,80,000	
	To Work-in-progress Ledger Control A/c			1,80,000
	(Being goods finished during the year transferred)			
(f)	Work-in-progress Control Account	Dr.	1,50,000	
	To Administration Overhead Control A/c			1,50,000
	(Being administration expenses charged to production)			
(g)	Production Overhead Control A/c	Dr.	1,20,000	
	To Outstanding Works Overhead Account			1,20,000
	(Being works expenses incurred during the period but still unpaid)			
(h)	Overhead Control Account	Dr.	4,60,000	
	To Cash/Bank Account			4,60,000
	(Being works expenses paid in Cash/Bank during the period)			

Example 14.4

Record the following transactions in the ledger under the integral system and prepare the trial balance. Trial balance at the beginning of the period is as follows:

	Dr.	Cr.
Bank Balance	Rs 1,500	
Stock:		
Finished goods	2,000	
Work-in-progress	3,250	
Raw materials	3,000	

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Creditors		1,000
Debtors	500	
Fixed assets	51,000	
Depreciation provision		1,250
Capital account		55,000
Profit and loss account		4,000
	61,250	61,250
Transactions during the year were:		
	Rs.	Rs.
Materials purchased on credit		5,000
Materials issued to production:		
Direct	3,500	
Indirect	500	4,000
Payment to creditors		3,000
Wages paid:		
Direct	5,000	
Indirect	1,000	6,000
Finished goods produced		15,000
Cost of finished goods sold		16,000
Sales value		20,000
Receipt from debtors		17,500
Overhead incurred:		
Factory	3,000	
Office	500	
Selling and distribution	500	4,000
Depreciation (in addition to overheads)		250

Solution:

Bank Account

	Rs.		Rs.
To Balance b/d	1,500	By Purchases ledger control A/c	3,000
To Sales ledger control A/c	17,500	By Wages control A/c	6,000
		By Factory overheads	3,000
		By Office overheads	500
		By Selling and distribution overheads	500
		By Balance c/d	6,000
	19,000		19,000

Finished Goods Ledger Control Account

	Rs.		Rs.
To Balance b/d	2,000	By Cost of sales A/c	16,000
To Work-in-progress A/c	15,000	By Balance	1,500
To Office overheads A/c	500		
	17,500		17,500

Work-in-progress Ledger Control Account

	Rs.		Rs.
To Balance b/d	3,250	By Finished goods ledger	
To Stores ledger A/c	3,500	control A/c	15,000
To Wages control A/c	5,000	By Balance c/d	1,500
To Factory overheads A/c	4,750		
	16,500		16,500

Stores Ledger Control Account

	Rs.		Rs.
To Balance b/d	3,000	By W.I.P. Ledger control A/c	3,500
		By Factory overheads A/c	500
To Purchases ledger Control A/c	5,000	By Balance c/d	4,000
	8,000		8,000

Purchases Ledger Control Account (Creditors account)

	Rs.		Rs.
To Bank	3,000	By Balance b/d	1,000
To Balance b/d	3,000	By Stores ledger control A/c	5,000
	6,000		6,000

Sales Ledger Control Account (Debtors A/c)

	Rs.		Rs.
To Balance b/d	500	By Bank	17,500
To Cost of sales A/c	20,000	By Balance c/d	3,000
	20,500		20,500

Factory Overheads Account

	Rs.		Rs.
To Stores ledger control A/c	500	By W.I.P. Ledger A/c	4,750
To Wages control A/c	1,000		
To Bank	3,000		
To Depreciation provision	250		
	4,750		4,750

Wages Control Account

	Rs.		Rs.
To Bank	6,000	By Work-in-Progress A/c	5,000
		By Factory overheads	1,000
	6,000		6,000

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Cost of Sales Account

	Rs.		Rs.
To Finished goods ledger control A/c	16,000	By Sales ledger control A/c	20,000
To Profit and Loss A/c	4,000		
	20,000		20,000

Office Overheads Account

To Bank	Rs. 500	By Finished goods ledger control A/c	Rs. 500

Selling and Distribution Overhead Account

To Bank	Rs. 500	By Profit and loss A/c	Rs. 500

Provision for Depreciation Account

To Balance c/d	Rs. 1,500	By Balance b/d	Rs. 1,250
		By Factory overheads	250
	1,500		1,500

Profit and Loss Account

To Selling and distribution overhead A/c	Rs. 500	By Cost of sales A/c	4,000
To Net profit	3,500		
	4,000		4,000

Profit and Loss Appropriation Account

To Balance c/d	Rs. 7,500	By Balance b/d	Rs. 4,000
		By Profit and Loss A/c (profit for the year)	3,500
	7,500		7,500

Share Capital Account

To Balance c/d	Rs. 55,000	By Balance b/d	Rs. 55,000

Fixed Assets Account

To Balance b/d	Rs. 51,000	By Balance c/d	Rs. 51,000

Trial Balance

	Dr.	Cr.
Purchase ledger control A/c		3,000
Sales ledger control A/c	3,000	
Provision for depreciation		1,500
Bank	6,000	
Finished goods ledger control A/c	1,500	
Work-in-progress ledger control A/c	1,500	
Stores ledger control A/c	4,000	
Profit and loss A/c		7,500

Share capital		55,000
Fixed assets	51,000	
	67,000	67,000

Example 14.5

BPR Limited keeps books on integrated accounting system. The following balance appear in the books as on April 1, 2006.

	Dr. (Rs.)	Cr. (Rs.)
Stores Control A/c	40,950	–
Work-in-Progress A/c	38,675	–
Finished Goods A/c	52,325	–
Bank A/c	22,750	–
Creditors A/c		18,200
Fixed Assets A/c	1,47,875	–
Debtors A/c	27,300	–
Share Capital A/c	–	1,82,000
Provision for Depreciation A/c	–	11,375
Provision for Doubtful Debts A/c	–	3,725
Factory Overheads Outstanding A/c	–	6,250
Pre-Paid Administration Overheads A/c	9,975	–
Profit and Loss A/c	–	72,800
	3,17,100	3,17,100

The transactions for the year ended March 31, 2003, were as given below:

	Rs.	Rs.
Direct Wages	1,97,925	–
Indirect Wages	11,375	2,09,300
Purchase of materials (on credit)		2,27,500
Materials issued to production		2,50,250
Material issued for repairs		4,550
Goods finished during the year (at cost)		4,89,125
Credit Sales		6,82,500
Cost of Goods sold		5,00,500
Production overheads absorbed		1,09,200
Production overheads paid during the year		91,000
Production overheads outstanding at the end of year		7,775
		Rs.
Administration overheads paid during the year		27,300
Selling overheads incurred		31,850
Payment to Creditors		2,29,775
Payment received from Debtors		6,59,750
Depreciation of Machinery		14,789
Administration overheads outstanding at the end of year		2,225
Provision for doubtful debts at the end of the year		4,590

Required:

Write up accounts in the integrated ledger of *BPR* Limited and prepare a Trial balance.

(CA, PE, Exam II, Group II, Nov. 2003)

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Solution:

Stores Control A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	40,950	By WIP A/c	2,50,250
To Creditors A/c	2,27,500	By Production overheads A/c	4,550
		By Balance c/d	13,650
	2,68,450		2,68,450

Wages Control A/c

Dr.			Cr.
	Rs.		Rs.
To Bank	1,97,925	By Work-in-Progress A/c	1,97,925
To Bank	11,375	By Production overheads A/c	11,375
	2,09,300		2,09,300

Work-in-Progress A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	38,675	By Finish goods A/c	4,89,125
To Wages control A/c	1,97,925	By Balance c/d	1,06,925
To Stores control A/c	2,50,250		
To Production overheads A/c	1,09,200		
	5,96,050		5,96,050

Production Overheads A/c

Dr.			Cr.
	Rs.		Rs.
To Wages control A/c	11,375	By WIP A/c	1,09,200
To Stores control A/c	4,550	By Profit and Loss A/c	14,039
To Bank (91,000–6,250)	84,750	(Under-absorbed overheads Written off)	
			Rs.
To Production overheads outstanding	7,775		
To Provision for depreciation	14,789		
	1,23,239		1,23,239

Finished Goods A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	52,325	By Cost of sales A/c	5,00,500
To Work-in-progress A/c	4,89,125	By Balance c/d	80,450
To Admn. Overheads A/c	39,500		
	5,80,950		5,80,950

Administration Overheads A/c

Dr.			Cr.
	Rs.		Rs.
To Pre-paid admn. Overheads A/c	9,975	By Finished goods A/c	39,500
To Bank	27,300		
To Admn. Overheads outstanding	2,225		
	39,500		39,500

Cost of Sales A/c

Dr.			Cr.
	Rs.		Rs.
To Finished goods A/c	5,00,500	To Sales A/c	5,32,350
To Selling overheads	31,850		
	5,32,350		5,32,350

Sales A/c

Dr.			Cr.
	Rs.		Rs.
To Cost of sales A/c	5,32,350	By Debtors A/c	6,82,500
To Profit and Loss A/c	1,50,150		
	6,82,500		6,82,500

Factory overheads / Production Overheads Outstanding A/c

Dr.			Cr.
	Rs.		Rs.
To Bank	6,250	By Balance b/d	6,250
To Balance c/d	7,775	By Production overheads	7,775
	14,025		14,025

Prepaid Administration Overheads A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	9,975	By Admn. Overheads A/c	9,975
	9,975		9,975

Provision for Depreciation A/c

Dr.			Cr.
	Rs.		Rs.
To Balance c/d	26,164	By Balance b/d	11,375
		By Production overheads A/c	14,789
	26,164		26,164

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Provision for Doubtful Debts A/c

Dr.			Cr.
	Rs.		Rs.
To Balance c/d	4,590	By Balance b/d	3,725
		By Profit and Loss A/c	865
	4,590		4,590

Profit and Loss A/c

Dr.			Cr.
	Rs.		Rs.
To Provision for doubtful debts	865	By Balance b/d	72,800
To Production overheads	14,039	By Sales A/c	1,50,150
To Balance c/d	2,08,046		
	2,22,950		2,22,950

Debtors A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	27,300	By Bank A/c	6,59,750
To Sales A/c	6,82,500	By Balance c/d	50,050
	7,09,800		7,09,800

Creditors A/c

Dr.			Cr.
	Rs.		Rs.
To Bank	2,29,775	By Balance b/d	18,200
To Balance c/d	15,925	By Stores control A/c	2,27,500
	2,45,700		2,45,700

Fixed Assets A/c

Dr.			Cr.
	Rs.		Rs.
To Balance b/d	1,47,875	By balance c/d	1,47,875

Bank A/c

Dr.			Cr.
	Rs.		Rs.
To Debtors	6,59,750	By Balance b/d	22,750
		By Direct wages	1,97,925
		By Indirect wages	11,375
		By Production overheads (Rs. 84,750 + Rs. 6,250)	91,000
		By Admn. Overheads A/c	27,300
		By Selling overheads A/c	31,850
		By Creditors A/c	2,29,775
		By Balance c/d	47,775
	6,59,750		6,59,750

Trial Balance
As on March 31, 2007

	Dr. Rs.	Cr. Rs.
Stores control A/c	13,650	
Work in Progress A/c	1,06,925	
Finished goods A/c	80,450	
Bank A/c	47,775	
Creditors A/c		15,925
Fixed Assets A/c	1,47,875	
Debtors A/c	50,050	
Share capital A/c		1,82,000
Provision for depreciation A/c		26,164
Profit and Loss A/c		2,08,046
Production overheads outstanding A/c		7,775
Outstanding administrative overheads A/c		2,225
Provision for doubtful debt		4,590
	4,46,725	4,46,725

THEORY QUESTIONS

1. What do you understand by "integrated accounts", and what are the principles involved? State the advantages of "Integrated accounts." *(B. Com. (Hons), Delhi)*
2. What is an integrated accounting? State its advantages. *(CA, PE, Exam II, Group II, May 2007,(ICWA Inter)*
3. What do you understand by the integrated accounting system? State its advantages and prerequisites. *(CA Inter)*
4. Distinguish between Interlocking and Integration System of cost and financial accounts?
5. Explain the accounts kept in Integrated Accounting System.
6. State the advantages of integrated cost and financial accounts. *(B. Com. (Hons), Delhi, 2004)*
7. Explain the basic requirements of an Integrated System of Accounting. *(B. Com. (Hons), Delhi)*
8. What is integrated accounting? Briefly describe the merits of integration. *(B. Com. (Hons), Delhi)*
9. Define integrated accounting system. Distinguish it with non-integrated accounting system. *(B. Com. (Hons), Delhi, 2006)*

PROBLEMS

1. Journalise the following transactions assuming cost and financial accounts are integrated:

	(Rs.)
Raw materials purchases	40,000
Direct materials issued to production	30,000
Wages paid (30% indirect)	24,000
Direct wages charged to production	16,800
Manufacturing expenses incurred	19,000
Manufacturing overhead charged to production	18,400
Selling and distribution costs	4,000
Finished products (at cost)	40,000

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Sales	58,000
Closing stock	NIL
Receipt from debtors	13,800
Payment to creditors	22,000

(C.A. Inter)

2. From the following particulars pass the journal entries in an integral accounting system:
(a) Issued materials Rs. 3,00,000/- of which Rs. 2,80,000 (standard Rs 2,40,000) is direct material.
(b) Net wages paid Rs. 70,000/-, Deductions being Rs. 12,000/- (standard Rs. 75,000/-)
(c) Gross salaries payable for the period is Rs. 26,000/-
(standard Rs. 25,000/-), Deductions Rs. 2,000/-
(d) Sales (Credit) Rs. 8,00,000/-
(e) Discount allowed Rs. 5,000/-
(f) Salaries and wages allocation: Rs. 60,000/- direct (standard Rs. 62,000/-) and out of the balance, 50% production, 30% admn. and 20% selling and distribution overheads. *(ICWA Inter)*

3. In the absence of the Chief Accountant, you have been asked to prepare a month's cost accounts for a company which operate a batch costing system fully integrated with the financial accounts. The following relevant information is provided to you:

		Rs.
Balances at the beginning of the month:		
Stores Ledger Control Account		25,000
Work-in-Progress Control Account		20,000
Finished Goods Control Account		35,000
Prepaid production Overheads brought forward from previous month		3,000
Transactions during the month:		
Materials purchased		75,000
Materials issued:		
To production	30,000	Rs.
To Factory maintenance	4,000	34,000
Materials transferred between batches		5,000
Total wages paid:		
To Direct workers	25,000	
To Indirect workers	5,000	30,000
Direct wages charged to batches		20,000
Recorded non-productive time of direct worker		5,000
Selling and distribution overheads incurred		6,000
Other production overheads incurred		12,000
Sales		1,00,000
Cost of finished goods sold		80,000
Cost of goods completed and transferred into Finished goods during the month		65,000
Physical value of work-in-progress at the end of the month		40,000
The production overhead absorption rate is 150% of direct wages charged to work-in-progress.		

Required:

Prepare the following accounts for the month:
(a) Stores Ledger Control Account
(b) Work-in-Progress Control Account
(c) Finished Goods Control Account
(d) Production Overhead Control Account
(e) Profit and Loss Account *(CA Inter)*

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4. Dutta Enterprises operates an integral system of accounting. You are required to pass the Journal Entries for the following transactions that took place for the year ended 30.6.2007.
(Narrations are not required)

	Rs.
Raw materials purchased (50% on Credit)	6,00,000
Materials issued to production	4,00,000
Wages paid (50% direct)	2,00,000
Wages charged to production	1,00,000
Factory overheads incurred	80,000
Factory overheads charged to production	1,00,000
Selling and distribution overheads incurred	40,000
Finished goods at cost	50,00,000
Sales (50% Credit)	7,50,000
Closing stock	Nil
Receipts from debtors	2,00,000
Payments to creditors	2,00,000

(B. Com. (Hons), Delhi 1998, 2002)

15 RECONCILIATION OF COST AND FINANCIAL ACCOUNTS

Learning Objectives

After reading this chapter, you should be able to:

1. describe the need for reconciliation;
2. explain the reasons for differences in profit and
3. discuss the reconciliation procedure.

NEED FOR RECONCILIATION

When a manufacturing firm uses an integrated accounting system, i.e., no separate cost and financial accounts, the question of reconciliation does not arise. But in many manufacturing concerns, cost and financial accounts are maintained separately and independently of each other. In such a case, profit disclosed by one accounting system tends to differ from that of the other accounting system. This creates problems and the need arises of reconciling the two accounting systems to arrive at one profit figure.

REASONS FOR DIFFERENCES IN PROFIT

Differences in the profits presented in cost and financial books may be due to the following reasons:

Items Appropriated or Charged to Profit but Not Found in Cost Accounts

1. Company tax.
2. Transfer to general reserve or any other fund to accumulated profits, for example, dividend equalisation reserve.
3. Dividend paid on the share capital.
4. Additional provisions for depreciation on plant, etc. and for bad debts.
5. Amounts written off as goodwill, preliminary expenses, underwriting commissions, debenture discount, capital issue expenses.
6. Appropriation for the purpose of repayment of loans or debentures.

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Purely Financial Matters Not Found in Cost Accounts

1. Interest received on bank deposits.
2. Interest, dividends, etc. received on investments.
3. Rents received.
4. Losses on the sale of investments, machinery, buildings, etc.
5. Profits on the sale of fixed assets.
6. Transfer fees received.
7. Interest on bank loans, mortgages, debentures and other borrowed money.
8. Interest on proprietor's capital.
9. Damages payable.
10. Penalties payable.

Treatment of Items in Cost Books and Financial Books

In cost accounts overheads are recovered on the basis of a predetermined rate. In this way recovered overhead may not agree with the actual overhead incurred. Profit in cost books may be comparatively (as to financial books) higher or lower depending on the under-absorption or over-absorption of overhead. Reconciliation is necessary to eliminate differences in profits. If the amount of over- or under-absorption is transferred to the costing and profit and loss accounts, then financial profit will talley with the costing profit.

Differences in the Valuation of Stock and Work-in-progress

In financial books, stock is valued at cost or market price whichever is lower. In cost accounting different methods of valuation of stock are in practice such as FIFO, LIFO, Average Costing, Weighted Average Costing, etc. Besides work-in-progress in cost accounts is often valued on a prime cost basis and sometimes variable manufacturing overhead is included therein. In financial accounting, work-in-progress may be valued after taking into account administrative expenses also. Similarly, finished goods in financial accounting is valued at cost or market price whichever is lower. On the contrary, in cost accounting, finished stock is generally valued at total cost of production. Since the value of stocks (raw material, work-in-progress, finished goods) in the financial accounts and cost accounts differs, the profits also differ from financial to cost accounting.

Depreciation

In financial accounts, depreciation may be calculated on straight line method or diminishing balance method. But, in cost accounting, depreciation can be calculated in terms of machine hour or any other base.

Abnormal Losses and Gains

Abnormal losses and gains (discussed earlier) may be transferred to costing profit and loss account or alternatively may not be considered and excluded totally from cost accounts. In the first situation (transfer to costing and profit and loss account) there will be no difference between financial profit and costing profit. But in the second situation (exclusion from cost accounts) financial profit (losses) will differ from costing profit (loss) and adjustments will be required.

RECONCILIATION PROCEDURE

Reconciliation of cost and financial accounts is done on the principle of bank reconciliation statement. One may begin with profit as per the financial books or cost books and thereafter items causing differences in profit may be added or deducted depending on the circumstances. After all such items have been considered,

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profit as per other books may be arrived at. This reconciliation may be achieved through a mere statement (Reconciliation Statement) or preparing a Memorandum Reconciliation Account. Both these approaches are discussed below:

1. Reconciliation Statement The following steps are required to be completed to prepare a Reconciliation Statement.

(i) Profit as per any set of books (cost or financial) may be taken as a starting point. This profit plus making all suitable adjustments (in terms of causes of difference in profit) will finally result into profit figure as per the other set of books.

(ii) The effect of a particular cause of difference should be determined on the profits shown by the other set of books.

(iii) In case, the cause (causing the difference in profit) has given as increase in profit shown by the other set of books, the amount of such increase should be added to the profit as per the former set of books which has been taken as a starting point.

(iv) In case, the cause has decreased the profit shown by other set of books, the amount of such decrease should be deducted from the profit as per the former set of books which has been taken as the starting point.

Completion of the above steps will give the profit as per the other set of books.

2. Memorandum Reconciliation Account This reconciliation procedure is in the form of an account. The debit side (Dr.) of the Memorandum Reconciliation Account shows items to be deducted from the profit as per any set of books taken as a starting point. The credit side of this account shows profit figure accepted as a starting point as well as items to be added to this profit figure. The difference between the credit side and debit side will give profit as per the other set of books. A proforma of Memorandum Reconciliation Account is shown in Fig. 15.1.

Memorandum Reconciliation Account

Dr.			**Cr.**
Particulars	*Amt (Rs.)*	*Particulars*	*Amt (Rs.)*
To _____	—	By profits as per cost Accounts	—
To _____	—	By _____	—
To _____	—	By _____	—
To _____	—	By _____	—
To profit as per financial accounts	—		
Total	—	Total	—

Fig. 15.1

Example 15.1

In a factory, works overheads are absorbed at 60% of Labour cost and Office overheads are 20% of Works Cost. Prepare (i) Cost Sheet, (ii) Trading and Profit and Loss Account and (iii) Reconciliation Statement if Total Expenditure consists of Material Rs. 2,00,000; Wages Rs. 1,50,000; Factory Expenses Rs. 1,00,000 and Office Expenses Rs. 85,000.

10% of the Output is Stock at the end and Sales are Rs. 5,20,000.

(B. Com. (Hons), Delhi, 2000)

Solution:

Cost Sheet

Particulars	*Amount Rs.*
Material	2,00,000
Wages	1,50,000
Prime Cost	3,50,000
Factory Overhead (60% of Rs. 1,50,000)	90,000
Works cost	4,40,000
Office Overheads (20% of works cost)	88,000
Cost of Production	5,28,000

Cost of goods sold:	Rs.
$\frac{5,28,000 \times 90}{100}$	4,75,200
Profit	44,800
Sales	5,20,000

Profit as per Cost Accounts = Rs. 44,800

Trading and Profit and Loss Account

Dr. **Cr.**

Particulars	*Amt.*	*Particulars*	*Amt.*
	Rs.		Rs.
To Material	2,00,000	By Sales	5,20,000
To Wages	1,50,000	By Closing stock	
To Gross profit c/d	2,22,800	$\frac{5,28,000 \times 10}{100}$	52,800
	5,72,800		5,72,800
To Factory Expenses	1,00,000	By Gross Profit b/d	2,22,800
To Office Expenses	85,000		
To Net Profit c/d	37,800		
	2,22,800		2,22,800

Reconciliation Statement

		Rs.
Profit as per cost accounts		44,800
Add:	Overcharged in Cost accounts : Office Overhead	3,000
		47,800
Less:	Undercharged in Cost accounts : Factory Overhead	10,000
	Profit as per financial records	37,800

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Example 15.2

Prepare a Reconciliation Account from the following details:

Profit as per cost accounts were of Rs. 59,700 while the profits as per financial accounts were of Rs. 60,000. The values of opening and closing stock as shown in cost accounts and financial accounts were as under:

	Financial A/cs	*Cost A/cs*
Raw materials:		
Opening	25,000	25,300
Closing	30,000	29,600
W.I.P		
Opening	16,000	15,500
Closing	20,000	19,900

(B.Com. (Hons), Delhi, 2003)

Solution:

Reconciliation Account

Dr. **Cr.**

Particulars	*Rs.*	*Particulars*	*Rs.*
To under-valuation of W.I.P. in cost books	500	By profit as per cost books	59,700
To profit as per financial books	60,000	By over-valuation of opening stock in cost books	300
		By over-valuation of closing stock in financial books	400
		By over-valuation of closing W.I.P. in financial books	100
	60,500		60,500

Example 15.3

From the following figures prepare reconciliation statement:

	Rs.
Profit as per costing records	5,000
Factory overheads under-recovered in costing	3,000
Selling and Administration overheads over-recovered in costing	2,000
Bank interest credited in financial books	500
Preliminary expenses written off in financial books	6,500
Opening stock value:	
in cost books	5,000
in financial books	4,000
Closing stock value:	
in cost books	12,000
in financial books	10,000

(B.Com, Delhi, 2002)

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Solution:

Reconciliation Statement

Particulars		*Rs.*	*Rs.*
Profit as per Cost Accounts			5,000
Add (+):	Selling and Administration overheads over-recovered in cost books	2,000	
	Bank interest credited in financial books	500	
	Opening Stock over-valued in Cost Account	1,000	3,500
			+ 8,500
Less (–):			
(i)	Factory overheads under-recovered in costing	3,000	
(ii)	Preliminary expenses written off in financial books	6,500	
(iii)	Closing stock of materials over-valued in cost A/c	2,000	(–) 11,500
Loss as per Financial Accounts			3,000

Example 15.4

From the following information, reconcile the profit as per cost accounts with financial accounts:

	Cost A/c	**Financial A/c**
	Rs.	*Rs.*
Profit	86,250	
Opening Stock:		
Material	10,500	10,300
Work-in-progress	8,500	8,000
Closing Stock:		
Material	14,200	15,000
Work-in-progress	6,000	5,600

Dividend and interest received Rs. 600.
Loss on sale of investments Rs. 1,000.
Interest charged by the bank not considered in Financial Accounts and Cost Accounts Rs. 1,500.
Goodwill written off during the year Rs. 2,500.
Preliminary expenses written off Rs. 3,000.
Overhead incurred Rs. 40,000.
Overhead absorbed in Cost Accounts Rs. 38,500.
Find out profit as per Financial Accounts.

(B.Com, Delhi, 2005)

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Solution:

Reconciliation Statement

		Rs.
Profit as per Cost Accounts		86,250
Add: (i) Dividend and interest credited in financial account	600	
(ii) Over valuation of opening stock of material in the cost accounts:	200	
(iii) Over valuation of opening workers progress in cost accounts	500	
(iv) Under valuation of closing stock of material	800	2,100
		88,350
Less: (i) Under-recovery of overheads in cost accounts (Rs. 40,000 – Rs. 38,500)	1,500	
(ii) Over-valuation of closing work-in-Progress in cost accounts	400	
(iii) Loss on sale of Investments	1,000	
(iv) Goodwill written off	2,500	
(v) Preliminary expenses written off	3,000	8,400
Profit as per Financial Accounts		79,950

Example 15.5

From the following figure, prepare a reconciliation statement:

	Cost Books Rs.	*Financial Books* Rs.
Profit	50,000	?
Marketing overheads	8,000	8,000
Provision for bad debts	—	5,000
Factory overheads	8,500	7,000
Director's fees	—	2,000
Income Tax paid	—	15,000
Rent of owned Premises	6,000	—
Depreciation	11,250	12,000
Share transfer fee (Cr.)	—	1,000
Administrative overheads	5,000	8,000

(B.Com, Delhi, 2006)

Solution:

Reconciliation Statement

Particulars		*Rs.*
Profit as per Cost Book		50,000
Add: Factory overhead over-charged in cost accounts	1,500	
Rent of own building charged in cost accounts	6,000	
Share Transfer Fee credited in financial books	1,000	8,500
		58,500
Less: Provision for bad debts charged in financial books	5,000	
Directors' fees in financial books	2,000	
Income tax in financial books	15,000	
Depreciation in financial books	750	
Administrative overheads undercharged in cost books	3,000	25,750
Profit as per financial books		32,750

Example 15.6

From the following information, you are required to prepare:

(i) Cost sheet for articles *X* and *Y*
(ii) Profit and Loss Account as per financial books
(iii) Reconciliation between profit as per cost books and as per financial books.

	Article *X*	Article *Y*
	Rs.	Rs.
Material consumed	36,000	48,400
Labour	63,000	83,600
Works overhead (Actual)	1,42,000	
Office expenses (Actual)	95,700	

Number of Articles sold	Price per Article
	Rs.
X 180	1,450
Y 220	1,600

There was neither opening stock nor any closing stock. Works overheads are charged 100% on labour and office overhead are charged at 25% on works cost.

(B.Com, Delhi, 2006)

Solution:

Cost Sheet for Articles X and Y

Particulars	*Article X (180 Units) Rs.*	*Article Y (220 Units) Rs.*	*Total Rs.*
Material	36,000	48,400	84,400
Labour	63,000	83,600	1,46,600
Prime cost	99,000	1,32,000	2,31,000
Works overhead (100% on Labour)	63,000	83,600	1,46,600
Work Cost	1,62,000	2,15,600	3,77,600
Office overheads (25% onwork cost)	40,500	53,900	94,400
Cost of Production	2,02,500	2,69,500	4,72,000
Profit (*Balancing figure*)	58,500	82,500	1,41,000
Sales (180 × Rs. 1450) and (220 × Rs. 1600)	2,61,000	3,52,000	6,13,000

Profit and Loss Account (For Financial Accounts)

Dr. **Cr.**

Particulars		*Rs.*	*Particulars*	*Rs.*
To materials consumed:			By sales:	
X	36,000		*X* (180 × Rs. 1450)	2,61,000
Y	48,400	84,400	*Y* (220 × Rs. 1600)	3,52,000

(*Contd.*)

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(*Contd.*)

Dr. **Cr.**

Particulars		*Rs.*	*Particulars*	*Rs.*
To Labour:				
X	63,000			
Y	83,600	1,46,600		
To works overheads (Actual)		1,42,000		
To office overheads (Actual)		95,700		
To Net Profit		1,44,300		
		6,13,000		6,13,000

Reconciliation Statement

Particulars	*Rs.*
Profit as per Cost Books (Rs. 58.500 + Rs. 82,500)	1,41,000
Add: Works overhead over-recovered (1,46,600 – 1,42,000)	4,600
	1,45,600
Less: Office overhead underrecovered (95,700 – 94,400)	1,300
Profit as per financial Profit and Loss A/c	1,44,300

Example 15.7

The following information is made available to you from the financial books of S.V. Ltd. for the year ended December 31, 2001:

	Rs.		*Rs.*
To Direct materials used	3,00,000	By Sales	
To Direct wages	2,00,000	(2,00,000 units)	7,50,000
To Factory expenses	1,20,000		
To Office expenses	40,000		
To Selling and Distribution expenses	80,000		
To Net Profit	10,000		
	7,50,000		7,50,000

Normal output of the factory is 2,50,000 units. Factory overheads are fixed upto Rs. 60,000 and office expenses are fixed for all practical purposes. Selling and distribution expenses are fixed to the extent of Rs. 50,000; the rest are variable.

Prepare a statement reconciling the profits as per cost and financial Accounts assuming that indirect expenses are absorbed on the basis of normal production capacity in cost accounts.

(B.Com. (Hons), Delhi, 2002)

Solution:

Statement of Cost and Profit

	Rs.
Direct Material used	3,00,000
Direct Wages	2,00,000
Prime Cost	5,00,000
Factory Expenses	
$\frac{4}{5}$th of Fixed Oveirhead 60,000 × $\frac{4}{5}$ = 48,000	
Variable Overhand (1,20,000 – 60,000) = 60,000	1,08,000
Works Cost f or Factory Cost	6,08,000
Office Expenses	
$\frac{4}{5}$th of Fixed Expenses 40,000 × $\frac{4}{5}$ = 32,000	32,000
Cost of Production	6,40,000
Selling and Distribution Expenses	
$\frac{4}{5}$th of Fixed Expenses 50,000 × $\frac{4}{5}$ = 40,000	
Variable Overheads (80,000 – 50,000) = 30,000	70,000
Cost of sales	7,10,000
Profit	40,000
Sales	7,50,000

Reconciliation Statement

			Rs.
	Psrofit as per Cost Accounts		40,000
Less:	Unabsorbed Factory Expenses	12,000	
	Unabsorbed Office Expense	8,000	
	Unabsorbed Selling and Distribution Expenses	10,000	
			30,000
	Profit as per Financial Accounts		10,000

Out of total factory overhead, Rs. 60,000 are fixed. The fixed factory overhead rate in financial accounts must have been determined on the basis of normal output i.e. 2,50,000 units Therefore, fixed factory overheads recovered in cost accounts must be Rs. 48,000 (i.e. $\frac{4}{5}$th of 60,000) and 40,000 (i.e. $\frac{4}{5}$th of Rs. 50,000) respectively.

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Example 15.8

Gain More Ltd. showed a net loss of Rs. 6,30,000 as per the financial accounts for the year ended 31st March, 2004. The cost accounts however disclosed a loss of Rs. 5,00,000 for the same period. On scrutiny of the two accounts the following are available:

	Rs.
Factory overheads under-recovered	70,000
Administration overheads over-recovered	30,000
Depreciation charged to financial accounts	1,50,000
Depreciation charged in cost accounts	1,20,000
Interest on investment not included in cost accounts	30,000
Income Tax provided in financial accounts	1,00,000
Stores adjustments (credit in financial accounts)	10,000

Prepare a Memorandum Reconciliation Account.

(ICWA, Inter, Stage 1, June 2004)

Solution:

GAIN MORE LTD.

Dr. Memorandum Reconciliation Account for the year ended 31st March, 2004 Cr.

Particulars	*Rs.*	*Particulars*	*Rs.*
To Loss as per Financial Accounts	6,30,000	By Factory overhead under-recovered	70,000
To Admn. Overheads over-recovered	30,000	By Deprn. undercharged in Cost Accounts (150,000 – 120,000)	30,000
To Intrest on Investment not included in Cost Accounts	30,000	By Provision for Income Tax not taken in Cost Accounts	1,00,000
To Store adjustments credit in financial accounts	10,000	By Balance c/d (net loss) as per Cost Accounts	5,00,000
	7,00,000		7,00,000

Example 15.9

From the following data prepare a Reconciliation Statement:

	Rs.
Profit as per cost accounts	1,45,500
Works overheads under-recovered	9,500
Administrative overheads under-recovered	22,750
Selling overheads over-recovered	19,500
Overvaluation of opening stock in cost accounts	15,000
Overvaluation of closing stock in cost accounts	7,500
Interest earned during the year	3,750
Rent received during the year	27,000
Bad debts written off during the year	9,000
Preliminary expenses written off during the year	18,000

(I.C.W.A. Inter June 1998, B. Com. (Hons) Delhi, 2006)

Solution:

Reconciliation Statement

		Rs. *(+)*	*Rs.* *(–)*
Profit as per Cost Accounts		1,45,500	
Add:	Over-recovery of Selling Overheads in Cost Account	19,500	
	Over-valuation of Opening Stock in Cost A/cs	15,000	
	Income excluded from Cost Accounts:		
	Interest earned	3,750	
	Rent received	27,000	
Less:	Under-recovery of Works Overhead in Cost A/cs		9,500
	Under-recovery of Administration Overhead in Cost A/cs		22,750
	Over-valuation of Closing Stock in Cost A/cs		7,500
	Expenses excluded from Cost Accounts:		
	Bad Debts		9,000
	Preliminary Expenses		18,000
		2,10,750	66,750
	Profit as per Financial Accounts	1,44,000	

Example 15.10

The following information is available from the financial books of a company having a normal production capacity of 60,000 units for the year ended 31st March, 2005.

(i) Sales Rs. 10,00,000 (50,000 units).
(ii) There was no opening and closing stock of finished units.
(iii) Direct material and direct wages cost were Rs. 5,00,000 and Rs. 2,50,000 respectively.
(iv) Actual factory expenses were Rs. 1,50,000 of which 60% are fixed.
(v) Actual administrative expenses were Rs. 45,000 which are completely fixed.
(vi) Actual selling and distribution expenses were Rs. 30,000 of which 40% are fixed.
(vii) Interest and dividends received Rs. 15,000.

You are required to:

(a) Find out profit as per financial books for the year ended 31st March, 2005;
(b) Prepare the cost sheet and ascertain the profit as per cost accounts for the year ended 31st March, 2005 assuming that the indirect expenses are absorbed on the basis of normal production capacity; and
(c) Prepare a statement reconciling profits shown by financial and cost books.

(B. Com. (Hons) Delhi, 2006)C.A. Inter May 2005)

Solution:

(a) Computation of Profit as per Financial Books
Profit and Loss Account
(for the year ended 31st March, 2005)

Particulars	*Rs.*	*Particulars*	*Rs.*
To Direct Material	5,00,000	By Sales (50000 units)	10,00,000
To Direct Wages	2,50,000	By Interest and Dividends	15,000
To Factory Expenses	1,50,000		
To Administrative Expenses	45,000		
To Selling and Distribution Expenses	30,000		
To Profit	40,000		
	10,15,000		10,15,000

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(b) Cost Sheet (for the year ended 31st March, 2005)

	Rs.	*Rs.*
Direct Material		5,00,000
Direct Wages		2,50,000
Prime Cost		7,50,000
Factory Overheads:		
Variable	60,000	
Fixed Rs. 90,000 × 5/6	75,000	1,35,000
Works Cost		8,85,000
Administrative Expenses Rs. 45,000 × 5/6		37,500
Cost of Production		9,22,500
Selling and Distribution Overheads:		
Variable	18,000	
Fixed Rs. 12,000 × 5/6	10,000	28,000
Cost of Sales		9,50,500
Profit		49,500
Sales		10,00,000

(c) Statement of Reconciliation
(Reconciling Profit shown by Financial and Cost Accounts)

		Rs. (+)	*Rs. (–)*
Profit as per cost Accounts		49,500	
Add:	Income from Interest and Dividends excluded in Cost Accounts	15,000	
Less:	Factory overheads undercharged in Cost Accounts		15,000
	Administrative Overheads undercharged in Cost Accounts		7,500
	Selling and Distribution Overheads undercharged in Cost Accounts (Rs. 30,000 – Rs. 28,000)		2,000
	Profit as per Financial Accounts		40,000
		64,500	64,500

Example 15.11

The financial records of Modern Manufacturers Ltd. reveals the following for the year ended 30.6.2003:

		(Rs. in thousand)
Sales (20000 units)		4,000
Materials		1,600
Wages		800
Factory Overheads		720
Office and administrative overheads		416
Selling and distribution overheads		288
Finished goods (1230 units)		240
Work-in-progress: Materials	48	
Labour	32	
Overheads (factory)	32	112
Goodwill written off		320
Interest on capital		32

In the costing records, factory overhead is charged at 100% of wages, administration overhead at 10% of factory cost and selling and distribution overhead at the rate of Rs. 16 per unit sold.

Prepare a statement reconciling the profit as per cost records with the profit as per financial records of the company.

(ICWA, Inter)

Solution:

(a) Profit and Loss Account for the Year Ended 30th June, 2003 (Rs. '000)

To Materials	1,600	By Sales	4,000
To Wages	800	By Closing stock:	
To Factory overheads	720	Finished goods	240
To Office and administration overheads	416	Work-in-progress	211
To Selling and distribution overheads	288		
To Goodwill written off	320		
To Interest on capital	32		
To Net profit	176		
	4,352		4,352

(b) Profit as per Cost Account (Rs. '000)

Materials	1,600.00
Wages	800.00
Prime cost	2,400.000
Factory overhead (100% of wages)	800.00
Factory cost (gross)	3,200.00
Closing W.I.P.	112.00
Factory cost (net)	3,088.00
Office and administration overheads (10% of factory cost)	308.80
Total cost of production	3,396.80
Closing stock of finished goods	(196.80)
Cost of production of unit sold	3,200.00
Selling and distribution overhead (Rs. 16 × 20000)	320.00
Cost of sales	3,520.00
Profit (balancing figure)	480.00
Sales	4,000.00

Note: Value of closing stock of finished goods:

Number of units sold	20,000
Closing stock of finished goods	1,230
Number of units produced	21,230
Total cost of production	3,396.80

Value of closing stock of finished goods

$$\text{Rs.}\frac{3396.80}{21,230} \times 1,230 = \text{Rs. } 196.80$$

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(c) Statement Reconciling the Profit as per Cost Accounts with the Profit as per Financial Accounts

	Rs. '000	*Rs. '000*
Profit as per cost accounts		480.00
Over-absorbed overhead: Factory overhead (800 – 720)	80.00	
Selling and distribution overhead (320 – 288)	32.00	112.00
Over-valuation of closing stock in financial accounts (240.00 – 196.80)		43.20
Under-absorbed overhead: Office and administration (416.00 – 308.80)		(107.20)
Goodwill written off in financial accounts		(320.00)
Interest on capital in financial accounts		(32.00)
Profit as per Financial accounts		176.00

Example 15.12

M/s Modern Company Limited furnished the summary of the trading, and profit and loss account for the year ending 31st December, 2001.

	Rs.			*Rs.*
To Raw materials	1,39,600	By Sales (12000 units)		4,80,000
To Direct wages	76,200	By Finished stock (200 units)		8,000
To Production overheads	42,600			
To Selling and distribution overheads	42,700	By Work-in-progress: Materials	28,200	
To Administration overheads	39,100	Wages	11,796	
To Preliminary expenses: written off	2,200	Production overhead	7,999	47,995
To Goodwill-written off	2,501	By Interest on securities (gross)		6,000
To Dividend (net)	3,000			
To Income tax	4,100			
To Net profit	1,89,994			
	5,41,995			5,41,995

The company manufactures a standard unit. Scrutiny of cost records for the same period shows that:

(i) Factory overheads have been allocated to the production at 20% on prime cost.
(ii) Administration overheads have been charged at Rs. 3 per unit on units produced.
(iii) Selling and distribution expenses have been charged at Rs. 4 per unit on units sold.

You are required to prepare a statement of cost and work out profit as per cost accounts and to reconcile the same with that shown in the financial accounts.

(CA Inter)

Solution:

M/s Modern Company Limited
Statement of Cost and Profit
(for the year ending Dec. 31st, 2001)

		(Production: 12000 units)
		Rs.
Materials consumed		1,39,600
Direct wages		76,200
	Prime cost	2,15,800

(*Contd.*)

	Factory overheads @ 20% of prime cost		43,160
			2,58,960
Less:	Closing work-in-progress:		
	Materials	Rs. 28,200	
	Wages	11,796	
	Production overheads	7,999	
			47,995
		Works cost	2,10,965
	Administration overheads @ Rs. 3 per unit on 12200 units		36,600
	Total cost of production		2,47,565
Less:	Cost of finished goods stock (see Working Note 1)		4,058
	Production cost of goods sold		2,43,507
	Selling and distribution overheads @ Rs. 4 on 12000 units		48,000
	Cost of sales		2,91,507
	Profit as per cost accounts		1,88,493
	Sales (12000) units @ Rs. 40 per unit		4,80,000

Working Notes:

1. The total cost of production is Rs. 2,47,565. Of 12200 units, 200 units are in stock. Hence the stock of finished goods has to be valued at $\frac{\text{Rs. } 2{,}47{,}565 \times 200 \text{ units}}{12200 \text{ units}} = \text{Rs } 4{,}058$
2. Administrative overheads are absorbed on the basis of units produced, hence they have been considered a part of the production cost.

Statement Reconciling Profit as per Cost Accounts and Profit as per Financial Account

		Rs. *(+)*	*Rs.* *(–)*
	Profit as per cost accounts	1,88,493	
Less:	Admn. overheads under-absorbed		2,500
	Preliminary expenses		2,200
	Goodwill written off		2,501
	Dividend		3,000
	Tax		4,100
Add:	Production overheads over-absorbed	560	
	Selling overheads over-absorbed	5,300	
	Interest on securities	6,000	
	Closing stock over-valued in Financial accounts (at selling price instead of cost)	3,942	
		2,04,295	14,301
	Profit as per financial accounts	1,89,994	

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Example 15.13

The profit and loss account of Oil India (Pvt) Ltd. for the year ended 31st March, 2003, is as follows:

	Rs.			*Rs.*
To Materials	4,80,000	By Sales		9,60,000
To Wages	3,60,000	By Closing stock		1,80,000
To Direct expenses	2,40,000			
To Gross profit	1,20,000	By Work-in-progress:		
		Materials	30,000	
		Wages	18,000	
		Direct expenses	12,000	
				60,000
	12,00,000			12,00,000
To Administration expenses	60,000	By Gross profit		1,20,000
To Net profit	60,000			
	1,20,000			1,20,000

As per the cost records the direct expenses have been estimated at a cost of Rs. 30 per kg and administration expenses at Rs. 15 per kg. The profit as per the costing records are Rs. 1,10,400. During the year 6,000 kg were manufactured and 4,800 kg were sold. Prepare a statement of costing profit and loss account and reconcile the profit with financial records.

(B.Com.(Hons) Delhi, 2007, 2001)

Solution:

Statement Showing Profit as per Cost Accounts

		Rs.	*Rs.*
Material:	Purchased	4,80,000	
Less:	Material content in W.I.P.	30,000	
			4,50,000
Wages:		3,60,000	
Less:	Wages content in W.I.P.	18,000	3,42,000
Direct expenses: @ Rs. 30 on 6,000 kg			1,80,000
Administration expenses: @ Rs. 15 on 6,000 kg			90,000
Cost of production of 6,000 kg			10,62,000
Less:	Value of closing stock: (6,000 – 4,800) kg $\times \frac{\text{Rs.}10,62,000}{6,000}$		= (2,12,400)
Cost of goods sold			8,49,600
Profit (balancing figure)			1,10,400
Sales			9,60,000

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Reconciliation Statement

			Rs.
Profit as per cost accounts			1,10,400
Add:	Over-absorption of administration overheads:		
	Amount absorbed in cost accounts	90,000	
	Amount actually incurred as per profit and loss account	(60,000)	30,000
			1,40,000
Less:	Under-absorption of direct expenses:		
	Amount as per profit and loss account	2,28,000	
	Amount charged in cost accounts	(1,80,000)	48,000
			92,400
Less:	Difference in valuation of closing stock:		
	Closing stock as per cost accounts	2,12,400	
	Closing stock as per profit and loss account	(1,80,000)	32,400
	Profit as per profit and loss account		60,000
Notes:	Expenses as per profit and loss account:		
	Expenses debited to profit and loss accounts		Rs. 2,40,000
Less:	Direct expenses content in closing W.I.P.		12,000
	Expenses as per profit and loss account		Rs. 2,28,000

Example 15.14

From the following Profit and Loss Account, draw up a Memorandum Reconciliation Account, showing the Profit as per cost accounts:

Profit & Loss Account (as at 31.12.2001)

		Rs.		*Rs.*
To	Office salaries	11,282	By Gross profits	54,648
To	Office expenses	6,514	By Dividend received	400
To	Salesmen's salaries	4,922	By Interest on bank deposits	150
To	Sales expenses	9,304		
To	Distribution expenses	2,990		
To	Loss on sale of machinery	1,950		
To	Fines	200		
To	Discount on debentures	100		
To	Net Profit	17,936		
		55,198		55,198
To	Income Tax	8,000	Net Profit	17,936
To	Reserve	1,000		
To	Dividend	4,000		
To	Balance c/d	4,936		
		17,936		17,936

The cost accountant of the company has ascertained a profit of Rs. 19,936 as per his books.

(ICWA Inter)

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Solution:

Memorandum Reconciliation Account

		Rs.		*Rs.*
To	Expenses not debited to Cost accounts:		By Profit as per cost accounts	19,636
	Fines	200	By Income not credited to cost A/cs:	
	Discount on debentures	100		
	Loss on sale of machinery	1,950	Dividend received	400
			Interest on Bank Deposit	150
	Income Tax	8,000		
	Reserve	1,000		
	Dividend	4,000		
	Net profit as per financial A/c	4,936		
		20,186		20,186

Example 15.15

In reconciliation between Cost and Financial Accounts, one of the areas of differences is for different methods of stock valuation. State, with reasons, in each of the following circumstances whether Costing Profit will be higher or lower than the Financial Profit.

Items of stock	*Cost Valuation* Rs.	*Financial valuation* Rs.
Raw material (Opening)	50,000	60,000
Work-in-progress (Closing)	60,000	50,000
Finished stock (Closing)	50,000	60,000
Finished stock (Opening)	60,000	50,000

(B. Com. (Hons), Delhi 1998)

Solution:

In the reconciliation it does not matter in which form the stock is kept, that is, raw material, work-in-progress or finished stocks. The basic principle is that if the opening stock is larger, Profit is lower, whereas if the closing stock is larger, profit is higher and vice-versa. On the basis of this principle, the following conclusions on the four propositions can be drawn:

1. Raw Material (Opening) is lower in Cost Accounts, the Costing Profit will be higher by Rs. 10,000.
2. Work-in-progress (Closing) is higher in Cost Accounts, Costing Profit will be higher by Rs. 10,000.
3. Finished Stock (Closing) is lower in Cost Accounts, Costing Profit will be lower by Rs. 10,000.
4. Finished Stock (Opening) is higher by Rs. 10,000 in Cost Accounts, Costing Profit will, therefore, be lower by Rs. 10,000.

Example 15.16

The financial books of a company reveal the following data for the year ended 31st March, 2002:

Opening Stock:	Rs.
Finished goods 875 units	74,375
Work-in-process	32,000

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1.4.01 to 31.3.02

Raw materials consumed	7,80,000
Direct Labour	4,50,000
Factory overheads	3,00,000
Goodwill	1,00,000
Administration overheads	2,95,000
Dividend paid	85,000
Bad Debts	12,000
Selling and Distribution Overheads	61,000
Interest received	45,000
Rent received	18,000
Sales 14,500 units	20,80,000
Closing Stock: Finished goods 375 units	41,250
Work-in-process	38,667

The cost records provide as under:

- Factory overheads are absorbed at 60% of direct wages.
- Administration overheads are recovered at 20% of factory cost.
- Selling and distribution overheads are charged at Rs. 4 per unit sold.
- Opening Stock of finished goods is valued at Rs. 104 per unit.
- The company values work-in-progress at factory cost for both Financial and Cost Profit Reporting.

Required:

(i) Prepare statements for the year ended 31st March, 2002 show
  - the profit as per financial records
  - the profit as per costing records.

(ii) Present a statement reconciling the profit as per costing records with the profit as per Financial Records. *(CA, PE, Exam II, Group II, May 2002)*

Solution:

(i)

Statement of Profit as per financial records
OR
Profit and Loss Account of the company
(for the year ended March 31, 2002)

	Rs.		*Rs.*
To Opening stock of Finished goods	74,375	By Sales	20,80,000
To Work-in-process	32,000	By Closing stock of finished goods	41,250
To Raw materials consumed	7,80,000	By Work-in-Process	38,667
To Direct labour	4,50,000	By Rent received	18,000
To Factory overheads	3,00,000	By Interest received	45,000
To Goodwill	1,00,000		
To Administration overhead	2,95,000		
To Selling and distribution overheads	61,000		
To Dividend paid	85,000		
To Bad debts	12,000		
To Profit	33,542		
	22,22,197		22,22,917

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Statement of Profit as per costing records

(for the year ended March 31, 2002)

	Rs.
Sales revenue (A) (14,500 units)	20,80,000
Cost of sales:	
Opening stock (875 units × Rs. 104)	91,000
Add: Cost of production of 14,000 units *(Refer to Working Note 2)*	17,92,000
Less: Closing stock $\left(\frac{\text{Rs. } 17.92{,}000 \times 375 \text{ units}}{14{,}000 \text{ units}}\right)$	48,000
Production cost of goods sold (14,500 units)	18,35,000
Selling and distribution overheads (14500 units × Rs. 4)	58,000
Cost of sales: (B)	18,93,000
Profit: {(A) – (B)}	1,87,000

(ii) Statement of Reconciliation

(Reconciling the profit as per costing records with the profit as per financial records)

	Rs.	*Rs.*
Profit as per Cost Accounts		1,87,000
Add: Administration overheads over absorbed (Rs. 2,98,667 – Rs. 2,95,000)	3,667	
Opening stock overvalued (Rs. 91,000 – Rs. 74,375)	16,625	
Interest received	45,000	
Rent received	18,000	83,292
		2,70,292
Less: Factory overheads under recovery (Rs. 3,00,000 – Rs. 2,70,000)	30,000	
Selling and distribution overheads under recovery (Rs. 61,000 – Rs. 58,000)	3,000	
Closing stock overvalued (Rs. 48,000 – Rs. 41,250)	6,750	
Goodwill	1,00,000	
Dividend	85,000	
Bad debts	12,000	2,36,750
Profit as per financial accounts		33,542

Working Notes:

1. Number of units produced

	Units
Sales	14500
Add: Closing stock	375
Total	14875
Less: Opening stock	875
Number of unit produced	14000

2. Cost Sheet

	Rs.
Raw materials consumed	7,80,000
Direct labour	4,50,000
Prime cost	12,30,000
Factory overheads *(60% of direct wages)*	2,70,000
Factory cost	15,00,000
Add: Opening work-in-process	32,000
Less: Closing work-in-process	(38,667)
Factory cost of goods produced	14,93,333
Administration overheads *(20% of factory cost)*	2,98,667
Cost of production of 14000 units *(Refer to Working Note 1)*	17,92,000

Cost of production per unit:

$$= \frac{\text{Total Cost of Production}}{\text{No. of Units Produced}} = \frac{\text{Rs. } 17.92{,}000}{14000 \text{ Units}} = \text{Rs. } 128$$

Example 15.17

A manufacturing company disclosed a net loss of Rs. 3,47,000 as per their cost accounts for the year ended March 31, 2003. The financial accounts however disclosed a net loss of Rs. 5,10,000 for the same period. The following information was revealed as a result of scrutiny of the figures of both the sets of accounts.

		Rs.
(i)	Factory Overheads under-absorbed	40,000
(ii)	Administration Overheads over-absorbed	60,000
(iii)	Depreciation charged in Financial Accounts	3,25,000
(iv)	Depreciation charged in Cost Accounts	2,75,000
(v)	Interest on investments not included in Cost Accounts	96,000
(vi)	Income-tax provided	54,000
(vii)	Interest on load funds in Financial Accounts	2,45,000
(viii)	Transfer fees (credit in financial books)	24,000
(ix)	Stores adjustment (credit in financial books)	14,000
(x)	Dividend received	32,000

Prepare a memorandum Reconciliation Account

(CA, PE, Exam II, Group II, May 2003)

Solution:

Memorandum Reconciliation Accounts

Dr.	*Rs.*		*Cr.* *Rs.*
To Net Loss as per Costing books	3,47,000	By Administration overhead over recovered in cost acounts	60,000
To Factory overheads under absorbed in Cost Accounts	40,000	By Interest on investment not included in Cost Accounts	96,000
To Depreciation under charged in Cost Accounts	50,000	By Transfer fees in Financial books	24,000

(*Contd.*)

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To Income-Tax not provided in Cost Accounts	54,000	By Stores adjustment (Credit in financial books)	14,000
To Interest on Loan Funds in Financial Accounts	2,45,000	By Dividend received in financial books	32,000
		By Net loss as per Financial books	5,10,000
	7,36,000		7,36,000

Example 15.18

ABC Ltd. has furnished the following information from the financial books for the year ended 31st March, 2007:

Profit and Loss Account

		Rs.		Rs.
To	Opening stock *(500 units at Rs. 140 each)*	70,000	By Sales (10250 units)	28,70,000
	Material consumed	10,40,000	By Closing stock (250 units at Rs. 200 each)	50,000
	Wages	6,00,000		
	Gross profit c/d	12,10,000		
		29,20,000		29,20,000
To	Factory overheads	3,79,000	By Gross profit b/d	12,10,000
	Administration overheads	4,24,000	Interest	1,000
	Selling expenses	2,20,000	Rent received	40,000
	Bad debts	16,000		
	Preliminary expenses	20,000		
	Net profit	1,92,000		
		12,51,000		12,51,000

The cost sheet shows the cost of materials at Rs. 104 per unit and the labour cost at Rs. 60 per unit. The factory overheads are absorbed at 60% of labour cost and administration overheads at 20% of factory cost. Selling expenses are charged at Rs. 24 per unit. The opening stock of finished good is valued at Rs. 180 per unit.

You are required to prepare:

(i) A statement showing profit as per Cost accounts for the year ended 31st March, 2007; and

(ii) A statement showing the reconciliation of profit as disclosed in Cost accounts with the profit shown in Financial accounts. *(CA, PE, Exam II, Group II, May 2007)*

Solution:

(a) (i) Statement of Profit as per Cost Accounts

	Units	*Rs.*
Opening stock @ Rs. 180 per unit	500	90,000
Cost of production @ Rs. 240 per unit (Refer Working Note 1)	10,000	24,00,000
Total	10,500	24,90,000
Less: Closing stock @ Rs. 240 per unit	– 250	– 60,000
	10,250	24,30,000
Selling expenses @ Rs. 24 per unit		2,46,000
Cost of sales		26,76,000
Profit		1,94,000
Sales	10,250	28,70,000

Working Notes:

(i) Statement of Cost (10000 units)

	Total cost Rs.	*Cost per unit* Rs.
Materials	10,40,000	104.00
Wages	6,00,000	60.00
Factory Overheads 60% of wages	3,60,000	36.00
Factory cost	20,00,000	200.00
Administration overhead 20% of factory cost	4,00,000	40.00
Total cost	24,00,000	240.00

(ii) Statement of differences between the two set of accounts

	Financial A/c Rs.	*Cost A/c* Rs.	*Difference* Rs.	*Remarks*
Factory overhead	3,79,000	3,60,000	19,000	Under recovery
Administrative overhead	4,24,000	4,00,000	24,000	Under recovery
Selling expenses	2,20,000	2,46,000	26,000	Over recovery
Opening stock	70,000	90,000	20,000	Over recovery
Closing stock	50,000	60,000	10,000	Over recovery

(iii) Reconciliation Statement

			Rs.
Profit as per cost accounts			1,94,000
Less: Under recovery of Overhead in Cost A/c			
Factory Overhead		19,000	
Administrative Overhead		24,000	– 43,000
Add: Over-recovery of selling overhead in Cost A/c			+ 26,000
Add: Over-valuation of opening stock in Cost A/c			+ 20,000
Less: Over-valuation of closing stock in Cost A/c			– 10,000
Add: Income excluded from Cost A/c			
Interest	1,000		
Rent	40,000		+ 41,000
Less: Expenses excluded from Cost A/c			
Bad debts	16,000		
Preliminary expenses	20,000		– 36,000
Profit as per financial account			1,92,000

Example 15.19

The following figures have been taken from the financial accounts of a manufacturing firm for the year of its operation:

	Rs.
Direct material consumption	50,00,000
Direct wages	30,00,000

(*Contd.*)

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Factory overheads	16,00,000
Administrative overheads	7,00,000
Selling and distribution overheads	9,60,000
Bad debts	80,000
Preliminary expenses written off	40,000
Legal charges	10,000
Dividends received	1,00,000
Interest on deposit received	20,000
Sales—120000 units	1,20,00,000
Closing Stock:	
Finished stock—4000 units	3,20,000
Work-in-progress	2,40,000

The Cost Accounts for the same period reveal that the Direct Material consumption was Rs. 56,00,000; Factory Overhead is recovered at 20% on Prime Cost; Administration Overhead is recovered @ Rs. 6 per unit of production; and Selling and Distribution Overheads are recovered at Rs. 8 per unit sold.

You are required to prepare, Costing and Financial Profit & Loss Accounts and reconcile the difference in the profit as arrived at in the two sets of accounts by preparing a Reconciliation Statement.

(B. Com. (Hons) Delhi, CA Inter)

Solution:

Costing Profit and Loss Account

	Rs.		*Rs.*
To Direct material consumed	56,00,000	By Sales	1,20,00,000
To Direct wages	30,00,000		
Prime Cost	86,00,000		
To Factory overheads (20% on prime cost)	17,20,000		
	1,03,20,000		
Less: Work-in-Progress	2,40,000		
Works cost	1,00,80,000		
To Administrative overheads (Rs. 6 per unit produced)	7,44,000		
Cost of production (124000 units)	1,08,24,000		
Less: Closing stock (4000 units)	3,49,161		
Cost of production of goods sold	1,04,74,839		
To Selling & distribution overheads (8 × 1,20,000)	9,60,000		
To Net Profit	5,65,161		
	1,20,00,000		1,20,00,000

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Financial Profit and Loss Account

	Rs.		*Rs.*
To Direct materials consumed	50,00,000	By Sales	1,20,00,000
		By Dividends	1,00,000
To Direct wages	30,00,000	By Interest on deposits	20,000
To Factory overheads	16,00,000	By Closing Stock:	
To Admn. overheads	7,00,000	Finished stock	3,20,000
To Selling & distribution	9,60,000	Work-in-progress	2,40,000
To Bad debts	80,000		
To Pre. expenses	40,000		
To Legal charges	10,000		
To Net profit	12,90,000		
	1,26,80,000		1,26,80,000

Reconciliation Statement

		Rs. *(+).*	*Rs.* *(–)*
	Profit as shown by financial books	12,90,000	
Less:	Direct Materials overcharged in costs		6,00,000
	Factory overheads over-absorbed in costs		1,20,000
	Administrative overheads undercharged in cost		44,000
Add:	Closing stock of finished goods overvalued in costs	29,161	
	Bad debts not recovered in costs	80,000	
	Preliminary expenses not charged in costs	40,000	
	Legal charges not charged in cost	10,000	
Less:	Dividends not included in costs		1,00,000
	Interest on deposits not included in costs		20,000
		14,49,161	8,84,000
Profit as per Cost Accounts			5,65,161
		14,49,161	14,49,161

Example 15.20

The Cost Accountant of a company has arrived at a profit of Rs. 73,24,150 based on cost accounting records for the Year ended 31.3.2007 As Cost Auditor, you find the following differences between the financial accounts and cost accounts (figures are in Rupees):

(a)	Decrease in value of WIP and finished goods inventory		
	as per F/A	1,28,21,995	
	as per cost account	1,31,04,220	Rs.
(b)	Profit on sale of fixed assets		61,500
(c)	Loss on sale of investments		11,200
(d)	Voluntary retirement compensation included in salaries and wages in F/A		16,75,000
(e)	Donation paid		25,000

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(f) Major repairs and maintenance written off in F/A 13,26,000
(Amount reckoned in Cost Accounts Rs. 6,08,420 for this job)
(g) Insurance claim relating to previous year received during the year 14,29,000
(h) Profit from retail trading activity 7,12,300

You are required to prepare a reconciliation statement between the profit figures as per costing and financial accounts. (Calculate the profit as per financial books) *(CA, Inter)*

Solution:

Reconciliation of profit between Cost Accounts and Financial Accounts for the year ended 31.3.2007

		Rs.	Rs.
Profit as per Cost Accounts			73,24,150
Add: (a) Difference in valuation of stock:			
Decrease in inventory as per Cost Accounts	Rs. 1,31,04,220		
Decrease in inventory as per Financial Accounts	Rs. 1,28,21,995		
Hence, valuation in Financial Books is higher by		2,82,225	
(b) Profit on sales of assets not included in Cost Accounts		61,500	
(c) Receipts of Insurance claim relating to previous year		14,29,000	
(d) Profit from trading activity		7,12,300	24,85,025
			98,09,175
Less: (a) Loss on sale of investments		11,200	
(b) Voluntary retirement compensation not included in cost		16,75,000	
(c) Donation paid		25,000	
(d) Part of repairs and maintenance costs excluded in Cost Accounts (13,26,000 – 6,08,420)		7,17,580	24,28,780
Profit as per Financial Accounts			73,80,395

THEORY QUESTIONS

1. Explain the need for reconciliation of cost and financial accounts.
(ICWA)

2. It has been stated that the results worked out from the costing records and those worked out from the financial accounts may not necessarily agree. Why?
(B. Com. Delhi)

3. Give reasons as to why it is necessary to reconcile cost accounts and financial accounts. What is the accounting procedure to be adopted for their reconciliation?
(C A, PE, Exam II, Group II, Nov. 2002, May 2004)(CA Inter)

4. Indicate the reasons why it is necessary for the cost and financial accounts of an organisation to be reconciled and explain the main sources of difference which would enter into such a reconciliation.

5. Discuss the main sources of difference between profit shown by financial accounts and profit shown by cost accounts. *(B. Com. (Hons), Delhi)*

6. Describe in brief the conditions which necessitate reconciliation of financial and cost records.
(B. Com. (Hons), Delhi)

7. What is a reconciliation statement?. Give reasones for the difference in profit as per cost accounts and financial accounts.

(B. Com. (Hons), Delhi,2004, 2007, B. Com. Delhi, 2004)

PROBLEMS

1. The following transactions have been extracted from the financial books of a company:

		Rs.	*Units*
Sales		2,50,000	20000
Materials		1,00,000	
Wages		50,000	
Factory overheads		45,000	
Office and administration overheads		26,000	
Selling and distribution overheads		18,000	
Closing stock;			
Finished goods		15,000	1230
Work-in-progress:			
Materials	3,000		
Wages	2,000		
Factory overheads	2,000	7,000	
Goodwill written off		20,000	
Interest on capital		2,000	

In costing books factory overhead is charged at 100% on wages, administration overhead at 10% of factory cost and selling and distribution at the rate of Re 1 per unit sold. Prepare a statement reconciling the profit as per cost and financial accounts.

(B. Com. (Hons). Delhi)

Ans: Profit as per cost accounts Rs. 30,000
Profit as per financial accounts Rs. 11,000

2. The following figure are available from financial accounts for the year ending 31st March, 2002:

	Rs.
Direct material consumption	2,50,000
Direct wages	1,00,000
Factory overheads	3,80,000
Administration overheads	2,50,000
Selling and distribution overheads	4,80,000
Bad debts	20,000
Preliminary expenses (written off)	10,000
Legal charges	5,000
Dividend received	50,000
Interest on deposit received	10,000
Sales 1,20,000 units	7,00,000
Closing stock:	
Finished stock = 40,000 units	1,20,000
Work-in-progress	80,000

The cost accounts reveal:
Direct material consumption—Rs. 2,80,000
Factory overhead recovered at 20% on prime cost.
Administration overhead at Rs. 3 per unit of production.
Selling and distribution overhead at Rs 4 per unit sold.

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Prepare:

1. Costing profit and loss account.
2. Financial profit and loss account.
3. Statement reconciling the profits disclosed by the costing profit and loss account and financial profit and loss account.

(CA Inter)

Ans: Loss as per cost A/c Rs. 4,22,000
Loss as per financial books Rs. 5,35,000

3. During the year a company's profits have been estimated from the costing system to be Rs. 46,126, whereas the financial accounts audited by the auditors disclose a profit of Rs. 33,248. Given the following information, you are required to prepare a reconciliation statement showing clearly the reasons for the difference:

To Opening Stock	Rs. 4,94,358		By Sales	Rs. 6,93,000
To Purchases	1,64,308			
	6,58,666			
Less: Closing Stock	1,50,242	5,08,424		
To Direct Wages		46,266		
To Factory Overhead		41,652		
To Gross Profit c/d		96,658		
		6,93,000		6,93,000
To Administration Expenses		19,690	By Gross Profit b/d	99,658
To Slling Expenses		44,352	By Sundry Income	632
To Net Profit		33,248		
		97,290		97,290

(a) Stock ledger closing balance is Rs. 1,56,394;
(b) Credit balance in wages control account is Rs. 49,734;
(c) Credit balance in factory overhead control account is Rs. 39,428;
(d) Administration expenses are charged to sales at 3% of selling price in cost accounts;
(e) Selling price includes 5% (on sales) provision for selling expenses;
(f) Sundry incomes is not considered in cost accounts.

4. From the information given below, prepare (i) a statement showing costing profit and loss and (ii) another statement reconciling the costing profits with those shown by financial accounts:

Profit and Loss A/c for the Year Ending 31st March, 2007

	Rs.		Rs.
To Materials consumed	1,05,000	By Sales (1,50,000 units)	2,00,000
To Direct wages	45,000		
To Indirect factory expenses	30,000		
To Office expenses	9,000		
To Selling and distribution expenses	6,000		
To Net profit	5,000		
	2,00,000		2,00,000

The normal output of the factory is 1,00,000 units. Factory expenses of a fixed nature are Rs. 18,000. Office expenses are for all practical purposes constant. Selling and distribution expenses are constant to the extent of Rs. 3,000 and the balance varies with sales.

(B. Com. (Hons), Delhi)

Ans: Loss as pre cost accounts, Rs. 10.000

5. The profit as per cost accounts is Rs. 1,65,300. The following details are ascertained on comparison of the Cost and Financial Accounts.

	Cost accounts Rs.	*Financial accounts* Rs.
(a) Opening Stocks:		
Materials	32,600	33,000
Work-in-progress	20,000	21,000
(b) Closing Stocks:		
Materials	36,000	34,400
Work-in-progress	16,000	15,200
Finished Goods	8,000	9,000

(c) Directors' fees paid Rs. 1,000, interest paid Rs. 800; reserve for bad debts Rs. 500, transfer fees collected Rs. 300, and dividends received Rs. 200 are exclusively taken in Financial Accounts, but ignored in Cost Accounts.
(d) Rent charged in costing but not in Financial Accounts Rs. 6,000.
(e) Preliminary expenses written off Rs. 13,000, but not charged in costing.
(f) Overheads charged in Financial Books Rs. 1,21,200, but recovered in costing Rs. 1,26,200.
Find out profit as per Financial Accounts and draw up a Reconciliation Statement.

Ans: Profit as per financial accounts, Rs. 1,58,700

6. A Company's trading, and profit and loss account was as follows:

Dr.			Cr. Rs.
To Purchase	25,210	By Sales: 50000 units	
Less: Closing stock	4,080	@ Rs. 1.50 each	75,000
	21,130	By Discount received	260
To Direct wages	10,500	By profit on sale of land	2,340
To Work expenses	12,130		
To Selling expenses	7,100		
To Administration expenses	5,340		
To Depreciation	1,100		
To Net profit	20,300		
	77,600		77,600

The profit as per cost accounts was only Rs. 19,770. Reconcile the financial and cost profits using the following information:
(a) Cost accounts valued closing stock at Rs. 4,280.
(b) The work expenses in the cost accounts were taken at 100% of direct wages.
(c) Selling and administration expenses were charged in the cost accounts at 10% of sales and Re. 0.10 per unit respectively.
(d) Depreciation in the cost accounts was Rs. 800.

(CA Inter)

7. The following is the trading, and profit and loss account of M/s Time and Tide Limited for the year ending 31st December, 2001.

	Rs.			Rs.
To Materials consumed	7,08,000	By Sales 30,000 units		15,00,000
To Direct wages	3,71,000	By Finished stock		
To Works overheads	2,13,000	1000 units		40,000
To Administration overheads	95,500	By Work-in-progress:		
To Selling and distribution		Material	17,000	
overheads	1,13,500	Wages	8,000	
To Net profit for the year	69,000	Works overhead	5,000	30,000
	15,70,000			15,70,000

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In manufacturing a standard unit, the company's cost records show that:

(i) Work overhead have been charged to work-in-progress at 20% on prime cost.
(ii) Administration overheads have been recovered as Rs. 3 per finished unit.
(iii) Selling and distribution overheads have been recovered as Rs. 4 per unit sold.
(iv) The under-absorbed or over-absorbed overheads have not been adjusted into the costing P & L A/c.

Prepare:

(i) A costing profit and loss account indicating net profit.
(ii) A statement reconciling the profit as disclosed by the cost accounts and that shown in the financial accounts.

(B. Com. Delhi)

Ans: Profit as per cost account ,Rs. 66,000

8. From the accounts of M/s Shankar & Co. Ltd. the trading, and profit and loss accounts are reproduced below:

	Rs.		Rs.
To Raw materials:		By Work-in-progress:	
Opening stock	29,500	Materials	4,000
Purchase	1,86,500	Wages	5,500
To Wages	2,98,000	Work expenses	3,300
To Work expenses	1,90,750	By Cost of goods manufactured	6,59,950
		By Closing stock of raw materials	32,000
	7,04,750		7,04,750
To Cost of goods sold	6,59,950	By Sales (7600 units)	9,12,000
To Administrative expenses	1,22,500	By Finished stock (1400 units)	1,17,600
		By Interest on investment	6,800
To Selling and distribution expenses	1,64,000		
To Bad debts written off	17,500		
To Net profit transferred to appropriation A/c	72,450		
	10,36,400		10,36,400

The following information is also available:

1. Accrued wages of Rs. 17,000 included in wages.
2. Works expenses are allocated to production at 60 per cent of direct labour cost.
3. Administrative expenses are allocated at Rs. 12 per unit of production.
4. Selling and distribution expenses are allocated so as to work out 20% of selling price.

Prepare the costing profit and loss account and statement of reconciliation between the two accounts (cost and financial).

(B. Com. (Hons), Delhi, 2004)

Ans: Profit as per cost account Rs. 91,200

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PART 4

COST ANALYSIS FOR DECISION MAKING AND CONTROL

Part 4 explains the procedure of making cost analysis for managerial decision making, control and planning. Managers need to understand behavior of costs for better planning, effective control and sound decision making. The topics covered in this part are variable costing, alternative choices decisions, pricing decisions, standard costing, budgeting, responsibility accounting and divisional performance measurement.

16. MARGINAL (VARIABLE) COSTING
17. ALTERNATIVE CHOICES DECISIONS
18. PRICING DECISIONS
19. STANDARD COSTING
20. BUDGETING
21. RESPONSIBILITY ACCOUNTING AND DIVISIONAL PERFORMANCE MEASUREMENT

MARGINAL (VARIABLE) COSTING

16

Learning Objectives

After reading this chapter, you should be able to:

1. explain concepts of marginal cost, marginal and absorption costing;
2. distinguish between absorption costing and marginal costing, advantages and limitations of marginal costing;
3. describe the preparation of income statement under absorption costing and marginal costing;
4. discuss methods of determining cost behaviour, cost-volume-profit (CVP) analysis and its limitations, curvilinear break-even analysis and
5. understand cost indifference point.

CONCEPT OF MARGINAL COST, MARGINAL COSTING

Marginal cost, in cost accounting, means variable production costs, that is, the costs which tend to vary in direct proportion to the changes in the production level. If an extra unit of output is produced, the costs which could be incurred for producing this extra unit, will only be marginal (variable) costs since fixed costs remain constant.

Marginal costing is a costing techinque in which only variable manufacturing costs are considered and used while valuing inventories and determining cost of goods sold. That is, only variable manufacturing costs are considered product costs and are allocated to products manufactured. These costs include direct materials, direct labour and variable factory overhead. Fixed factory (manufacturing) overheads are not considered product costs and are not used to value inventories and determine the cost of goods sold and are excluded from the cost of product. Fixed manufacturing costs are treated as period costs in marginal costing, that is, costs which are a function of a time rather than of production. In marginal costing, fixed manufacturing overheads are written off to the profit and loss account in the period in which they are incurred.

Absorption Costing

Absorption costing, also known as full costing, is a costing technique in which all manufacturing costs, variable and fixed, are considered as costs of production and are used in determining the cost of goods manufactured and inventories. All manufacturing costs are fully absorbed into finished goods.

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DIFFERENCE BETWEEN MARGINAL COSTING AND ABSORPTION COSTING

Marginal costing and absorption costing differ from each other in the following respects:

1. *Cost element in product cost* Marginal costing and absorption costing differ only in the treatment of fixed factory (manufacturing) overheads in the accounting records and financial statement. In both the costing techniques it is agreed that selling and administrative expenses, whether variable or fixed, are period costs and these costs are not treated as product costs with the result that selling and administrative expenses are not included in the costs of inventories, and costs of goods sold. Similarly, it is also agreed that variable manufacturing costs are products costs, i.e., costs to be charged to the product.The disagreement between the two, is only in regard to the treatment of fixed manufacturing costs.
2. *Inventory values* Marginal costing and absorption costing do influence inventory values differently. The value of inventories under marginal costing is relatively at a lower figure as inventories are determined in terms of only variable production costs. In absorption costing, the value of inventories is comparatively at a higher figure because it considers fixed factory overhead also besides the variable production costs.
3. *Difference in net income* The treatment of fixed factory overhead brings differences in the net income figures in the two costing techniques. The magnitude of any difference in net income is a function of fixed manufacturing costs per unit and the change in inventory levels.

The question of difference in net income has been further explained in the following pages while discussing income statement under absorption costing and marginal costing.

INCOME STATEMENTS UNDER ABSORPTION COSTING AND MARGINAL COSTING

Income Statement under Absorption Costing

Under absorption costing all costs are divided into three categories: manufacturing, selling, and administrative costs. In the income statement, all manufacturing costs (variable and fixed) are subtracted from the sales revenue to get a gross margin/gross profit on sales: and selling and administrative expenses (fixed and variable) are deducted from gross margin to arrive at the net income.

It should be clearly understood that fixed manufacturing overhead are charged to units produced on the basis of per unit fixed manufacturing overhead rate obtained by dividing the standard fixed manufacturing overhead by normal output level as follows:

$$\frac{\text{Standard fixed manufacturing overhead}}{\text{Normal output (Capacity)}}$$

If production is above or below the normal or standard output, adjustments are made for volume (capacity) variances. If the volume (capacity) variance is favourable, i.e., over-absorption (actual production being higher than normal capacity production), the amount of over-absorption is deducted from the total cost of goods manufactured and sold. If the volume (capacity) variance is unfavourable, i.e., under-absorption (actual production being lesser than normal capacity production), the amount of under-absorption is added to the cost of goods manufactured and sold. A proforma of income statement prepared under absorption costing is given in Fig. 16.1.

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Income Statement (Absorption Costing)

		Amount Rs.
Sales		
Less:	Manufacturing costs:	
	(1) Variable production costs:	
	Direct material cost	
	Direct labour cost	
	Variable manufacturing overhead	
	(2) Fixed factory (manufacturing) overhead	
	Cost of goods manufactured	
Add:	Beginning inventory	
	Cost of goods available for sale	
Less:	Closing inventory	
	Cost of goods sold	
	Over- or under-applied factory (manufacturing) overhead (Over-absorption to be deducted and under-absorption to be added)	
	Cost of goods sold at actual	
	Gross profit on sales	
Less:	Fixed selling and administrative expenses	
	Variable selling and administrative expenses	
	Net Income	

Fig. 16.1 Income Statement Proforma (Absorption Costing)

Income Statement under Marginal Costing

Under marginal costing, only variable costs of production (direct material, direct labour and variable manufacturing) are subtracted from sales revenue to determine a balance which is known by different names, such as marginal contribution, marginal income (profit), marginal revenue, marginal balance, profit pick-up, etc. All fixed costs, and variable selling, distribution and administrative costs are deducted from this balance to arrive at the net income. Since fixed manufacturing costs are not charged to products under marginal costing, there can be no volume (capacity) variance. Marginal contribution/marginal income under marginal costing is greater than the gross profit/gross margin under absorption costing. Figure 16.2 depicts a proforma of income statement prepared under marginal costing.

Under marginal costing, fixed manufacturing overhead are excluded and therefore inventory values are lower than inventory value computed under absorption costing. Income may be higher or lower depending upon whether inventories are built up or liquidated. That is, the income statement under absorption costing may reflect higher profit if the production is more than the normal capacity production and also lower sales has been made. This happens because above normal capacity production has over-absorbed its actual fixed manufacturing overhead.

Absorption/full costing and marginal costing influence differently gross profit, net profit, and inventory values of different month/periods. The following data and income statement prepared under both costing techniques explain this situation.

Income Statement (Marginal Costing)

		Amount (Rs.)
Sales		
Less:	Variable production costs:	
	Direct material costs	
	Direct labour cost	
	Variable manufacturing (factory) overhead	
	Cost of goods manufactured	
Add:	Beginning inventory	
	Cost of goods available for sale	
Less:	Closing inventory	
	Cost of goods sold	
	Marginal contribution	
Less:	Fixed manufacturing overhead	
	Variable selling and administrative expenses	
	Fixed selling and administrative expenses	
	Net Income	

Fig. 16.2 Income Statement Proforma (Marginal Costing)

Data:

Normal capacity 20,000 units per month
Variable costs (direct materials, direct labour, variable factory overhead) per unit Rs. 6.
Fixed factory overhead Rs. 25,000 per month or Rs. 1.25 per unit at normal capacity.
Fixed selling and administrative expenses are Rs. 5,000 p.m.
Variable selling and administrative expenses are Re. 1.00 per unit sold.
Sales prices per unit is Rs. 10.
Actual production, sales and inventories in units are:

	First month	*Second month*	*Third month*	*Fourth month*
Unit in beginning inventory	—	—	3,000	1,000
Units produced	1 7,500	21,000	19,000	20,000
Units sold	17,500	18,000	21,000	16,500
Units in closing inventory	—	3,000	1,000	4,500

Solution:

Income Statement (Absorption Costing)

	First month	*Second month*	*Third month*	*Fourth month*
Sales	Rs. 1,75,000	1,80,000	2,10,000	1,65,000
Variable cost per unit Rs. 6	1,05,000	1,26,000	1,14,000	1,20,000
Fixed factory overhead @ Rs. 1.25	21,875	26,250	23,750	25,000
Cost of goods manufactured	1,26,875	1,52,250	1,37,750	1,45,000

(*Contd.*)

Add: Beginning inventory	—	—	21,750	7,250
Cost of goods available for sales	1,26,875	1,52,250	1,59,500	1,52,250
Less: Ending inventory	—	21,750	7,250	32,625
Cost of goods sold	1,26,875	1,30,500	1,52,250	1,19,625
Over- or under-applied factory overhead	3,125	(1,250)	1,250	—
Cost of goods sold at actual	1,30,000	1,29,250	1,53,500	1,19,625
Gross profit on sales	45,000	50,750	56,500	45,375
Selling and administrative expenses (fixed and variable)	22,500	23,000	26,000	21,500
Net income for the month	22,500	27,750	30,500	23,875

Note: In absorption costing income statement, fixed factory expenses are included in the unit cost and also in the inventory values.

(i) Ending inventory: Second month $\frac{3,000}{21,000} \times 1,52,250 = \text{Rs. } 21,750$

Third month $\frac{1,000}{22,000} \times 1,59,500 = \text{Rs. } 7,250$

Fourth month $\frac{4,500}{21,000} \times 1,52,250 = \text{Rs. } 32,625$

(ii) In first month, Rs. 3,125 is under-absorbed factory overhead due to production less than normal capacity and should be added to the cost of goods sold.

(iii) In the second month, Rs. 1,250 is over-absorbed due to higher production and has, therefore been subtracted.

(iv) In the third month, Rs. 1,250 is under-absorbed and has been added back to cost of goods sold.

(v) In the fourth month, production is at normal capacity and there is no under- or over-absorption.

Income Statement (Marginal Costing)

	First month	*Second month*	*Third month*	*Fourth month*
Sales (Rs.)	1,75,000	1,80,000	2,10,000	1,65,000
Variable production cost:				
Variable manufacturing costs Rs. 6 per unit	1,05,000	1,26,000	1,14,000	1,20,000
Cost of goods manufactured	1,05,000	1,26,000	1,14,000	1,20,000
Add: Beginning inventory	—	—	18,000	6,000
Cost of goods available for sale	1,05,000	1,26,000	1,32,000	1,26,000
Less: Closing inventory	—	18,000	6,000	27,000
Cost of goods sold	1,05,000	1,08,000	1,26,000	99,000
Contribution	70,000	72,000	84,000	66,000
Less: Fixed factory overhead	25,000	25,000	25,000	25,000

(*Contd.*)

Fixed selling and administrative expenses	5,000	5,000	5,000	5,000
Variable selling and administrative expenses	17,500	18,000	21,000	16,500
Total fixed costs and non-manufacturing variable costs	47,500	48,000	51,000	46,500
Net income for the month	22,500	24,000	33,000	19,500

Note: Under marginal costing, fixed factory (manufacturing) overhead costs are not included in the product unit costs and costs of inventories.

(i) Valuation of closing inventory

Second month = 3,000 × Rs. 6 = Rs. 18,000

Third month = 1,000 × Rs. 6 = Rs. 6,000

Fourth month = 4,500 × Rs. 6 = Rs. 27,000

(ii) The question of under- or over-absorption of factory overhead does not arise under marginal costing.

A comparison of the income statements leads to the following conclusions:

1. Under variable costing, the closing inventory is costed at a smaller figure because only variable production costs are charged to the product.
2. Both costing methods report the same amount of profit in periods in which production and sales are equal and there is no inventory change (first month). This is because the amount of fixed factory overhead costs charged to the period was the same in each case. Under marginal costing Rs. 25,000 was deducted from sales as period costs. Under absorption costing Rs. 25,000 was charged to the sales in two parts; (a) Rs. 21,875 as part of the cost of sales (17,500 units × Rs. 1.25); and (b) Rs. 3,125 as unfavourable volume (capacity) variance.
3. When inventory of manufactured goods fluctuates from period to period, net income will differ somewhat under the two methods because absorption costing requires that part of the period costs be included in inventory, whereas marginal costing excludes period costs. Therefore:
   (i) When production exceeds sales (the inventory is increased), the net income reported under absorption costing is higher than that reported under variable costing. This follows because under absorption costing, a portion of the fixed costs budgeted for the period is shifted to the following period in the closing inventories whereas under marginal costing the total fixed costs are charged against income. This is clear from comparing the net income of the second and fourth month.
   (ii) When sale exceeds production (the inventories are decreased), marginal costing shows a higher profit because only current period costs are being charged aganist current revenues, whereas under absorption costing the period costs previously included in inventory are now being charged against current revenues. This situation is illustrated by the income of the third month.
4. Under marginal costing profits always move in the same direction as sales volume. They cannot, of course, increase or decrease in direct proportion because unit fixed costs do not remain constant. Profit reported under absorption costing behave irregularly and sometimes in the opposite direction from sales. For example, sales of the fourth month are lower than the sales of the first month, yet the net income reported for the fourth month is higher than the net income for the first month.
5. The above income statements are prepared on the assumption that selling prices remained constant and that there were no changes in either the manufacturing costs or the selling and administrative expenses. Further, it has been assumed that overheads costs are absorbed at predetermined rates based on normal capacity.

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6. The aggregate net income (of different months or periods taken together) will be the same under both costing methods provided production and sales, in total, are equal. In the above example, total production are 77500 units and total sales are 73000 units. Since production and sales are unequal, the combined net income is not the same.

Reconciliation of Net Income

The differences in the net income between absorption costing and marginal costing are due to: (i) amount of fixed factory overhead charged to inventory, (ii) Over- or under-absorbed fixed factory overhead having been deferred in absorption costing. The entire difference in net income can be explained by the amount of fixed factory overhead that is included in the beginning and closing inventories.

Reconciliation of Differences between Absorption and Marginal Costing Income

	Second month (Rs.)	*Third month (Rs.)*	*Fourth month (Rs)*
Marginal costing income	24,000	33,000	19,500
Absorption costing income	27,750	30,500	23,875
Difference to be explained	(3,750)	2,500	(4,375)
1. Differences in the value of opening and closing inventories:			
(a) Second month:			
Opening	0	—	—
Closing 18,000–21,750	(3,750)		
(b) Third month:			
Opening 18,000–21,750	—	3,750	
Closing 6,000 –7,250	—	(1,250)	—
(c) Fourth month:			
Opening 6,000–7,250	—	—	(1,250)
Closing 27,000–32,625	—	—	(5,625)
	(3,750)	2,500	(4,375)

Inventory Values

Differences between the net incomes reported under absorption costing and marginal costing are also reflected in inventory values. As stated earlier, inventories under absorption costing absorb a part of the fixed manufacturing costs of a period, whereas inventories under marginal costing include only the variable manufacturing costs. Closing inventories calculated from the data given above would be as follows:

Closing Inventories

	First month	*Second month*	*Third month*	*Fourth month*
Absorption costing @ Rs. 7.25 per unit	—	21,750	7,250	32,625
Marginal costing @ Rs. 6.00 per unit	—	18,000	6,000	27,000

The following summarises the differences between marginal costing and absorption costing with regard to effect on net income:

1. If production = sales; absorption profit = marginal costing profit.
2. If production > sales; absorption profit > marginal costing profit.

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3. If production < sales; absorption profit < marginal costing profit.
4. If production fluctuates and sales are constant; absorption profit fluctuates and marginal costing profit is constant.
5. If production is constant and sales fluctuates; both profits vary in the direction of sales.

APPLICATIONS (ADVANTAGES) OF MARGINAL COSTING

The marginal costing has great potentialities for management in different managerial tasks and decision-making processes. Marginal costing is particularly useful to management in (i) profit planning, (ii) product pricing decisions, (iii) cost control, (iv) managerial decision-making, and (v) the impact of fixed costs.

Profit Planning

Profit planning, generally known as budget or plan of operations, may be defined as the planning of future operations to attain a defined profit goal. Under marginal costing, the cost data needed for profit planning and decision-making are readily available from the accounting records and statements. It facilitates the analysis of cost-volume-profit relationships by separating fixed and variable costs on the income statement. Marginal costing helps management in planning and evaluating the profit resulting from a change in volume, in the sales-mix, in make or buy situations, in the selection of the most profitable products, customers, territories, and other segments of the entire business.

Product Pricing Decisions

Marginal costing provides more useful information to management for pricing than absorption costing. Marginal costing serves as the basis of product pricing in many cases. Under marginal costing, management has the data to determine when it is advisable to accept orders if other than normal conditions exist. In some cases, a sales order can be accepted even if it contributes partly to fixed costs. However, the full cost and not only the variable cost should be the basis of product pricing in the long-run. The full cost is the cost which includes variable manufacturing cost and fixed manufacturing cost incurred in the production process.

Cost Control

Marginal costing provides continuing opportunities to review period costs in relation to the level of sales and net income. Separation of variable and period costs supports the use of standards, budgets, and responsibility reporting to aid management in controlling costs. Marginal costing helps in preparing reports for all departments or responsibility centres based on standard costs, flexible budgets, and a division of all costs into their fixed and variable components. All managers can examine and interpret their reports with respect to the cost variances originating in their respective areas of responsibility. Reports prepared on the marginal costing basis and accompanied by additional information become valuable planning and control tools.

Impact of Fixed Costs

Marginal costing evaluates the impact of fixed costs on profits because the total amount of fixed costs for the period appears in the income statement. It is argued that managerial decisions can be easily made if fixed expenses are separated and are not mixed, in controlling operating costs.

Managerial Decision Making

The identification and classification of costs as either fixed or variable provide a framework for the accumulation and analysis of costs. This also provides a basis for the study of contemplated changes in

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production levels or proposed actions concerning new markets, plant expansion or contraction, or special promotional activities. The marginal income figure is useful figure to management because it can be readily projected to measure increments in net income which accompany increments in sales.

LIMITATIONS OF MARGINAL COSTING

The limitations of marginal costing are listed below:

1. The marginal costing method requires that all costs should be divided into fixed and variable components. It cannot be true under all circumstances. Examples of factors that might affect this assumption include quantity discounts on materials, and labour efficiency variances.
2. Complete product cost does not depend only on variable costs. Fixed costs should be considered in determining the product cost, for long-range pricing and other long-run policy decisions.
3. Income figure obtained under marginal costing have to be used carefully if management decides to expand business or drop a product line. Management has to consider other factors also before deciding to drop a product line such as customer goodwill.

COST BEHAVIOUR

Cost behaviour can be defined as the manner in which costs changes due to changes in volume or activity. In relation to cost behaviour analysis, fixed and variable cost classifications are generally found. A proper analysis of cost behaviour patterns is the basis of all profit planning and cost control. The separation of costs into fixed, variable and semi-variable is necessary in order to determine, analyse, control, measure or evaluate the following:

1. Departmental expenses allowed at various levels of production.
2. Operating efficiency of a department.
3. Use of variable costing method.
4. Utilisation of facilities.
5. Break-even point.
6. Relative profitability of territories, departments and customers.
7. Company profit position.
8. Cost-volume-profit analysis.
9. Marginal or differential cost for various decision making purposes.
10. Effect of proposed capital expenditures.
11. Effect of alternative courses of action.

METHODS OF DETERMINING COST BEHAVIOUR

Several methods are used for segregating semi-variable costs into fixed and variable. There are four major techniques that are found in practice and they may be listed as follows:

1. High and low points method
2. Scattergraph method
3. Least squares regression method
4. Accounting or analytical approach.

High and Low Points Method

This approach considers the difference in total cost between two different volumes, and divides the incremental cost by the volume. As the words 'high' and 'low' imply, the two levels of volume chosen are the highest and the lowest for the period under review. The result of this division is the estimated variable cost per unit. Then, the average activity level is computed together with the average cost for the periods in the data base. The fixed cost is estimated by taking the total average cost and subtracting the variable cost for the average activity level. The variable cost is computed by multiplying the average activity level by the variable cost per unit as determined above.

As a simple illustration, assume that a company incurred the following costs in two periods (high and low) in which 5000 units and 10000 units were produced:

	Cost incurred	
	5000 units	10000 units
Insurance on factory building	Rs. 30,000	Rs. 30,000
Indirect material	Rs. 45,000	Rs. 70,000

Since insurance remained constant at the two volumes, there is no variable component. Indirect materials contain both a fixed and variable components.

Separation is made as follows:

Variable components:		
Indirect material cost of 10000 units		Rs. 70,000
Indirect material cost of 5000 units		Rs. 45,000
Cost of production of additional 5000 units		Rs. 25,000
Variable cost per unit Rs. 25,000 ÷ 5000 units		Rs. 5
Fixed components:	5000 units	10000 units
Total indirect material cost	Rs. 45,000	Rs. 70,000
Variable components @ Rs. 5 per unit	Rs. 25,000	Rs. 50,000
Fixed costs for period	Rs. 20,000	Rs. 20,000

Scattergraph Method

In this method, various costs are plotted on a vertical line, the *y*-axis, and measurement figures (activity levels such as direct labour hours, units of output, percentage of capacity or direct labour cost) are plotted along a horizontal line, the *x*-axis. A stright line is fitted to this scatter of points by visual approximation. The slope of the line is used to estimate the variable costs and the intercept of the line with the vertical axis is considered as the estimated fixed cost.

Least Squares Regression Method

The method of least squares uses the equation for a straight line:

$Y = a + bx$, with a as the fixed element, and b the degree of variability. For many accounting applications, regression provides an accurate estimate of fixed and variable costs.

Accounting or Analytical Approach

This approach to cost behaviour analysis is a close scrutiny of the chart of accounts and a classification of costs into their fixed and variable components according to their basic characteristics determined by the accountant using good judgement, knowledge, and experience. This approach is simple and inexpensive but in its simplicity lies its inherent weakness. The results obtained are not accurate and may happen to be mere guesses.

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Example 16.1

The following are the maintenance costs incurred in a machine shop for six months with corresponding machine hours:

Month	*Machine hours*	*Maintenance costs*
		Rs.
January	2000	30,000
February	2200	32,000
March	1700	27,000
April	2400	34,000
May	1800	28,000
June	1900	29,000
Total:	12000	1,80,000

Analyse the Maintenance Cost which is semi-variable into fixed and variable element.

Solution:

Computation of Variable Cost and Fixed Cost has been done according to Range Method.

	Machine hours	*Maintenance costs*
		Rs.
Highest point, April	2400	34,000
Lowest point, March	1700	17,000
	700	7,000

$$\text{Variable cost per machine hour} = \frac{\text{Change in maintenance costs}}{\text{Change in hours}}$$

$$= 7000 \div 700 = \text{Rs. } 10$$

Total variable cost for 2400 machine hours will be $2400 \times$ Rs. 10 = Rs. 24,000

Hence, fixed cost is (Rs. 34,000 – Rs. 24,000) = Rs. 10,000

Analysis of Maintenance Cost into Fixed and Variable Element

	Machine hours	*Maintenance cost (Rs.)*	*Fixed cost (Rs.)*	*Variable cost (Rs.)*
January	2000	30,000	10,000	20,000
February	2200	32,000	10,000	22,000
March	1700	27,000	10,000	17,000
April	2400	34,000	10,000	24,000
May	1800	28,000	10,000	18,000
June	1900	29,000	10,000	19,000

COST-VOLUME-PROFIT (CVP) ANALYSIS

Profits of business firms are the result of many factors such as: (i) selling prices, (ii) volume of sales (iii) unit variable costs (iv) total fixed costs, (v) combinations in which the various product lines are sold, etc. To do an affective job in planning, management must have analyses which allow reasonably correct predictions of how profits will be affected by a change in any one of these factors. A cost volume profit (CVP) analysis is useful to management in knowing how profit is influenced by sales volume, sales price, variable expenses and fixed expenses.

Broadly, CVP analysis uses the techniques of (i) Break-even analysis and (ii) Profit-volume (P/V) analysis.

Break-even Analysis

A break-even analysis indicates at what level cost and revenue are equal and there is no profit and no loss. It is a simple and easily understandable method of presenting to management the effect of changes in volume on profits. Detailed analysis of break-even data will reveal to management the effect of alternative decisions which reduce or increase costs and which increase sales volume and income. It is a device which portrays the effects of any type of future planning by evaluating alternative courses of action.

Break-even Point

The break-even point can be defined as the point or sales level at which profit are zero and there is no loss. That is, break-even point is that point at which total costs are equal to total sales revenue. At the break-even point profit being zero, contribution (sales-variable cost) is equal to the fixed cost. If the actual volume of sales is higher than the break-even volume, there will be a profit. Beyond the break-even point, all the marginal contribution represents income.

Assume that a company manufactures and sells a single product as follows:

Selling price per unit = Rs. 20

Variable cost per unit = Rs. 10

Total fixed cost = Rs. 1,00,000

The break-even sales to cover fixed costs will be 10000 units,

Selling price per unit = Rs. 20

Variable cost per unit = Rs. 10

Contribution = Rs. 10

$$\text{Break-even volume} = \frac{\text{Rs. 1,00,000 fixed cost}}{\text{Rs. 10 contribution margin}}$$

= 10000 units.

If the company can sell more than 10000 units, it will earn profits because fixed costs remain constant. If less than 10000 units are sold, a loss will be incurred. The profits will be equal to the number of units sold in excess of 10000 units multiplied by the unit contribution margin. For example, if 25000 units are sold the company will be operating at 15000 units above its break-even point and will earn a profit of Rs. 1,50,000 (15000 units × Rs. 10 contribution margin).

Break-even Formula

The break-even point can be obtained directly by a mathematical formula. The basic formula to find out the break-even point is:

$$\text{Break-even sales (units)} = \frac{\text{Fixed cost}}{\text{Contribution margin per unit}}$$

$$\text{Break-even sales (volume)} = \frac{\text{Fixed cost}}{\text{C / S ratio (also known as P / V ratio*)}}$$

$$\text{Break-even sales volume} = \frac{\text{Total fixed expenses}}{1 - \text{Total variable expenses/Total sales volume}}$$

$$\text{Cash break-even point (units)} = \frac{\text{Cash fixed cost}}{\text{Cash contribution per unit}}$$

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* C/S ratio is popularly known as P/V ratio because after fixed costs are fully recovered, that is, after break-even point, all contributions (sales-variable costs) become profit. However, before break-even point all contributions will not become profit since fixed costs are yet to be recovered.

Break-even Chart

Total revenues and total costs at different sales volume can be estimated and plotted on a break-even chart. This chart is constructed as follows:

1. A horizontal base line, the *x*-axis, is drawn and spaced into equal distances representing either plant capacity, sales volume or number of units.
2. A vertical line, the *y*-axis is drawn on the left side of the chart and also spaced into equal parts. This line indicates sales revenue and also costs.
3. A line parallel to the horizontal line (*x*-axis) is drawn for fixed costs.
4. A total cost line is drawn starting at the *y*-axis fixed cost point and moving to the right. This total cost line represents the total of all items of cost, fixed and variable.
5. The sales line is drawn starting at the zero point on the vertical axis and ending at the top on the right side.
6. The total cost line intersects the sales line at a point which is known as the break-even point.
7. The area to the left of the break-even point between the total cost line and the sales line is the loss area; the profit area lies to the right of the break-even point above the total cost line.

The data from the previous example are presented on the break-even chart (see Fig. 16.3).

From Fig. 16.3 it can be observed that the break-even point occurs when sales are 10000 units at Rs. 2,00,000.

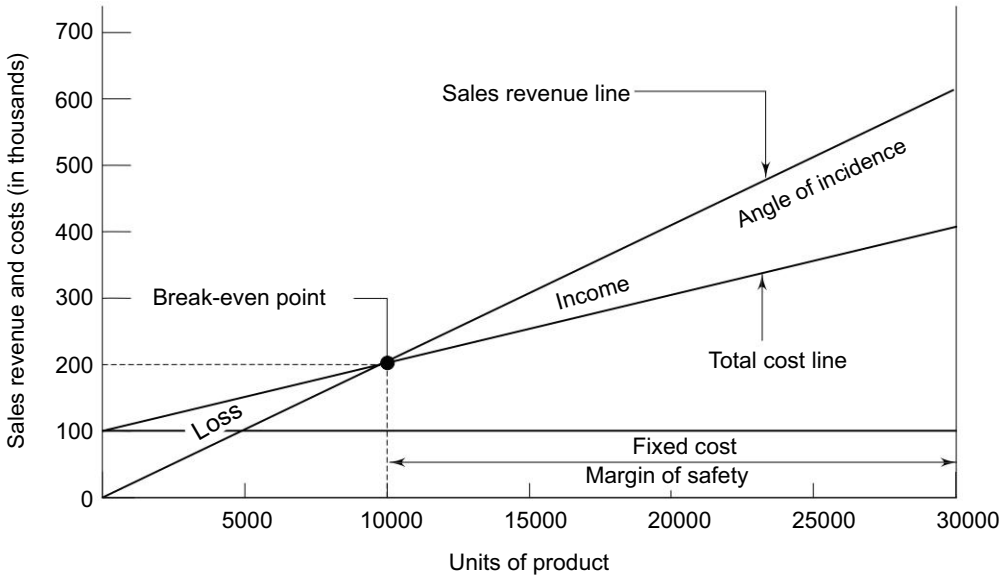


Fig. 16.3 Break-even Chart

Cash Break-Even Point

If a firm has a minimum of available cash or the opportunity cost of holding excess cash is high, management may want to know the volume of sales that will cover all cash expenses, during a period. This is known as the cash break-even point.

Not all fixed operating costs involve cash payments. For example, depreciation expense is a non-cash charge. To find the cash break-even point, the non-cash charges must be subtracted from total fixed operating costs. Therefore, the cash break-even point is lower than the usual break-even point. The formula is:

$$\text{BEP} = \frac{FC - d}{P - V}$$

where P is selling price per unit

V is unit variable cost

FC is Fixed operating costs

d is depreciation expenses

Thus, cash break-even point indicates break-even sales to cover only the fixed costs involving cash payments and to break-even.

This is illustrated below:

Let Sales 20000 units at Rs. 10 per unit

Variable costs, Rs. 4 per unit

Fixed cost Rs. 50,000 including depreciation, Rs. 10,000

Preference divided to be paid Rs. 20,000

Taxed to be paid Rs. 25,000

Assume that there are no lags in payment.

Break-even point (in units) will be 6667 units as displayed in Fig. 16.4.

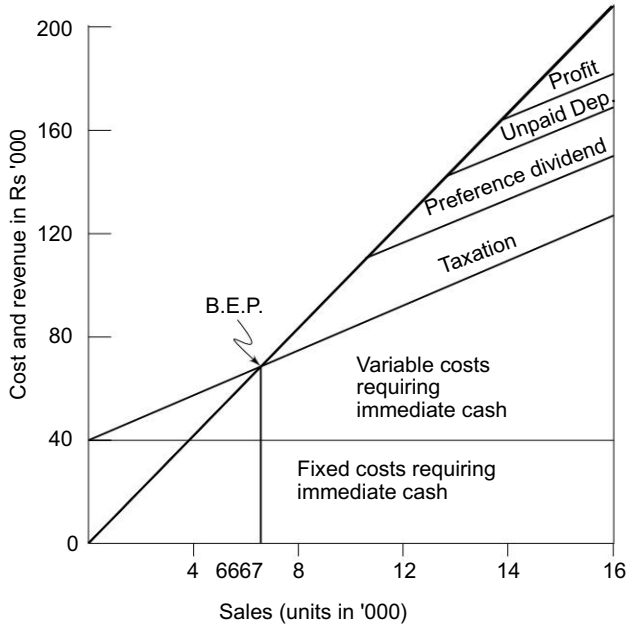


Fig. 16.4 Break-even Chart

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Margin of Safety

This is the difference between sales and the break-even point. If the distance is relatively short, it indicates that a small drop in production or sales will reduce profits considerably. If the distance is long, it means that the business can still make profits even after a serious drop in production. It is important that there should be a reasonable margin of safety, otherwise a reduced level of production may prove dangerous. The margin of safety can be found by using the following formula:

$$\text{Margin of safety} = \text{Profit} \div \text{P/V ratio}$$

or

$$\text{Margin of safety} = \frac{\text{Profit} \times \text{Sales}}{\text{Sales} - \text{Variable cost}}.$$

Angle of Incidence

This is the angle at which the sales line cuts the total cost line. Management's aim will be to have as large an angle of incidence as possible because a large angle of incidence shows a high rate of profit. A narrow angle would show that even fixed overheads are absorbed and profit accrues at a relatively low rate of return, indicating that variable costs form a large part of cost of sales.

Sales Formula

Often, it is necessary to know what level of sales is required to achieve a desired level of profit. The desired sales can be expressed in various ways:

$$\text{Sales} = \text{Fixed cost} + \text{Variable cost} + \text{Profit}$$
$$\text{Sales} = (\text{Profit} + \text{Fixed cost})/\text{P/V ratio}$$

Basic Assumptions in Break-even Analysis

Break-even analysis is based on several assumptions, listed as follows:

1. Selling prices and pricing policy will remain constant at all sales levels. If this is not ture, sales revenue cannot be plotted as a straight line.
2. All costs and expenses can be separated into fixed and variable components.
3. The total of the fixed costs is constant at all sales levels; the unit variable costs remain the same. If this is not true, straight lines cannot be drawn.
4. Production and sales quantities are equal.
5. Managerial policies, technological methods, and efficiency of men and machines will not change and cost control will neither be strengthened nor weakened.
6. Volume is assumed to be the only important factor affecting cost behaviour. Other influencing factors such as unit prices, sales-mix, labour strikes, and production methodology remain constant.
7. In case of multiple products being manufactured by the enterprise, the sales-mix should remain unchanged. That is, the calculation of the break-even point in the case of multiple products predetermines the number of units to be sold in respect of each product. This multiproduct sales-mix should remain unchanged.

Curvilinear Break-even Analysis

Break-even analysis is based on the assumption that total sales line and total cost line are straight lines and have linear relationship between them. However, in reality, this may not be true and there may be not linear relationship between total sales line and total cost line. This may be due to the following reasons:

First, sales value may decline after demand level has reached at the saturation point.

Second, average variable cost per unit may decrease if a firm gets discount on the bulk purchase of raw materials when output increases.

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In another situation when the plant is being operated at higher capacity to have higher production, there is likely to be breakdowns and bottle-necks making variable cost per unit to increase. Therefore, after a particular level of output, variable cost per unit may increase.

In such cases, the contribution will not increase in linear proportion that is, the total cost line will not be straight, as assumed but will be of curvilinear shape. This situation will give rise to two break-even points. The optimum profit is earned at the point where the distance between sales and total cost is the greatest. This is displayed in Fig. 16.5.

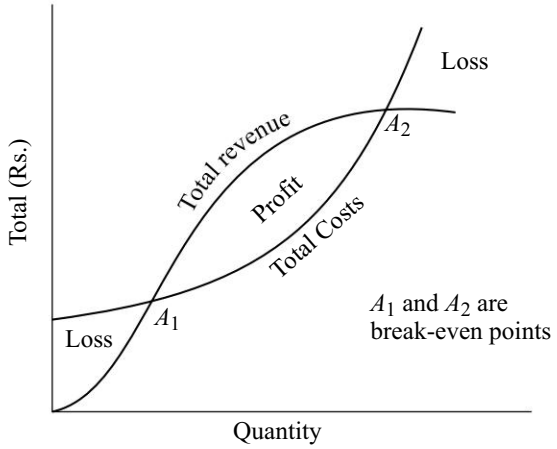


Fig. 16.5 Curvilinear break-even Chart

Profit/Volume (P/V) Analysis

A P/V graph is sometimes used in place of or along with a break-even chart. Profits and losses are given on a vertical scale; and units of products, sales revenue or percentage of activity are given on a horizontal line. The horizontal line is drawn on the graph to separate profits from losses. The profits and losses at various sales levels are plotted and connected by the profit line. The break-even point is measured at the point where the profit line intersects the horizontal line. The P/V graph may be preferred to the break-even chart because profit and losses at any point can be read directly from the vertical scale; but the P/V graph does not clearly show how costs vary with activity.

Data used earlier to prepare the break-even chart are also used in preparing the P/V graph (see Fig. 16.6).

A cost-volume profit analysis can be used to measure the effect of factor changes and management decision alternatives on profits. These factors include possible changes in selling prices, changes in variable or fixed cost, expansion or contraction of sales volume, or other changes in operating methods or policies. Cost-volume profit analysis is also useful for problems of product pricing, sales-mix, adding or deleting product lines, and accepting special orders.

Changes in Selling Prices

The CVP graph is frequently used to illustrate the potential profit effects of contemplated price changes. Effects on the profit pattern are as follows:

1. *Increase in selling price* If the selling price is increased, it increases the P/V ratio, and the rate of fixed costs recovery is increased. The break-even point (break-even volume) declines, profit beyond the break-even point increases, losses below the break-even point decreases.

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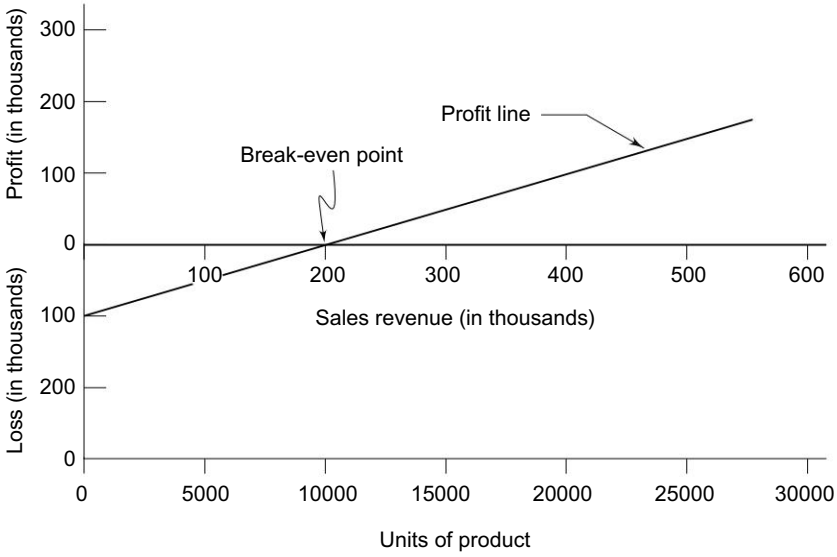


Fig. 16.6 Profit Volume (P/V) Graph

2. *Decrease in selling price* If the selling price decreases, it decreases the P/V ratio and the rate of fixed cost recovery declines. The break-even point increases.

Assume, for example, that a company produces a product with a selling price of Rs. 10 per unit and a variable cost of Rs. 4 per unit. Fixed costs are Rs. 36,000 per year. The effect of a 20% increase and 20% decrease in the present selling price is given below:

	Selling price		
	Present	*20% Increase*	*20% Decrease*
Selling price per unit	Rs. 10.00	Rs. 12.00	Rs. 8.00
Variable cost per unit	4.00	4.00	4.00
Marginal contribution per unit	6.00	8.00	4.00
P/V ratio	60%	$66\frac{2}{3}\%$	50%
Fixed costs	36,000	36,000	36,000
Break-even point in units	6,000	4,500	9,000
In volume	60,000	54,000	72,000
Changes in break-even point	–	–	–
In units	0%	– 25%	+ 50%
In sales volume	0%	– 10%	+ 20%

Changes in Variable Costs

The CVP graph is used to evaluate the impact of increases and decreases in variable costs per unit.

1. *Increase in variable costs* An increase in variable costs has the same effect as a decrease in the selling price. It decreases the P/V ratio and the rate of fixed cost recovery is slower. The break-even point moves to higher level; profits after the break-even point decreases; losses before the break-even point increases.

2. *Decrease in variable costs* A decrease in variable costs has the same effect as an increase in the selling price. A higher P/V ratio is achieved and the rate of fixed costs recovery is increased. The break-even point declines, profits beyond the break-even point are higher; losses before the break-even point are lower.

To illustrate the effect of change in variable costs, assume a company is selling a product for Rs. 40 a unit and has a variable cost of Rs. 20 per unit. Fixed costs total Rs. 48,000 per year. The effects of a 20% increase and a 20% decrease in variable cost are given in the following Table:

	Present variable cost (Rs.)	*20% Increase (Rs.)*	*20% Decrease (Rs.)*
Unit selling price	40.00	40.00	40.00
Variable cost per unit	20.00	24.00	16.00
Marginal contribution	20.00	16.00	24.00
P/V ratio	50%	40%	60%
Fixed costs	48,000	48,000	48,000
Break-even point:			
Sales volume	96,000	1,20,000	80,000
Units	2,400	3,000	2,000

Changes in Fixed Cost

Increases and decreases in the fixed cost do not have any impact on the P/V ratio but they change the break-even point. With the same P/V ratio, the rate of the fixed costs recovery remains the same.

1. *Increase in fixed costs* If fixed costs are increased, the break-even point (break-even-volume) is higher. Profits above the break-even point are lower by the amount of the increase in fixed costs; below the break-even point losses increase by the amount of increase.
2. *Decrease in fixed costs* If fixed costs are decreased, it lowers the break-even point. The profits are greater by the amount of the decrease, and losses are smaller by the amount of the decrease in fixed costs.

Assume that a company has a P/V ratio of 40% and present fixed costs of Rs. 50,000. The effects of change in the fixed costs by Rs. 10,000 are as follows:

	Present fixed cost	*Increase by* Rs. 10,000	*Decrease by* Rs. 10,000
Fixed costs	Rs. 50,000	Rs. 60,000	Rs. 40,000
P/V ratio	40%	40%	40%
Break-even point (Rs.)	1,25,000	1,50,000	1,00,000
Decrease	0	+25,000	– 25,000

From the above example, it is clear that the P/V ratio is the same in each situation and break-even point can be determined by dividing the amount of the change by the P/V ratio:

$$\frac{\text{Change in fixed costs}}{\text{P/V ratio}}$$

$$= \frac{\text{Rs. } 10{,}000}{40\,\%} = \text{Rs. } 25{,}000$$

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DESIRED OR TARGET PROFIT

Sometimes, management faces two decisions: (i) to increase sales volume through reduction in selling prices, and (ii) to increase selling prices in case the P/V ratio is low, with the expectation that a higher profit will be earned. These decisions should be taken carefully after studying the profit pattern and other factors, otherwise the results can be harmful particularly for those companies whose P/V ratios are already low. Also, if reduction in selling prices does not increase the sales volume, the price reduction will result only in lower profits. Price cuts, like increase in variable unit costs, decrease the contribution margin. On a unit basis, price decreases may appear to be insignificant, but when the unit differential is multiplied by thousands of units, the total effect may be significant. Perhaps, many more units will have to be sold to make up the loss in profit or to earn a target profit.

Assume Company *A* hopes to increase its profits by selling more units, and to sell more, it plans to reduce its prices by 10%. The present price and cost structure and the desired one is given below:

	Present price and cost	*Desired price and cost*
Selling price	Rs. 50	Rs. 45
Variable cost	25	25
Contribution margin	25	20
Contribution margin (%)	50%	44.4%

At present, the contribution margin being 50%, Company *A* will break-even when sales are twice the fixed costs. This means that if fixed costs are 1,00,000, 4000 units must be sold to earn a revenue of Rs. 2,00,000. But when the price is reduced to recover Rs. 1,00,000 in fixed costs, sales revenue must amount to Rs. 2,25,000. Not only must the revenue be higher but with a lower price per unit, more units must be sold to obtain that revenue; 5000 units must be sold just to break-even. To overcome the effect of the cut in price, sales volume in physical units must be increased by 25%.

5000 units to be sold at a lower price to break-even.
4000 units to be sold at present price to break-even.
1000 Increase in number of units.

$$\frac{1000}{4000} = 25\%$$

Sales revenue must be increased by $12\frac{1}{2}$ %.

Rs. 2,25,000 sales revenue at new break-even point.
Rs. 2,00,000 sales revenue at present break-even point.
Rs. 25,000 increase in sales revenue.

$$\frac{25{,}000}{2{,}00{,}000} = \frac{1}{8} = 12\frac{1}{2}\%$$

The increase in sales volume required to overcome the effect of a price reduction is relatively greater when the rate of the contribution margin per unit is relatively low. If a product makes only a small contribution, then a reduction in selling price makes it all the more difficult to recover the fixed costs and to earn profits.

Similarly, a business firm may think of increasing the selling price if the P/V ratio is low. However, increase in selling price may reduce the sales volume.

Suppose a company has the following present and proposed costs and selling price structure:

	Present	*Proposed*
Selling price per unit	Rs. 100	Rs. 120
Variable cost per unit	70	70
Contribution per unit	30	50
P/V Ratio	30%	41.67%
Increase in contribution	–	20

Decrease in the present sales volume without effecting the present $= \frac{20}{50} = 40\%$

If there is a 20% increase in the selling price, the sales volume should not decline by more than 40%. If decline in sales volume is less than 40% the profit position would be improved. Thus, any company with a P/V ratio of 30% can raise its selling price by 20% and absorbed a 40% reduction in sales volume without reduction in net income regardless of the amount of fixed costs involved.

MULTI-PRODUCT SITUATIONS

When there are multiple products with different contribution margins, the mix of the product has a direct effect on the fixed costs recovery and total profits of the firm. Different products have different P/V ratios because of different selling prices and variable costs. Some products make larger contributions to fixed cost recovery and profit than others. The total profits depends to some extent upon the proportions in which the products are sold.

For example, assume that a company with fixed costs of Rs. 25,000 per year manufactures two products *A* and *B* with P/V ratios as follows:

	Product A	*Product B*
Unit selling price	Rs. 10	Rs. 20
Variable costs	4	16
Marginal contribution	6	4
P/V Ratio	60%	20%

With comparatively low variable costs, product *A* has a relatively high P/V ratio, each unit of product *A* sold contributes Rs. 6 to fixed costs recovery and profit. Product *B*, with comparatively high variable costs, has a low P/V ratio, each unit sold contributes only Rs. 4 to fixed costs recovery and profit. Other things being equal, the sale of product *A* is more profitable than that of product *B*, despite the fact that the selling price of product *B* is twice that of product *A*. It is correct to say that profits will decline as the sales mix shifts from product *A* to product *B*. This also implies, however, that new analyses of profit volume relationship must be made as the product-mix changes.

Different combinations of sales-mix (based on the above-figure) will result in different net income. For example, if the total sales volume is Rs. 1,00,000 equally divided between the two products, the net income would be Rs. 15,000.

	Product A	*Product B*	*Total*
Per cent of sales revenue	50%	50%	100%
Sales revenue	Rs. 50,000	50,000	1,00,000
P/V ratio	60%	20%	40%
Marginal contribution	30,000	10,000	40,000
Fixed costs			25,000
Net income			Rs. 15,000

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$$\text{Break-even point} = \frac{\text{Fixed cost}}{\text{P/V ratio}}$$

$$= \frac{25{,}000}{40\%} = \text{Rs. } 62{,}500$$

If the sales mix is changed so that product *A* has 60% of the sales revenue, the profit on sales of Rs. 1,00,000 would increase to Rs. 19,000.

	Product A	*Product B*	*Total*
Per cent of sales revenue	60%	40%	100%
Sales revenue	Rs. 60,000	40,000	1,00,000
P/V ratio	60%	20%	44%
Marginal contribution	36,000	8,000	44,000
Fixed cost			25,000
Net income			Rs. 19,000

$$\text{BEP} = \frac{25{,}000}{44\%} = \text{Rs. } 56{,}818$$

SALES MIX AND BREAK-EVEN POINT

Sales mix is the relative proportion of each product line to the total sales of various products sold by an enterprise. As stated earlier, if there are no constraints or limitations, management should try to maximise the sales of the product(s) with higher P/V ratio. However, a sales mix results because there are limits to the quantities of any given product that can be produced and there may also be certain market limitations on how much can be sold.

When different products have their own different production facilities, selling prices, variables costs and fixed costs separately, cost-volume-profit analysis can be done for each product separately. But, in many situations, this is not found and different products share common facilities and have common fixed costs. In such a situation CVP analysis is performed by averaging the data using the sales mix as weights. The break-even point is computed for a specified sales mix and break-even chart and P/V graph are constructed for any specified sales mix. But any one break-even chart or P/V graph will show a constant sales mix for the total sales of different products, covering the cost and revenue lines as well. The sales necessary to achieve desired or target level of operating profit can be computed on the basis of specified sales mix. If the sales mix changes, CVP analysis, break-even point, desired sales for target profit, costs and revenue lines will also change accordingly.

To illustrate the computation of break-even point in a sales mix situation, an example is given here. Assume, for a company, the fixed costs are Rs. 6,75,000. Further, assume that the units sales volume, units selling prices, unit variable costs, unit contribution margins for products *A*, *B* and *C* are as follows:

Products	*Sales Volume (units)*	*Unit Selling (price) (Rs.)*	*Unit Variable Cost (Rs.)*	*Contribution per unit (Rs.)*	*Margin % (P/V ratio) (Rs.)*
A	20000	50	20	30	60
B	10000	50	30	20	40
C	10000	50	40	10	20
	40000				

Break-even points (in units) will be computed using a weighted average contribution margin as follows:

Products	*Sales Mix (%)*		*Contribution Margin per unit (Rs.)*	*Weighted Contribution Margin (Rs.)*
A	50%	×	30	15
B	25%	×	20	5
C	25%	×	20	2 .50
Total weighted contribution margin				Rs. 22.50

$$\text{BEP (Units)} = \frac{\text{Fixed cost}}{\text{Weight contribution margin}}$$

$$= \frac{\text{Rs. } 6{,}75{,}000}{\text{Rs. } 22.50} = 30000 \text{ units}$$

The detailed composition of sales and contribution margins at this level (30000 units) are as follows:

Products	*Sales Mix*		*Total Units*		*Units of Products*		*Contribution Margin per unit (Rs.)*	*Total Contribution (Rs.)*
A	50%	×	30000	=	15000	×	30	4,50,000
B	25%	×	30000	=	7500	×	20	1,50,000
C	25%	×	30000	=	7500	×	10	75,000
Break-even contribution margin.								Rs. 6,75,000

Break-even point (sales in Rupees) can also be calculated. For this, first, total P/V ratio is required and then divide the fixed costs by total P/V ratio. Using the above information, calculation is shown below:

	Products			
	A	*B*	*C*	*Total*
Sales (units)	20000	10000	10000	40000
Selling Price (Rs.) per unit	50	50	50	
Sales (Rs.)	10,00,000	5,00,000	5,00,000	20,00,000
Less: Variable Costs (Rs.)	4,00,000	3,00,000	4,00,000	11,00,000
Contribution margin	6,00,000	2,00,000	1,00,000	9,00,000
Less: Fixed Costs				6,75,000
Profit before tax				2,25,000

$$\text{Total P/V ratio} = \frac{\text{Total contribution}}{\text{Total sales}}$$

$$= \frac{\text{Rs. } 9{,}00{,}000}{\text{Rs. } 20{,}00{,}000}$$

$$= 45\%$$

$$\text{Break-even sales (Rs.)} = \frac{\text{Fixed cost}}{\text{Total P/V ratio}}$$

$$= \frac{\text{Rs. } 6{,}75{,}000}{45\%}$$

$$= \text{Rs. } 15{,}00{,}000$$

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Rs. 15,00,000 as break-even sales can be verified by computing break-even sales of individual products as follows:

Product	*Break-even Units*	*Selling Price (Rs.)*	*Break-even Sales (Rs.)*
A	15000	50	7,50,000
B	7500	50	3,75,000
C	7500	50	3,75,000
Total break-even sales:			15,00,000

If there is any change in the above sales mix, the break-even point, P/V ratio, amount of profit before tax may change. For instance, assume that the quantities sold of products *A*, *B* and *C* are 5000 units, 20000 units and 15000 units, respectively. Further, assume, that there are no changes with regard to fixed costs, variable cost per unit and selling price per unit. The change in the sales mix will influence the factors of CVP analysis as shown below:

Products	*Sales Volume (units)*	*Sales Mix %*	*Contribution margin per (units) (Rs.)*	*Total Contribution (Rs.)*	*Sales Revenue (Rs.)*
A	5,000	12.50%	30	1,50,000	2,50,000
B	20,000	50%	20	4,00,000	10,00,000
C	15,000	37.5%	10	1,50,000	7,50,000
Total contribution margin				7,00,000	
Less: Fixed Costs				6,75,000	
Profit before tax				25,000	

$$\text{Total P/V ratio} = \frac{\text{Total contribution}}{\text{Total sales}}$$

$$= \frac{\text{Rs. } 7,00,000}{\text{Rs. } 20,00,000}$$

$$= 35\%$$

$$\text{Break-even sales} = \frac{\text{Fixed costs}}{\text{Total P/V ratio}}$$

$$\text{Break-even sales} = \frac{\text{Rs. } 6,75,000}{\text{Rs. } 17.50}$$

$$= \text{Rs. } 19,28,571$$

Break-even point in units will be computed using a weighted average contribution margin, as stated earlier.

The calculation is shown below:

Products	*Sales Mix (%)*		*Contribution Margin Per unit (Rs.)*	*Weighted Contribution margin (Rs.)*
A	12.50%	×	30	3.75
B	50%	×	20	10.00
C	37.50%	×	10	3.75
Total weighted contribution margin				17.50%

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$$\text{BEP (units)} = \frac{\text{Fixed cost}}{\text{Weight contribution margin}}$$

$$= \frac{\text{Rs. } 6,75,000}{17.50}$$

$$= 38,571 \text{ units}$$

It can be observed that due to change in sales mix profit before tax is considerably lower (Rs. 25,000) although the amount of sales revenue is the same. The total contribution is less than the earlier ones. P/V ratio has decreased (35%) and break-even-point in units has increased to 38,571 units. These differences are due to changes in sales mix. On the need of promoting products having different P/V ratios, Anderson and Sollenberger advise:

> "One way to encourage the sales force to sell more of the high contribution margin lines is to compute sales commissions on the contribution margin and not on sales revenue. If sales commissions are based on sales revenue, a sales force may have a high volume of sales of less profitable product lines and still earn a satisfactory commission. But if sales commission are related to contribution margin, the sales force is encouraged to strive for greater sales of more profitable products, and, in doing so, will help to improve total company profits.'[1]

DESIRED PROFIT AND TAX

The amount of desired profit before income taxes is treated as if it were additional fixed costs in finding out the sales units or sales revenue required to give the amount of desired profit. The usual formula is:

$$\text{Desired sales units} = \frac{\text{Fixed cost + Profit before Tax}}{\text{Contribution Margin per unit}}$$

$$\text{Desired sales revenue} = \frac{\text{Fixed cost + Profit before Tax}}{\text{P/V ratio}}$$

The amount of desired profit can be mentioned as a profit after income taxes. In such a case, the profit before tax is calculated by the following formula:

$$\text{Profit before tax} = \frac{\text{Profit after Tax}}{(1-\text{tax rate})}$$

For instance, if profit after tax is Rs. 1,20,000 and tax rate 40%, profit before tax will be Rs. 2,00,000 as calculated below:

$$\text{Profit before tax} = \frac{1,20,000}{(1-.40)}$$

$$= \text{Rs. } 2,00,000$$

Sometimes management is interested in knowing the sales units required to give a specified amount of profit on per unit basis. The formula for computing such number of sales units to give desired profit per unit is as follows:

$$\text{Sales unit for desired profit per unit} = \frac{\text{Fixed cost}}{(\text{Contribution margin per unit} - \text{Desired profit per unit})}$$

[1] Lane K. Anderson and Harold M. Sollenberger, *Managerial Accounting,* South Western Publishing Co., pp. 156-157.

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Say, if fixed costs are Rs. 1,00,000 and contribution margin per unit Rs. 10 and the desired profit per unit Rs. 2, then the sales units required to give this profit will be 12500 units, as calculated below:

$$\text{Sales units for desired profit per unit} = \frac{\text{Rs. } 1,00,000}{(\text{Rs. } 10 - \text{Rs. } 2)}$$

$$= \frac{\text{Rs. } 1,00,000}{\text{Rs. } 8}$$

$$= 12500 \text{ units}$$

Similarly, if the desired profit is stated not on a per unit basis, but as a percentage of sales, the relevant formula for calculating the required sales volume is:

$$\text{Sales volume for desired profit (as percentage of sales)} = \frac{\text{Fixed cost}}{(\text{P/V ratio} - \text{proft margin})}$$

Say, if fixed costs are Rs. 1,00,000, P/V ratio 40% and profit margin (percentage of sales) 20%, the required sales revenue will be Rs. 5,00,000 as calculated below:

$$\text{Sales volume (for desired profit margin)} = \frac{\text{Rs. } 1,00,000}{(40\% - 20\%)} = \text{Rs. } 5,00,000$$

IMPROVING PROFIT-VOLUME RATIO

P/V ratio can be improved by the following possible courses of action:

(i) Increase the unit selling price of product.
(ii) Reducing the product unit variable/marginal cost.
(iii) Increasing the share of high contribution margin products in a multiproduct company.
(iv) Reducing the share of low contribution margin products in the total sales.

COST INDIFFERENCE POINT

A cost indifference point is that point at which total costs (fixed cost and variable cost) associated with the two alternatives are equal. There may be two methods or two alternatives of doing a thing, say two methods of production. It is also possible at a particular level of activity, one production method or method of doing a thing is superior to another, and vice versa. Accordingly there is a need to know at which level of production, it will be preferable to shift from one production method to another production method. This level or point is known as cost indifference point and at this point total cost of two production methods are the same.

Cost indifference point is useful in many decision situations, such as quality improvement schemes, different marketing plans, production plans or methods etc.

Cost indifference point should be distinguished from break-even point. Break-even point compares total sales and total cost of a product. Also, at break-even point total cost line intersects total sales line. As stated above, cost indifference signifies equality of total costs of two alternatives or two methods of doing the same thing. At cost indifference point, total cost lines of two alternatives intersect each other.

Example 16.2

A factory is thinking whether to hire a machine at an annual charge of Rs. 12,00,000 to increase the production of a product from current level of 6000 units. It is expected that hiring of new machine will reduce the variable cost per unit by Rs. 100 due to savings in labour cost. Fixed costs of the factory will remain the

same, except the hiring charges of Rs. 12,00,000. The selling price of the product is Rs. 1200 per unit. The present cost breakup of the product is as follows:

Variable cost Rs. 900 per unit
Fixed cost Rs. 100 per unit.

Required: Calculate cost indifference point for the new machine (that is, additional units which must be produced and sold to justify hiring the machine)

Solution:

Contribution Per Unit

	Existing	*New*
Selling price per unit (Rs.)	1,200	1,200
Variable cost per unit (Rs.)	900	800
Contribution per unit	300	400

Total contribution required:

Existing contribution = 6000 units × Rs. 300	=	Rs. 18,00,000
Hiring charges of the machine	=	Rs. 12,00,000
Total contribution required		30,00,000

$$\text{Number of units to be sold} = \frac{\text{Total contribution required}}{\text{Proposed contribution per unit}}$$

$$= \frac{\text{Rs. } 30,00,000}{\text{Rs. } 400}$$

= 7500 units

Additional number of units to be sold = 7500 – 6000 = 1500 units

Thus, 1500 additional units need to be produced and sold to justify hiring of the machine.

Notes: For the new machine indifference point is the point indicating the extra units to be manufactured and sold to achieve the existing level of profit. Production and sale of 7500 units with hiring the new machine will give total contribution of Rs. 30,00,000 and after deducting hiring charges of Rs. 12,00,000 remaining contribution Rs. 18,00,000 will help in maintaining the current level of profit which is also Rs. 18,00,000.

LIMITATIONS OF CVP ANALYSIS

CVP analysis is a useful planning and control device, usually in the form of a chart, showing how revenue, costs, and profit fluctuate with volume. The CVP technique is useful to management in areas of budgeting, cost control and decision making. In spite of CVP being a useful technique, it suffers from some limitations. Some limitations of CVP are as follows:

1. It is difficult to classify exactly all the expenses into fixed and variable category. In fact, most of the expenses are neither totally variable nor wholly fixed in a realistic situation.
2. Contribution itself is not a guide if there is some key or limiting factor. Therefore, contribution needs to be linked with key or limiting factor.
3. Sales staff and marketing personnel may give undue importance to marginal cost as compared to total cost and decide to sell at a price based on marginal cost, which will result in low profits or loss.

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4. Fixed overheads cannot altogether be excluded particularly in large contracts while valuing work-in-progress. In other situations or business decisions as well, consideration of fixed overheads becomes necessary to judge the performance and profitability.
5. In a multiproduct situation, different products typically yield different contribution margins and are produced in various volumes with differing costs. As a result, neither the revenue curve nor the cost curve is necessarily straight and the break-even point is difficult to find.

Because of the many assumptions, CVP is only an approximation at best. If prices, unit costs, sales mix, operating efficiency, or other relevant factors change, then the overall CVP analysis and relationships also must be modified. Because of these assumptions, cost data are of limited significance.

Therefore, while preparing or interpreting cost-volume profit analysis, all assumptions and limitations should be carefully considered. A series of CVP analysis based on different sets of assumptions and circumstances may be prepared to reflect situations prevailing in different business enterprises. When circumstances change, CVP analysis should also be revised to reflect the changing situations. It is also necessary to have up-to-date analysis so that it can act as a useful device in profit forecast, budgeting, cost control and managerial decision-making.

Example 16.3

Prepare income statements under marginal costing and absorption costing from the following information for the year 2003–04:

Opening Stock : 500 units valued at Rs. 35,000 including variable cost of Rs. 50 per unit.
Fixed cost : Rs. 1,00,000
Output : 5000 units, variable cost: Rs. 60 per unit
Sales : 3000 units @ Rs. 100 per unit

Closing stock is valued on the basis of FIFO. Also explain the reason for difference in profits in both the cases. *(B.Com. (Hons), Delhi 1998, 2005)*

Solution:

Income Statement

Particulars	*Absorption Costing system*	*Marginal Costing system*
Sales (3000 × Rs. 100)	3,00,000	3,00,000
Less: Cost of manufactured and sold:		
Variable Cost	3,00,000	3,00,000
Fixed Cost	1,00,000	–
Add: Opening inventory		
Variable Cost	25,000	25,000
Fixed Cost	10,000	–
Cost of goods available for sales	4,35,000	3,25,000
Less: Closing Inventory:		
Variable Cost (for 2,500 units)	(1,50,000)	(1,50,000)
Fixed Cost	(50,000)	–
Cost of manufactured and sold	2,35,000	1,75,000
Gross margin/contribution	65,000	1,25,000
Less: Fixed cost	–	1,00,000
Profit	65,000	25,000

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The difference between two profits under two systems is because of Fixed cost charged on opening inventory and closing inventory. Under Absorption system, fixed cost included in opening stock (relating to previous year) is charged to this year sales. While under the marginal cost system, the fixed cost of the whole output is charged to the current sales. Difference in net income in absorption costing and marginal costing is simply due to difference in inventory values in the two costing techniques. This is clear from the following analysis.

Absorption costing profit	=	Rs. 65,000
Marginal costing profit	=	Rs. 25,000
Difference in net income	=	Rs. 40,000
Inventory values		
Absorption costing:		
Opening inventory		Rs. 35,000
Closing inventory		2,00,000
Difference	→	1,65,000
Marginal costing:		
Opening inventory		25,000
Closing inventory		1,50,000
Difference	→	1,25,000
Net difference in inventory values		Rs. 40,000

Notes: (i) Variable cost has been assumed as variable production cost.
(ii) Fixed cost has been treated as fixed production cost.

Example 16.4

You are given the following information relating to the year 2005–06 and 2006–07:

	2005–06	*2006–07*
Opening stock (units)	–	300
Production (units)	1200	1400
Fixed cost	Rs. 2,00,000	Rs. 2,10,000
Variable cost	Rs. 1,50,000	Rs. 2,80,000
Sales (units)	900	1100
Selling price (Rs./per unit)	400	500
Closing stock (units)	300	600

Prepare profit and loss account using FIFO under marginal costing and under absorption costing.

(B.Com. (Hons), Delhi, 2007)

Solution:

Profit and Loss A/c (Absorption Costing)

	2005-06	*2006-07*
Sales (Rs.)	3,60,000	5,50,000
Less: Cost of goods sold:		
Opening stock	–	87,500
Variable cost	1,50,000	2,80,000
Fixed cost	2,00,000	2,10,000

(*Contd.*)

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Cost of goods available for sales	3,50,000	5,77,500
Less: Closing inventory	87,500	2,10,000
Cost of goods sold	2,62,500	3,67,500
Net profit	97,500	1,82,500

Valuation of Closing Stock (based on FIFO)

$$2005\text{–}06 = \text{Fixed cost}\left(\text{Rs. } 2{,}00{,}000 \times \frac{300 \text{ units}}{1200 \text{ units}}\right) + \text{Variable cost}\left(\text{Rs. } 1{,}50{,}000 \times \frac{300}{1200}\right)$$

$$= \text{Rs. } 87{,}500$$

$$2006\text{–}07 = \text{Fixed cost}\left(\text{Rs. } 2{,}10{,}000 \times \frac{600}{1400}\right) + \text{Variable cost}\left(\text{Rs. } 2{,}80{,}000 \times \frac{600}{1400}\right)$$

$$= \text{Rs. } 2{,}10{,}000$$

Profit and Loss A/c (Marginal costing) FIFO

	2005–06	*2006–07*
Sales	3,60,000	5,50,000
Less: Cost of goods sold:		
Opening stock	–	37,500
Variable cost	1,50,000	2,80,000
Cost of goods available for sales	1,50,000	3,17,500
Less: Closing stock	37,500	1,20,000
Cost of goods sold	1,12,500	1,97,500
Margin	2,47,500	3,52,500
Less: Fixed cost	2,00,000	2,10,000
Net profit	47,500	1,42,500

Valuation of Closing Stock (FIFO)

$$2005\text{–}06 = \text{Rs. } 1{,}50{,}000 \times \frac{300}{1200} = \text{Rs. } 37{,}500$$

$$2006\text{–}07 = \text{Rs. } 2{,}80{,}000 \times \frac{600}{1400} = \text{Rs. } 1{,}20{,}000$$

Notes: For preparing Profit and Loss A/c, variable cost has been assumed as variable production cost. Further, fixed cost has been assumed as fixed production cost.

Example 16.5

The data given below relate to Modern Garments which produced and sold T-shirts during 2004–05: Opening stock of 500 T-shirts valued at Rs. 1,00,000 including variable cost of Rs. 80 per T-shirt:

Production	5,000 T-shirts
Sales @ Rs. 300 per T-shirt	4,000 T-shirts
Direct material cost	Rs. 2,00,000
Direct labour cost	Rs. 1,00,000

Factory overheads:
Variable Rs. 1,00,000
Fixed Rs. 6,00,000
Selling and distribution overheads:
Variable Rs. 20,000
Fixed Rs. 30,000
Closing stock is valued at current cost.

Prepare income statements under (a) absorption costing, (b) marginal costing, and (c) explain the reasons for the difference in profit under the two systems. *(B.Com. (Hons), Delhi, 2005)*

Solution:

(a) Income Statement under Absorption Costing System

		(Rs.)
Sales (4000 × 300)		12,00,000
Less: Cost of production and sold		
Variable production cost:		
Direct Material	2,00,000	
Direct Labour	1,00,000	
Factory overhead	1,00,000	
Fixed:		
Factory overheads	6,00,000	
Cost of production	10,00,000	
Add: Opening Inventory:		
Variable and Fixed Cost	1,00,000	
	11,00,000	
Less: Closing Inventory:		
$\left(\frac{10,00,000}{5,000} \times 1,500\right)$	3,00,000	
	8,00,000	8,00,000
Gross Margin		4,00,000
Less: Selling and Distribution Cost:		
Variable	20,000	
Fixed	30,000	50,000
Profit		3,50,000

Note: Closing inventory (1500 T-shirts) have been costed in terms of only current production cost that is, Rs. 10,00,000 based on FIFO assumption.

(b) Income Statement (Marginal Costing)

			Rs.
	Sales (4000 × 300)		12,00,000
Less :	Variable production cost of goods sold:		
	Direct material	Rs. 2,00,000	
	Direct labour	1,00,000	
	Factory overheads	1,00,000	
		4,00,000	

(*Contd.*)

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Add	:	Opening inventory (500 × 80)	40,000	
			4,40,000	
Less	:	Closing inventory (1500 × 80)	1,20,000	
		Variable cost of production of goods sold		3,20,000
		Contribution		8,80,000
Less	:	(i) Fixed factory overheads		(6,00,000)
		(ii) Variable selling and distribution overheads		(20,000)
		(iii) Fixed selling and distribution overheads		(30,000)
		Net income		2,30,000

(c) The reasons for difference in profit in the two costing techniques is due to differences in inventory values in absorption costing and marginal costing. In absorption costing fixed factory overheads is considered in the valuation of closing stock. But in marginal costing, fixed factory overheads are not charged to inventory but simply written off in the profit and loss account.

Example 16.6

Your company has a production capacity of 12,500 units and normal capacity utilisation is 80%. Opening inventory of finished goods on 1-1-1999 was 1000 units. During the year ending 31-12-1999, it produced 11000 units while it sold only 10000 units.

Standard variable cost per unit is Rs. 6.50 and standard fixed factory cost per unit Rs. 1.50. Total fixed selling and administration overhead amounted to Rs. 10000. The company sells its product at Rs. 10 per unit.

Prepare Income Statements under Absorption Costing and Marginal Costing. Explain the reasons for difference in profit, if any. *(B. Com. (Hons) Delhi, 2000)*

Solution:

Income Statement for the year ended 31st Dec., 1999
(Under Absorption Costing Method)

		Rs.	*Rs.*
Sales:	10000 Units @ Rs. 10 per unit		1,00,000
Less:	Cost of goods sold		
	Variable Production Costs:		
	11,000 units @ Rs. 6.50 per unit	71,500	
	Fixed factory cost @ Rs. 1.50 per unit		
	11000 × 1.50 =	16,500	
		88,000	
Add:	Opening stock: 1000 units		
	@ Rs. 8 per unit (that is, Rs. 6.50 + Rs. 1.50)	8,000	
	Costs of goods available for sales	96,000	
Less:	Closing stock: 2000 units valued at current cost.		
	$\frac{96,000 \times 2,000}{12,000}$	16,000	80,000
		Gross Profit	20,000
Less:	Fixed selling and administrative overhead.		10,000
	Net Profit		10,000

Income Statement for the year ended 31st December, 1999
(Under Marginal Costing Method)

		Rs.	*Rs.*
Sales:	10,000 units @ Rs. 10 per unit		1,00,000
Less:	Marginal Cost:		
	Variable production cost:		
	11000 units @ Rs. 6.50 per unit	71,500	
	Variable cost of opening stock of finished stock (1000 units @ Rs. 6.50 per unit)	6,500	
	Cost of goods available for sales	78,000	
Less:	Closing stock of finished stock:		
	2000 units @ Rs. 6.50 per unit	13,000	
		65,000	65,000
	Contribution		35,000
Less:	Fixed selling and administrative overhead	10,000	
	Fixed factory cost @ Rs. 1.50 per unit	16,500	26,500
	Net Profit		8,500

Reason for difference The difference in profits, Rs. 1,500 (that is Rs. 10,000 – Rs. 8,500), as arrived at under absorption and marginal costing methods is due to the element of fixed cost included in the valuation of opening and closing stock under the absorption costing method.

Example 16.7

'*LMN*' Limited sells its product at Rs. 3 per unit. The company uses a First-in, First-out actual costing system. A new fixed manufacturing overhead allocation rate is computed each year by dividing the actual fixed manufacturing overhead cost by the actual production costs. The following simplified data are related to its first two years of operation:

		Year I	*Year II*
Unit Data			
	Sales	1000	1200
	Production	1400	1000
Cost		Rs.	Rs.
	Variable manufacturing	700	500
	Fixed manufacturing	700	700
	Variable marketing and administration	1,000	1,200
	Fixed marketing and administration	400	400

Required:

(i) Prepare income statements based on:
(a) absorption costing and (b) variable costing for each year.
(ii) Give reasons for the differences in the answer. *(B. Com. (Hons) Delhi, 2001)*

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Solution:

(i) Income Statement (Absorption Costing)

		Year I (Rs.)	*Year II (Rs.)*
Sales		3000	3600
Less:	Cost of goods sold:		
	Opening stock	Nil	400
	Variable manufacturing	700	500
	Fixed manufacturing	700	700
Cost of goods available for sales		1,400	1,600
Less:	Closing inventory $\frac{400}{1,400} \times$ Rs. 1,400 (year I)	400	240*
Cost of goods sold		1,000	1,360
Gross Profit		2,000	2,240
Less:	Variable Marketing and Administration	(1,000)	(1,200)
	Fixed Marketing and Administration	(400)	(400)
Net Income		600	640

Note: In year II, FIFO method of inventory valuation is used. That is, ~~closing~~ inventory ~~of 200~~ units belong to current production lot. Therefore, value of 200 units will be

$$\frac{200}{1000} \times \text{Rs. } 1200 = \text{Rs. } 240$$

Income Statement
(Marginal Costing)

		Year I	*Year II*
	Sales	3000	3600
Less:	Cost of goods sold:		
	Opening stock	Nil	200
	Variable manufacturing	700	500
	Cost of goods available for sales	700	700
Less:	Closing stock @ Re 0.50 (400 units, 200 units)	200	100
	Cost of goods sold	500	600
	Contribution margin	2500	3000
Less:	Fixed manufacturing	(700)	(700)
	Variable marketing & Administration	(1000)	(1200)
	Fixed marketing & Administration	(400)	(400)
	Net Income	400	700

(ii) The difference in profit figures between absorption costing and variable costing is due to the factory cost attached to inventory. Difference in Net Income is due to difference in inventory values. This is explained as below:

	Year I (Rs.)	*Year II (Rs.)*
Absorption costing net income	600	640
Marginal costing net income	400	700
	200	60
Absorption costing inventory: Opening	Nil	400
Closing	400	240
Difference	400	160
Marginal costing inventory: Opening	Nil	200
Closing	200	100
Difference	200	100
Net difference	200	60

Example 16.8

ABC Motors assembles and sells motor vehicles. It uses an actual costing system, in which unit costs are calculated on a monthly basis. Data relating to March and April, 2000 are:

	March	*April*
Unit data:		
Beginning Inventory	0	150
Production	500	400
Sales	350	520
Variable-cost data:		
Manufacturing Costs per unit produced	Rs. 10,000	Rs. 10,000
Distribution costs per unit sold	3,000	3,000
Fixed-cost data:		
Manufacturing Costs	Rs. 20,00,000	Rs. 20,00,000
Marketing Costs	6,00,000	6,00,000

The selling price per motor vehicle is Rs. 24,000

Required:

(i) Present income statements for *ABC* Motors in March and April of 2000 under (a) variable costing, and (b) absorption costing.

(ii) Explain the differences between (a) and (b) for March and April. *(C.A. Inter, May 2000)*

Solution:

(i) Income Statement (Variable Costing)

		March (Rs.)	*April (Rs.)*
Sales		84,00,000	1,24,80,000
Less:	Variable cost of goods sold:		
	Opening stock	Nil	15,00,000
	Variable manufacturing cost	50,00,000	40,00,000
	Cost of goods available for sales	50,00,000	55,00,000
Less:	Closing stock	15,00,000	3,00,000
	Cost of goods sold	35,00,000	52,00,000
	Contribution Margin	49,00,000	72,80,000
Less:	Other costs:		
	Fixed manufacturing	(20,00,000)	(20,00,000)
	Fixed marketing	(6,00,000)	(6,00,000)
	Variable distribution	(10,50,000)	(15,60,000)
	Net Income	12,50,000	31,20,000

Income Statement (Absorption Costing)

		March (Rs.)	*April (Rs.)*
Sales		84,00,000	1,24,80,000
Less:	Cost of goods sold:		
	Opening stock	Nil	21,00,000
	Variable manufacturing cost	50,00,000	40,00,000
	Fixed manufacturing cost	20,00,000	20,00,000
	Cost of goods available for sales	70,00,000	81,00,000
Less:	Closing stock	21,00,000	4,50,000
	Cost of goods sold	49,00,000	76,50,000
	Gross profit	35,00,000	48,30,000
Less:	Distribution Cost	(10,50,000)	(15,60,000)
	Fixed marketing	(6,00,000)	(6,00,000)
	Net Income	18,50,000	(26,70,000)

Note: The company follows actual costing system and calculates unit costs on monthly basis. Therefore, for April month, inventory of 30 units has been valued as follows:

Variable manufacturing cost 30 × Rs. 10,000	= 30,00,000
Fixed manufacturing cost @ Rs. 5000 × 30	= 15,00,000
(Rs. 20,00,000¸ Current Production 400 units)	
That is, inventory at Rs. 15,000 per unit	= 45,00,000

For March month, inventory of 150 units has been calculated as follows:

Variable manufacturing Rs. 10,000 × 150	= Rs. 15,00,000
Fixed manufacturing Rs. 4,000 × 150	= Rs. 6,00,000
That is, inventory at Rs. 14,000 per unit	= Rs. 21,00,000

(ii) Difference in Profit

	March	April
Absorption Costing profit	Rs. 18,50,000	Rs. 26,70,000
Variable costing profit	↑ 12,50,000	↓ 31,20,000
	6,00,000	4,50,000

Difference in profit is due to difference in inventory values in the two costing techniques.

	March (Rs.)	*April (Rs.)*
Absorption costing:		
Opening stock	Nil	21,00,000
Closing stock	21,00,000	4,50,000
Difference	21,00,000	16,50,000
Variable costing:		
Opening stock	Nil	15,00,000
Closing stock	15,00,000	3,00,000
Difference	15,00,000	12,00,000
Net difference (effect)	6,00,000	4,50,000

Example 16.9

The directors of a company have been studying the following condensed profit reports for the years 2006 and 2007:

	2006	*2007*
Sales (Rs.)	3,00,000	4,50,000
Profit (or loss) (Rs.)	55,000	35,000

The directors are perturbed over the trend, for a 50% increase in sales resulted in a decrease in profit in 2007. The chief cost accountant explains that unabsorbed overhead was charged to 2007 operations. His statement was based on the following data:

Data	*2006*	*2007*
Sales (units)	20,000	30,000
Production (units)	30,000	20,000
Sales price per unit (Rs.)	15	15
Variable cost per unit (Rs.)	5	5
Fixed factory overhead (Rs.)	1,80,000	1,80,000
Fixed factory overhead per unit (standard)	6	6
Fixed selling and administrative expenses	25,000	25,000

Prepare: (a) income statement by the conventional method to which the chief cost accountant referred; (b) income statements by variable costing method.

Solution:

Income Statement (Absorption Costing)

(Rs.)

		2006	*2007*
	Sales	3,00,000	4,50,000
Less:	Cost of goods sold:		
	Opening stock	–	1,10,000
	Variable production cost	1,50,000	1,00,000
	Fixed production cost	1,80,000	1,20,000
	Cost of goods available for sales	3,30,000	3,30,000
Less:	Closing inventory	1,10,000	–
	Cost of goods sold	2,20,000	3,30,000
	+ Amount of under/ – Over-absorption	–	+ 60,000
		2,20,000	3,90,000
	Gross profit	80,000	60,000
Less:	(i) Fixed selling and administrative expenses	(25,000)	(25,000)
	(ii) Variable selling and administrative expenses	NIL	NIL
	Net income	55,000	35,000

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Income Statement (Variable Costing)

(Rs.)

		2006	*2007*
	Sales	3,00,000	4,50,000
Less:	Variable cost of good sold:		
	Opening inventory	–	50,000
	Variable production cost	1,50,000	1,00,000
	Cost of goods available for sales	1,50,000	1,50,000
Less:	Closing inventory	50,000	–
	Cost of goods sold	1,00,000	1,50,000
	Margin	2,00,000	3,00,000
Less:	Fixed production cost	(1,80,000)	(1,80,000)
	Fixed selling and administration expenses	(25,000)	(25,000)
	Variable selling and administrative expenses	NIL	NIL
Net income (Loss)		(5000)	95,000

Notes: Variable cost given in the question has been assumed as variable production cost.

Example 16.10

Using the information given below, calculate the net income for the months of October, November and December and the value of finished goods on hand at the end of period using absorption costing and marginal costing. Also, comment on the differences in profits under these two methods.

	October	November	December
Production units	45000	36000	45000
Sales units	36000	42000	48000
Opening stock	–	9000	3000
Closing stock	9000	3000	–
Additional information:			
Selling price per unit		Rs. 50	
Variable production cost per unit		Rs. 30	
Fixed production cost per unit		Rs. 10	
Total fixed production costs per month		Rs. 3,90,000	
Normal output per month		39000 units	

(CA Inter)

Solution:

Income Statement (Absorption Costing)

(Rs.)

		October	*November*	*December*
Sales:		18,00,000	21,00,000	24,00,000
Less:	Cost of goods sold:			
	Opening stock	–	3,60,000	1,20,000
	Variable production cost	13,50,000	10,80,000	13,50,000
	Fixed production cost	4,50,000	3,60,000	4,50,000
	Cost of goods available for sales	18,00,000	18,00,000	19,20,000

(*Contd.*)

Less:	Closing stock	3,60,000	1,20,000	–
	Cost of goods sold	14,40,000	16,80,000	19,20,000
	± Capacity variance (Under/over-absorption)	(60,000)	+ 30,000	(60,000)
	Cost of goods sold at actual	13,80,000	17,10,000	18,60,000
Less:	Fixed and variable administrative and selling overheads	NIL	NIL	NIL
	Net Income	4,20,000	3,90,000	5,40,000

Income Statement (Marginal Costing)

(Rs.)

		October	*November*	*December*
Sales		18,00,000	21,00,000	24,00,000
Less:	Variable cost of goods sold:			
	Opening stock	–	2,70,000	90,000
	Variable production cost	13,50,000	10,80,000	13,50,000
Cost of goods available for sales		13,50,000	13,50,000	14,40,000
Less:	Closing stock	2,70,000	90,000	–
Cost of goods sold		10,80,000	12,60,000	14,40,000
Margin		7,20,000	8,40,000	9,60,000
Less:	(i) Fixed production cost	(3,90,000)	(3,90,000)	(3,90,000)
	(ii) Fixed and variable Selling,distributions and administrative overheads	–	–	–
Net income		3,30,000	4,50,000	5,70,000

Difference in Profit (Rs.)

	October	November	December
Absorption costing profit	4,20,000	3,90,000	5,40,000
Marginal costing profit	3,30,000	4,50,000	5,70,000
Difference	90,000	60,000	30,000

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Reconciliation Statement

	October	November	December
Inventory values (Rs):			
Absorption costing:			
Opening inventory	—	3,60,000	1,20,000
Closing inventory	3,60,000	1,20,000	—
	3,60,000	2,40,000	1,20,000
Marginal costing:			
Opening inventory	—	2,70,000	90,000
Closing inventory	2,70,000	90,000	—
	2,70,000	1,80,000	90,000
Net difference in income	90,000	60,000	30,000

Thus, difference in net income in the two costing techniques for difference months are due to differences in inventory values for the respective months.

However, total production units of three months (that is, 126,000 units) are equal to total sales units which is also 126000 units. Therefore, total absorption profit of the three months together which is Rs. 13,50,000 is equal to three months total of marginal costing profit which is also Rs. 13,50,000.

Thus, it is proved that when production units equals sales units, absorption costing profit will be equal to marginal costing profit.

Example 16.11

For the coming year, a manufacturing company has budgeted as under:

Contribution/Sales (C/S) Ratio = 45%

Margin of Safety Ratio = $33\frac{1}{2}\%$

Fixed Costs = Rs. 5,85,000

Required: Determine Total Sales-volume for the coming year and Profit thereon. *(B.Com. Delhi, 2005)*

Solution:

$$\text{Break-even sales (Volume)} = \frac{\text{Rs. Fixed cost}}{\text{P/V Ratio or C/S Ratio}}$$

$$\text{Break-even sales} = \frac{\text{Rs. } 5,85,000}{45\%}$$

$$\text{Break-even sales} = \text{Rs. } 5,85,000 \times 100/45$$

$$= \text{Rs. } 13,00,000$$

$$\%\ \text{Profit} = \text{P/V Ratio} \times \text{Margin of sales Ratio} \times 100$$

$$\%\ \text{Profit} = \frac{45}{100} \times \frac{100}{300} \times 100$$

$$\%\ \text{Profit} = 15\%$$

$$\text{Sales Volume (s)} = \frac{\text{Fixed cost + (Profit \% on Sales or S)}}{\text{P/V Ratio}}$$

$$S = \frac{\text{Rs. } 5{,}85{,}000 + 15\%\ S}{45\%}$$

$$45\%\ S = \text{Rs. } 5{,}85{,}000 + 15\%\ S$$

$$30\%\ S = \text{Rs. } 5{,}85{,}000$$

$$S = \text{Rs. } 5{,}85{,}000 \times 100/30$$

$$= \text{Rs. } 1{,}95{,}000$$

Sales = Rs. 19,50,000, Profit = 15% of Rs. 19,50,000 = Rs. 2,92,500.

Example 16.12

A company annually manufactures and sells 20000 units of a product, the selling price of which is Rs. 50 and profit earned is Rs. 10 per unit.
The analysis of cost of 20000 units is:

Materials Cost	Rs. 3,00,000
Labour Cost	Rs. 1,00,000
Overheads	Rs. 4,00,000
	(50% variable)

You are required to compute:

(i) Break-even sales in units and in Rupees.
(ii) Sales to earn a profit of Rs. 3,00,000.
(iii) Profit when 15000 units are sold. *(B.Com, Delhi, 2002)*

Solution:

(i) Break-even sales in Rupees $= \dfrac{\text{Fixed cost}}{\text{P/V Ratio}}$

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$\text{Contribution} = \text{Sales} - \text{Variable cost}$$

$$= \text{Rs. } 10{,}00{,}000 - \text{Rs. } 6{,}00{,}000^*$$

$$= \text{Rs. } 4{,}00{,}000$$

$$^*\text{Variable cost} = \text{Material cost} + \text{Labour cost} + \text{Overheads (variable)}$$

$$= \text{Rs. } 3{,}00{,}000 + \text{Rs. } 1{,}00{,}000 + 50\% \text{ of Rs. } 4{,}00{,}000 = \text{Rs. } 6{,}00{,}000$$

$$\text{P/V Ratio} = \frac{\text{Rs. } 4{,}00{,}000}{\text{Rs. } 10{,}00{,}000} \times 100 = 40\%$$

$$\text{Break-even sales (Rs.)} = \frac{\text{Rs. } 2{,}00{,}000}{\text{Rs. } 40\%}$$

$$= \text{Rs. } 5{,}00{,}000$$

$$\text{Break-even sales (units)} = \frac{\text{Rs. } 5{,}00{,}000}{\text{Rs. } 50} = 10000 \text{ units.}$$

(ii) Sales to earn a profit of Rs. 3,00,000

$$= \frac{\text{Fixed cost + Desired proft}}{\text{P/V ratio}}$$

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$$= \frac{\text{Rs. } 2,00,000 + \text{Rs. } 3,00,000}{40\%}$$

$$= \frac{\text{Rs. } 5,00,000 \times 100}{40}$$

$$= \text{Rs. } 12,50,000.$$

(iii) Profit when 15000 units are sold

Profit = (Sales × P/V Ratio) – Fixed cost
= (Rs. 7,50,000 × 40%) – Rs. 2,00,000
= Rs. 3,00,000 – Rs. 2,00,000
= Rs. 1,00,000

*15000 units @ Rs. 50 = Rs. 7,50,000.

Example 16.13

When sales of a company declines from Rs. 9,00,000 to Rs. 7,00,000, its profit of Rs. 50,000 is converted into a loss of Rs. 50,000.

Determine contribution margin ratio. *(B.Com. (Hons), Delhi, 2002)*

Solution:

Sales	Profit
Rs.	Rs.
9,00,000	50,000
7,00,000	(–) (Loss) 50,000
2,00,000	1,00,000

$$\text{P/V Ratio or Contribution Margin Ratio} = \frac{1,00,000}{2,00,000} \times 100$$

$$= 50\%$$

Example 16.14

A company having annual sales of Rs. 10 crores is earning 12% profit before charging interest and depreciation. Interest and depreciation amount to Rs. 60 lakhs and Rs. 100 lakhs respectively. If the contribution/sales ratio of the company is 0.4, calculate its break-even sales. *(B.Com. (Hons), Delhi 2002)*

Solution:

$$\frac{\text{Contribution}}{\text{Sales}} = .4$$

$$\frac{C}{10,00,00,000} = .4$$

C = 4,00,00,000
S – V = C
10,00,00,000 – V = 4,00,00,000
10,00,00,000 – 4,00,00,000 = V
6,00,00,000 = V

$$\text{Profit @ 12\% on sales before interest and depreciation} = \frac{10,00,00,000 \times 12}{100} = \text{Rs. } 1,20,00,000$$

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Less:	Interest	(60,00,000)
	Depreciation	(1,00,00,000)
	Loss	40,00,000

As we know S – V = F + Profit/Loss

10,00,00,000 – 6,00,00,000 = F – 40,00,000

4,00,00,000 + 40,00,000 = F

4,40,00,000 = F

$$\text{B.E.P} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

$$= \frac{4,40,00,000}{.4}$$

$$= \frac{44,00,00,000}{.4} = \text{Rs. } 11,00,00,000$$

Example 16.15

In a purely competitive market 10,000 units of a product can be manufactured and sold and certain amount of profit is generated. It is estimated that 2,000 units of that product need to be manufactured and sold in a monopoly market to earn the same profit.

Profit under both the market conditions is targeted at Rs. 2,00,000. The variable cost per unit is Rs. 100 and the total fixed cost is Rs. 37,000.

You are required to determine the selling prices under both monopoly and competitive conditions.

(B.Com. (Hons), Delhi, 2002)

Solution:

Under Monopolistic Conditions:

Let x be the selling price per unit.

$\therefore$ Sale = $2000\,x$

Variable cost = $2000 \times$ Rs. 100 = Rs. 2,00,000

Fixed cost = Rs. 37,000

Desired Profit = Rs. 2,00,000

or $2000\,x - 200000 = 37000 + 200000$

$\because$ (S – V = F + P)

or $$x = \frac{4,37,000}{2000} = 218.50 \text{ per unit}$$

Under Competitive Conditions

Let y be the selling price per unit

Sale = $10000\,y$

Variable Cost = $10000 \times$ Rs. 100

= Rs. 10,00,000

Fixed Cost = Rs. 37,000

Desired Profit = Rs. 2,00,000

$10,000\,y - 10,00,000 = 37,000 + 2,00,000$ [$\because$ S – V = F + P]

$$y = \frac{12,37,000}{10,000} = 123.70 \text{ per unit}$$

1. Under Monopolistic conditions selling price per unit is Rs. 218.50
2. Under Competitive conditions selling price per unit is Rs. 123.70.

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Example 16.16

A company has a fixed cost of Rs. 20,000. It sells two products *A* and *B*, in the ratio of 2 units of *A* and 1 unit of *B*. Contribution is Re. 1 per unit of *A* and Rs. 2 per unit of *B*. How many units of *A* and *B* would be sold at break-even point? *(B.Com. (Hons), Delhi 2003)*

Solution:

Fixed cost = Rs. 20,000

Contribution is Re. 1 per unit of *A* and units of *A* product sold is 2.

So the contribution of product *A* = 1 × 2 = Rs. 2

Contribution is Rs. 2 per unit of *B* and unit sold is 1.

So the contribution of product *B* = 2 × 1 = Rs. 2

Total contribution of *A* and *B* product = Rs. 2 + Rs. 2 = Rs. 4

$$\text{B.E.P. (in units) (}A\text{ and }B\text{ combined)} = \frac{\text{Fixed cost}}{\text{Contribution of } A \text{ and } B}$$

$$= \frac{20{,}000}{4} = 5000$$

Units of two product *A* and *B* are sold in the ratio of 2 : 1

∴ B.E.P. of *A* product will be = 5000 × 2 = 10000 units

While of *B* product will be = 5000 × 1 = 5000 units

It can be proved:

B.E.P.	= C = Fixed Cost	
Contribution of *A*	= 10,000 units × 1 Re. 1 per unit	= Rs. 10,000
Contribution of *B*	= 5000 units × Rs. 2 per unit	= Rs. 10,000
C	=	Rs. 20,000

C = Fixed cost

∴ Rs. 20,000 contribution = Rs. 20,000 fixed cost, which is correct

Alternate Method

Contribution of *A* product is Re. 1 per unit but 2 units are sold = 2 × 1 = Rs. 2

Contribution of *B* product is Rs. 2 per unit but 1 unit is sold = 1 × 2 = Rs. 2

We may divide fixed overhead in two products equally, that is Rs. 10,000 for *A* product and Rs. 10,000 for *B* product,

$$\therefore \text{B.E.P. of } A \text{ product (in units)} = \frac{\text{Fixed Overhead or cost}}{\text{Contribution per units}}$$

$$= \frac{\text{Rs. } 10{,}000}{\text{Re. } 1} = 10000 \text{ units}$$

$$\text{B.E.P. of } B \text{ product (in units)} = \frac{\text{Fixed cost}}{\text{Contribution per units}}$$

$$= \frac{\text{Rs. } 10{,}000}{\text{Rs. } 2} = 5000 \text{ units}$$

Example 16.17

The manager of *ABC* Ltd., provides you with the following information:

		Rs.
Sales		4,00,000
Costs:	Rs.	
Variable (60% of sales)	2,40,000	
Fixed	80,000	3,20,000
Profit before tax		80,000
Income tax (60%)		48,000
Net Profit		32,000

The *ABC* Ltd. is thinking of expanding the plant. The fixed costs with plant expansion will be increased by Rs. 40,000. The company also wants to earn additional income after tax of Rs. 3,200 on investment.

(B.Com. (Hons), Delhi 2004)

Solution:

	Rs.
Sales	4,00,000
Less: Variable cost (60% of sales)	2,40,000
Marginal cost of Contribution	1,60,000

$$\text{PV ratio} = \frac{C}{S} \times 100$$

$$= \frac{1,60,000 \times 100}{40,000} = 40\%$$

Required sales with increased expansion, fixed cost of Rs. 40,000 and additional income after tax of Rs. 3,200 on investment.

$$\text{Sales} = \frac{\text{Fixed cost} + \text{Profit}}{\text{PV Ratio}}$$

$$= \frac{\text{Rs. } 80,000 + \text{Rs. } 40,000 + \text{Rs. } 80,000 + \text{Rs. } 3,200}{40\%}$$

$$= \frac{2,03,200 \times 100}{40} = \text{Rs. } 5,08,000$$

If company makes the sales more than Rs. 5,08,000 then expansion will be able to derive additional income.

Example 16.18

ABC Ltd. manufactures three products, *P*, *Q* and *R*. The unit selling prices of these products are Rs. 100, Rs. 80 and Rs. 50 respectively. The corresponding unit variable costs are Rs. 50, Rs. 40 and Rs. 20. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs. 14,80,000.

Given the above information, you are required to work out the overall break-even quantity and the product-wise break-up of such quantity. *(B.Com. (Hons), Delhi 2004)*

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Solution:

Product	*Sales Price per unit*	*Variable cost per unit*	*Contribution per unit*	*Ratio of contribution per unit*	*Ratio of sales*	*Ratio of contribution*
P	100	50	50	5	2	10
Q	80	40	40	4	3	12
R	50	20	30	3	5	15
					Total	37

$$\text{Composite B.E.P. (in Units)} = \frac{\text{Fixed cost}}{\text{Ratio of contribution per unit}}$$

$$= \frac{14,80,000}{37} = 40000 \text{ units}$$

Product mix break up

$$P = 40000 \times \frac{2}{10} = 8000 \text{ units}$$

$$Q = 40000 \times \frac{3}{10} = 12000 \text{ units}$$

$$R = 40000 \times \frac{5}{10} = 20000 \text{ units}$$

Verification

Product	*Unit*	*Sales Price per unit*	*Sales value*	*Variable cost per unit*	*Variable cost*	*Contribution*
P	8000	100	8,00,000	50	4,00,000	4,00,000
Q	12000	80	9,60,000	40	4,80,000	4,80,000
R	20000	50	1,00,0000	20	4,00,000	6,00,000
Total	40000		27,60,000		12,80,000	14,80,000

As we know that at BEP

Sales – Variable costs = Fixed costs

Rs. 27,60,000 – Rs. 12,80,000 = Rs. 14,80,000

Fixed cost is Rs. 14,80,000 (given in the question)

Example 16.19

A producer of Ladies purses is earning a monthly post tax profit of Rs. 60,000 when income tax rate is 40%. Selling price of a purse is Rs. 50 and per unit variable cost is Rs. 30. How many more purses he should sell to earn same monthly post tax profit, if the tax rate goes up to 50%? *(B.Com. (Hons), 2005)*

Solution:

Contribution per unit

= Sale Price – V/C per unit

= 50 – 30 = Rs. 20

Computation of Pre Tax Profits when Tax rate is 40% and 50%

	40%	50%
After Tax Profits	60,000	60,000
Add: Tax $\left(\frac{40}{100-40}\right), \frac{50}{(100-50)}$	40,000	60,000
Pre Tax Profits	100,000	120,000

Computation of No. of more purses to be sold to earn the same monthly Post Tax Profits

$$= \frac{\text{Increase in pre tax profit}}{\text{Contribution per unit}}$$

$$= \frac{20000}{20} = 1000 \text{ units}$$

Example 16.20

The following is cost data relating to two alternative machines:

	Inferior Machines	*Superior Machine*
Fixed cost	Rs. 5,00,000	Rs. 8,00,000
Variable cost per unit	Rs. 30	Rs. 25
Selling price	Rs. 50	Rs. 55

Calculate the level of output at which you are indifferent about the two machines and beyond which the superior machine should be preferred. *(B.Com. (Hons), 2005)*

Solution:

To calculate the level of output at which we are indifferent about the two machines
Computation of Contribution per unit

	Inferior Machine	*Superior Machine*
Sales price	50	55
Less: Variable Cost	30	25
Contribution	20	30
Fixed Cost	5,00,000	8,00,000

Let the amount of profit at which we will be indifferent to both of the machines = Rs. x

$$\frac{5,00,000 + x}{20} = \frac{8,00,000 + x}{30}$$

$$15,00,000 + 3x = 16,00,000 + 2x$$

$$x = 1,00,000$$

Hence the level of output for indifference at a profit of Rs. 1,00,000 will be:

$$\text{Inferior Machine} = \frac{\text{FC + Des. profit}}{\text{Contribution per unit}} = \frac{5,00,000 + 1,00,000}{20}$$

$$= 30,000 \text{ units}$$

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$$\text{Superior Machine} = \frac{\text{Rs } 8,00,000 + \text{Rs } 1,00,000}{30}$$
$$= 30{,}000 \text{ units}$$

Example 16.21

Calculate break-even for a train journey between Delhi–Bangalore where cost of an Engine is Rs. 1,00,000 and of a bogie Rs. 20,000. Capacity of a bogie is 80 passengers and each ticket for the journey is Rs. 600. There is no variable cost per passenger. *(B.Com. (Hons), 2005)*

Solution:

Calculation of Contribution per Bogie:

Sales of Tickets (600 × 80)	48,000
Less: Cost of bogie	20,000
Contribution per bogie	28,000

Calculation of break-even for one train journey

$$= \frac{\text{Cost of Engine (As Fixed)}}{\text{Contribution Ratio}}$$

$$= \frac{1,00,000}{\frac{28,000}{48,000}} = 1,00,000 \times \frac{48,000}{28,000}$$

$$= \text{Rs. } \frac{12,00,000}{7} = \text{Rs. } 1,71,429 \text{ approximately}$$

Example 16.22

M/s Natraj Stationers manufactures plastic files for office use. The break-up of its cost and sales is as follows:

Variable Cost per file	:	Rs. 40
Fixed cost	:	Rs. 60,000 per year
Production capacity	:	3,000 files per year
Selling price	:	Rs. 100 per file.

You are required to compute the following:

(i) Break-even point;
(ii) Number of files to be sold to earn a net profit of Rs. 30,000.
(iii) If the firm manufactures and sells 500 files more per year with an additional fixed cost of Rs. 2,000, what should be the selling price to earn the same amount of profit per file as in (ii) above?

(B.Com. (Hons), Delhi 2005)

Solution:

(1) Calculation of cost per unit and P/V Ratio

	Rs.
(a) Sales per unit	100
Less: Variable cost	40
Contribution	60

(b) Calculation of P/V Ratio

$$= \frac{\text{Contribution}}{\text{Sales}} = \frac{60}{100} \times 100 = 60\%$$

(2) Calculation of BEP

$$= \frac{\text{FC}}{\text{P/V Ratio}} = \frac{60,000}{60\%} = \text{Rs. } 1,00,000$$

(3) No. of files to be sold to earn a net profit of Rs. 30,000

$$= \frac{\text{FC} + \text{Des. profit}}{\text{Contribution per file}} = \frac{60,000 + 30,000}{60}$$

$$= \frac{90,000}{60} = 1,500.$$

Profit per file = Rs. 30,000 ÷ 1500 files = Rs. 20

(4) Selling Price to earn the same of amount of profit per file as in (2) above

Desired Profit (2000 × 20)	40,000
Fixed Cost (60,000 + 2,000)	62,000
Cost	102,000
Variable cost (2000 × 40)	80,000
Sales Desired	1,82,000

$$\text{Sales Price per file} = \frac{1,82,000}{2,000} = \text{Rs. } 91$$

Example 16.23

Workwell Ltd. is a single product producer with P/V ratio of 40% for the product during the current year. Due to increasing competition it is believed that the price will have to be reduced by 10% in the next year. By what percentage sales value and sales quantity should increase so that Workwell Ltd. earns same profit in the next year also?

(B.Com. (Hons), Delhi, 2007)

Solution:

Assume old price Rs. 100, contributions Rs. 40

Therefore variable cost = Rs. 100 – 40 = Rs. 60

With 10% price decrease, new P/V ratio will be $\frac{90 - 60}{90} = \frac{1}{3}$

(i) New desired sale to earn same contribution of Rs. 40 = $\frac{40}{1/3}$ = Rs. 120 that is. 20% increase in sales value

(ii) New quantity for same profit = $120 \times \frac{100}{90} = 133\frac{1}{3}$ that is $33\frac{1}{3}$ % increase in quantity sold

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Example 16.24

ZED Ltd. produces two products, *P* and *Q*. The budgeted selling price per unit for *P* and *Q* are Rs. 3,600 and Rs. 4,320 respectively. Variable costs of production and sales for *P* and *Q* are Rs. 1,800 and 3,600 respectively. Annual fixed costs of the company amounts to Rs. 1,76,000. The company has two different production/sales options as under:

Option 1—A mix of 2 units of *P* for every 3 units of *Q*
Option 2—A mix of 1 unit of *P* for every 2 units of *Q*

Find out the combined Break-even Point under each option and the optimal mix that the company should adopt. *(ICWA, Stage 2, Dec. 2005)*

Solution:

Contribution per unit of product	*Product P*	*Product Q*
Budgeted Selling Price	3600	4320
Less variable cost	1800	3600
Contribution	1800	7 20

Option—1 (2 units of *P* and 3 units of *Q*)

Total contribution = Rs. 1,800 × 2 + Rs. 720 × 3 = Rs. 3,600 + Rs. 2,160 = Rs. 5,760

Break-even Point = (Fixed Cost × Total sales)/Contribution

Total sales value of 2 units of *P* and 3 units of *Q* = Rs. (2 × 3,600 + 3 × 4,320)
= Rs. 20,160

Combined Break-even Point = Rs. 1,76,000/5,760 × 20,160 = Rs. 6,16,000

Option—2 (1 unit of *P* and 2 units of *Q*)

Total contribution = Rs. 1,800 × 1 + Rs. 720 × 2 = Rs. 1,800 + Rs. 1,440 = Rs. 3,240

Total sales value = Rs. 3,600 × 1 + Rs. 4,320 × 2 = Rs. 3,600 + Rs. 8,640 = Rs. 12,240

Combined Break-Even Point = Rs. 1,76,000/3,240 × 12,240 = Rs. 6,64,889

Conclusion:

As Option—1 results in lower BEP and in this option average contribution per total number of units is higher, the company should adopt this option.

Example 16.25

A Ltd. has been offered a choice to buy a machine between *M*1 and *M*2. The following data are provided:

	*M*1	*M*2
Annual output in units	10000	10000
Fixed Cost	Rs. 60,000	Rs. 32,000
Profit at above level	Rs. 60,000	Rs. 48,000

The market price of the product is expected to be Rs. 20 per unit.
You are required to compute:

(i) Break-Even Point of each machine
(ii) the level of sales at which both the machines earn equal profit
(iii) the range of sales at which one is more profitable from the other.

(ICWA Inter, Dec. 1997, ICWA, Stage 2, June 2006)

Solution:

A Ltd.	Machines	
(i)	*M*1	*M*2
	Rs.	Rs.
Sales value 10000 × Rs. 20	2,00,000	2,00,000
Contribution (Fixed Cost + Profit)	1,20,000	80,000
Variable Cost	80,000	1,20,000
P/V Ratio (Contribution/Sales)	60%	40%
Break Even Point (Fixed Cost/PV ratio)	1,00,000	80,000
Break-Even Point (Units)	5,000	4,000
Contribution per unit (Rs.)	12	8
Variable Cost per unit	8	12

(ii) Since the selling price of the product produced by machine *M*1 and *M*2 are same, the machine will earn equal profit when the total costs of operation of both the machines are same.
If x be the output at which total cost of the machines are same we have total cost of

$$\text{Machine } M1 = 8x + 60{,}000$$
$$\text{And Machine } M2 = 12x + 32{,}000$$
$$\text{Therefore, } 8x + 60{,}000 = 12x + 32{,}000$$
$$\text{or, } 4x = 28{,}000$$
$$\text{or, } x = 7000$$

At a production level of 7000 units the profits made by *M*1 and *M*2 would be same.

(iii) The Break-Even Point of *M*1 is 5000 units as compared to that of 4000 units in case of *M*2 and at a production level of 7000 units they earn equal profits. Therefore, *M*2's profit earning capacity is more in the region 4000 to 6999 units because it starts earning profit at a lower point as BEP is lower here. Beyond 7000 units *M*1 will earn more profits because it has a higher P/V ratio which enables it to earn more contribution of the increasing sales.

Example 16.26

A company has a contribution/sales ratio of 40%. It maintains a margin of safety of 20%. If its annual fixed cost amount to Rs. 24 lakhs, calculate its

(i) Break-even sales,
(ii) Margin of safety,
(iii) Total sales,
(iv) Total variable costs and
(v) Profit

(ICWA, Inter, Dec. 1998, ICWA, Inter, Stage 1, June 2007)

Solution:

(i) $$\text{Break-Even sales} = \frac{\text{Fixed Cost}}{\text{Contribution / Sales}} = \frac{24,00,000}{0.4} = \text{Rs. 60 lakhs}$$

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(ii) Margin of Safety = Sales – Break-Even Sales

= Rs. 75 lakhs – 60 lakhs

= Rs. 15 lakhs

(iii) Total Sales = Break-Even Sales + Margin of Safety

$$\text{Sales} = 60 + 0.2\ \text{Sales} = \frac{60}{0.8} = \text{Rs. 75 lakhs}$$

= Rs. 60 lakhs + Rs. 15 lakhs = Rs. 75 lakhs

$\therefore$ S = Rs. 75 lakhs

(iv) Total variable costs = $\text{Sales}\left(1 - \frac{\text{Contribution}}{\text{Sales}}\right)$

= Rs. 75 lakhs $\left(1 - \frac{4}{10}\right)$

= Rs. 45 lakhs

(v) Profit = Sales – (Variable cost + Fixed cost)

= Rs. 75 lakhs – (Rs. 45 lakhs + Rs. 24 lakhs)

= Rs. 6 lakhs

Example 16.27

A company sells its product at Rs. 15 per unit. In a period, if it produces and sells 8000 units, it incurs a loss of Rs. 5 per unit. If the volume is raised to 20000 units, it earns a profit of Rs. 4 per unit.

Calculate break-even point in terms of rupees as well as in units.

(B. Com. (Hons,) Delhi 2001, CA Inter Nov. 1996)

Solution:

I. Sales = 8000 Units × Rs. 15 per Unit = Rs. 1,20,000

Loss = 8000 Units × Rs. 5 per Unit = Rs. 40,000

II. Sales = 20,000 Units × Rs. 15 per Unit = Rs. 3,00,000

Profit = 20,000 Unit × Rs. 4 per Unit = Rs. 80,000

	Sales	*Profit/Loss*
I.	1,20,000	(–) 40,000
II.	3,00,000	(+) 80,000

$$\text{P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}}$$

$$= \frac{1,20,000}{1,80,000} = \frac{2}{3} \text{ or } 66\frac{2}{3}\%$$

Sales at Break even point (in Rs.)

Fixed Cost = S × P/V Ratio – Profit

(On the basis raised volume II)

$$\text{Fixed Cost} = \text{Rs. } 3,00,000 \times \frac{2}{3} - 80,000$$

Fixed Cost = Rs. 2,00,000 – Rs. 80,000 = Rs. 1,20,000

$$\text{B.E.P.} = \frac{\text{F}}{\text{P/V Ratio}} = \frac{1,20,000 \times 3}{2} = \text{Rs. } 1,80,000$$

$$\text{Sales at Break-even point (in units)} = \frac{\text{Sales in Rs.}}{\text{Selling price per unit}}$$

$$= \frac{\text{Rs. } 1,80,000}{15} = 12,000$$

Note: (1) Rs. 5 per unit loss is given is the question, in the indirect way it is a variable cost per unit.
(2) Change in Profit is computed by adding loss of Rs. 40,000 in the profit of Rs. 80,000 because loss of Rs. 40,000 has also been covered in the second period of time or in the second option if the volume is raised to 20000 units.

Example 16.28

A Company manufactures radios, which are sold at Rs. 1,600 per unit. The total cost is composed of 30% for direct materials, 40% for direct wages and 30% for overheads. An increase in material price by 30% and in wage rates by 10% is expected in the forthcoming year, as a result of which the profit at current selling price may decrease by 40% of the present profit per unit. You are required to prepare a statement showing current and future profit at present Selling Price.

How much Selling Price should be increased to maintain the present rate of profit?

(CA Inter May 2001)

Solution:

Let X be the cost, Y be the profit and Rs. 1,600 selling price per unit of radio manufactured by a company. Hence

$$X + Y = \text{Rs. } 1,600 \qquad \text{(i)}$$

Statement of Present and Future Cost of a Radio

Particulars	*Present cost (Rs.)*	*Increase in cost (Rs.)*	*Anticipated future cost (Rs.)*
	(a)	*(b)*	*(c) = (a) + (b)*
Direct material	0.3 X	0.09 X	0.39 X
Direct labour	0.4 X	0.04 X	0.44 X
Overheads	0.3 X	–	0.30 X
Total	X	0.13 X	1.13 X

An increase in material price and wage rates resulted into a decrease in current profit by 40 percent at present selling price; therefore we have:

$$1.13X + 0.6Y = 1,600 \qquad \text{(ii)}$$

On solving (i) and (ii) we get:

$X =$ Rs. 1,207.55
$Y =$ Rs. 392.45

Current profit Rs. 392.45 or 32.5% of cost
Future profit Rs. 235.47

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Statement of Revised Selling Price to Maintain the Present Rate of Profit

	Rs.
Direct material cost 0.39 × Rs. 1,207.55	470.94
Direct labour cost (0.44 × Rs. 1207.55)	531.32
Overheads 0.30 × Rs. 1,207.55	362.27
Total cost	1,364.53
Profit (32.5% of total cost)	443.47
Revised selling price	1,808.00

Example 16.29

Raj Ltd. manufactures three products *X*, *Y* and *Z*. The unit selling prices of these products are Rs. 100. Rs. 160 and Rs. 75 respectively. The corresponding unit variable costs are Rs. 50, Rs. 80 and Rs. 30. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs. 14,80,000.

Calculate overall break-even quantity and the product-wise break up of such quantity.

(C.A. Inter May 1999)

Solution:

Overall Break-Even Quantity

Products	*X*	*Y*	*Z*
Selling Price per unit (Rs.)	100	160	75
Less: Variable Cost per unit (Rs.)	50	80	30
Contribution per unit (Rs.)	50	80	45
Share in Total Sales	20%	30%	50%
Proportionate Contribution per unit	10	24	22.50

Composite Contribution per unit = 56.5

$$\text{Composite Break-even Point} = \frac{\text{Total Fixed Cost}}{\text{Composite Contribution per unit}}$$

$$= \frac{\text{Rs. } 14,80,000}{\text{Rs. } 56.5} = 26{,}195 \text{ units.}$$

Product-wise break-up of overall break-even quantity:

Product *X*: 26195 units × 20/100 = 5239 units

Product *Y*: 26195 units × 30/100 = 7858 units

Product *Z*: 26195 units × 50/100 = 13098 units

Example 16.30

A single product company sells its products at Rs. 60 per unit. In 1996, the company operated at a margin of safety of 40%. The fixed costs amounted to Rs. 3,60,000 and the variable cost ratio to sales was 80%.

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In 1997, it is estimated that the variable cost will go up by 10% and the fixed costs will increase by 5%. Find the selling price required to be fixed in 1997 to earn the same P/V ratio as in 1996.

Assuming the same selling price of Rs. 60 per unit in 1997, find the number of units required to be produced and sold to earn the same profit as in 1996.

(CA Inter May 1998)

Solution:

Basic Calculations

1. P/V Ratio in 1996

$$\text{P/V Ratio} = \frac{\text{Selling Price per unit} - \text{Variable Cost per unit}}{\text{Selling Price per unit}} \times 100$$

$$= \frac{\text{Rs. } 60 - \text{Rs. } 48}{\text{Rs. } 60} \times 100 = \frac{\text{Rs. } 12}{\text{Rs. } 60} \times 100 = 20\%$$

2. *Number of units sold (in 1996)*

$$\text{Break-even Point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs. } 3,60,000}{\text{Rs. } 12} = 30000 \text{ units}$$

The margin of safety is 40%. Hence break-even point is at 60% of units sold.

or
$$\text{No. of units sold} = \frac{\text{Break-even point}}{60\%} = \frac{30,000 \text{ units}}{60} \times 100 = 50000 \text{ units}$$

3. Profit earned in 1996

$$\begin{aligned}\text{Profit} &= \text{Units sold in 1996} \times \text{Contribution per unit} - \text{Fixed costs}\\ &= 50,000 \text{ units} \times \text{Rs. } 12 - \text{Rs. } 3,60,000\\ &= \text{Rs. } 6,00,000 - \text{Rs. } 3,60,000 = \text{Rs. } 2,40,000\end{aligned}$$

Fixation of Selling Price in 1997

$$\begin{aligned}\text{Variable Cost per unit in 1997} &= \text{Rs. } 48 + \text{Rs. } 4.80 = \text{Rs. } 52.80\\ \text{Fixed cost in 1997} &= \text{Rs. } 3,60,000 + \text{Rs. } 18,000 = \text{Rs. } 3,78,000\\ \text{P/V Ratio in 1996} &= 20\%\end{aligned}$$

Since P/V ratio is 20%. Hence, Variable cost is 80%

$$\text{Hence, the required selling price} = \frac{\text{Rs. } 52.80}{80\%} = \text{Rs } 66$$

Number of units to be produced and sold in 1997 to earn the same profit as in 1996

$$\begin{aligned}\text{Profit in 1996} &= \text{Rs. } 2,40,000\\ \text{Fixed cost in 1997} &= \text{Rs. } 3,78,000\\ \text{Desired contribution in 1997} &= (\text{Rs. } 2,40,000 + \text{Rs. } 3,78,000)\\ &= \text{Rs. } 6,18,000\\ \text{Contribution per unit in 1997} &= \text{Selling price per unit} - \text{Variable cost per unit}\\ &= \text{Rs. } 60 - \text{Rs. } 52.80 = \text{Rs. } 7.20\end{aligned}$$

$$\text{Number of units to be produced and sold in 1997} = \frac{\text{Fixed cost in 1997}}{\text{Contribution per unit in 1997}}$$

$$= \frac{\text{Rs. } 6,18,000}{\text{Rs. } 7.20} = 85,833 \text{ units.}$$

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Example 16.31

A producer installed a machine which can produce product '*A*' as well product '*B*'. Annual maximum machine running capacity is 4000 hours. Cost details about the products are as follows:

	Product A	*Product B*
Selling price per unit	Rs. 50	Rs. 20
Variable cost per unit	Rs. 30	Rs. 12
Machine hours required per unit of product	10 hrs.	2 hrs.
Annual demand	300 Units	1,600 Units

Annual fixed cost: Rs. 10,000.

Calculate optimum product-mix showing annual contribution and profit. Give necessary explanation. Also show that a product-mix other than that suggested by you will affect the profits.

(B.Com. (Hons), Delhi 2005)

Solution:

Calculation of Contribution per hour

	A	*B*
Sales	50	20
Less: Variable Cost	30	12
Contribution	20	8
Machine hours.	10	2
Contribution per machine hour $\left(\frac{\text{Contribution}}{\text{Machine hour}}\right)$	2	4

Since the contribution per machine hour is more in case of product *B*. Hence, product *B*, should be produced in maximum.

Calculation of No. of units to be produced (optimum product mix)

Total machine hours.	4000
Less: Machine hours for *B* (1600 × 2)	3200
Machine Hours for *A*	800

$\therefore$ No. of units of *A* should be $= \frac{800}{10}$

$= 80$ units

No. of units of *B* should be = 1600 units

Calculation of Annual Contribution and Profit

	A	*B*	*Total*
Sales ($A = 80 \times 50$) ($B = 1{,}600 \times 20$)	4,000	32,000	36,000
Less: Variable Cost *A* 80 × 30 *B* 1,600 × 120	2,400	19,200	21,600
Contribution	1,600	12,800	14,400
Less: Fixed Cost			10,000
Profit			4,400

Any product mix other than suggested above will reduce the profits as is clear from the following example:

	A	*B*	*Total*
Sales units	100	1,500	1,600
Sales	5,000	30,000	35,000
Less: Variable Cost	3,000	18,000	21,000
Contribution	2,000	12,000	14,000
Less: Fixed Cost Profit			10,000
Profit			4,000

Example 16.32

An exporter of garments is earning a profit of Rs. 1,00,000 on a sale of Rs. 12,00,000. Selling price is Rs. 40 per garment and variable cost is Rs. 30 per garment. The exporter incurs an additional fixed cost of Rs. 3,00,000 on product improvement which also enables him to economise Rs 5 in per garment variable cost. As per trade agreements, the sale of his garments is restricted to the old value of Rs. 12,00,000. What should be the selling price per garment so that the exporter earns the same profit at the same sales value?

(B.Com. (Hons), 2005)

Solution:

$$\text{Units sold} = \frac{\text{Sales}}{\text{Selling Price per unit}} = \frac{\text{Rs.12,00,000}}{\text{Rs. 40}}$$

$$= 30{,}000 \text{ units}$$

Computation of fixed cost before incurring additional fixed cost

	Sales	40	12,00,000
Less:	Variable cost	30	9,00,000
	Contribution	10	3,00,000
Less:	Profits		100,000
	Fixed Cost		200,000

Hence, total fixed cost in the new case

$$= 200{,}000 + \text{Rs. } 300{,}000 = \text{Rs. } 500{,}000$$

Contribution in the New Case = New Fixed Cost + Profits

$$= 5{,}00{,}000 + 1{,}00{,}000 = \text{Rs. } 6{,}00{,}000$$

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Since as per agreement the sale value is restricted to the old value that is. Rs. 12,00,000. Hence P/V Ratio will be:

$$= \frac{6,00,000}{12,00,000} \times 100 = 50\%$$

The variable cost in the new case = Rs. 30 – 5 = Rs. 25
Variable Cost Ratio = 100 – P/V Ratio = 100 – 50 = 50%

Computation of New Selling Price:

If VC is 50, then SP = Rs. 100

If VC is 1, then SP = $\frac{100}{50}$

If VC is 25, then SP = $\frac{100}{50} \times 25$ = Rs. 50 per unit

Example 16.33

A factory engaged in manufacturing plastic buckets is working at 40% capacity and produces 10000 buckets per annum. The present cost break-up for one bucket is as under:

Material	Rs. 10
Labour	Rs. 3
Overheads	Rs. 5 (60% fixed)

The selling price is Rs. 20 per bucket. In case it is decided to work the factory at 50% capacity, the selling price falls by 3%. At 90% capacity the selling price falls by 5% accompanied by a similar fall in the price of material.

Calculate the profit at 50% and 90% capacities and also the break-even points for the same capacities.

(B.Com. Delhi, 2004, B.Com. (Hons), Delhi 2007)

Salution:

Statement showing profit and Break-even Point at Different Capacity Lavels

Capacity lavels		*50%*		*90%*
Production (units)		*12.500*		*22,500*
	Per unit	*Total*	*Per unit*	*Total*
(i) Sales	Rs. 19.40	Rs. 2,42,500	Rs. 19.00	Rs. 4,27,500
Variable cost:				
Materials	10.00	1,25,000	9.50	2,13,750
Wages	3.00	37,500	3.00	67,500
Variable overheads	2.00	25,00	2.00	45,000
(ii) Total variable cost	15.00	1,87,500	14.50	3,26,250
(iii) Contribution (i – ii)	4.40	55,000	4.50	1,01,250
(iv) Fixed costs		30,000		30,000
(v) Net profit (iii – iv)		25,000		71,250

	Break-even point; at 50% capacity	at 90% capacity
	$\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$	$\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$
In Units	$\frac{30,000}{4.40}$ = 6,818 units	$\frac{30,000}{4.50}$ = 6,667 units
In Sales value	Rs. 1,32,270	Rs. 1,26,673

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Example 16.34

(a) A company has a project to install a new machine exclusively for the manufacture of a new product which is expected to have good demand and reasonably high margin. Maximum possible annual sales may not exceed Rs. 50 lakhs and if there is competition it may fall considerably. The company has obtained quotations and short listed two offers for the new machine. Details in respect of the two models are given below:

	Machine models	
Maximum possible sales per year	Rs. 50 lakhs	Rs. 50 lakhs
Fixed costs per year	5 lakhs	8 lakhs
Estimated profit for maximum sales	15 lakhs	17 lakhs

You are required to calculate:

(i) Break-even sales of each machine.
(ii) Sales at which both models will give the same profit;
(iii) Range of sales over which one model is better than the other.

(b) For the final assembly of a product in an engineering company, a certain component is required. The company has the options either to produce the component itself or purchase it from the market. The production department which can make the component is currently working to full capacity and earning a contribution of Rs. 10 per hour on an order which will last for another ten months. Repeat orders are very likely. Variable cost of making the component is Rs. 42 and it takes one hour per unit. Market price of the component is Rs. 45 per unit.

What advice will you give to the management of the company? *(ICWA, Inter Stage 1, June 2004)*

Solution:

(a) Statement showing parameters of two machines

(Rs. in lakhs)

	Type of machines	*Model M1*	*Model M2*
1.	Maximum possible sales per year	50	50
2.	Fixed costs per year	5	8
3.	Estimated profit for maximum sales	15	17
4.	Total contribution based on max. sales (2 + 3)	20	25
5.	P/V Ratio (Contribution/Sales) (4/1).	0.40	0.50
	(i) Break-even sales FC ÷ P/V	12.50	16.00
	(ii) Sales at which both models will give the same profit [Ref. Working Note 1]	30.00	30.00
	Profit	7.00	7.00

Working Note 1:

Let S be the sales at which profit will be the same for both models.

	$M1$	$M2$
Sales = $[F + P] + C/S$	$[5 + P]/0.40$	$[8 + P]/0.50$

where, F = fixed costs; P = Profit; C = Contribution; S = Sales.

Accordingly to given expression,

$$\frac{5+P}{0.40} = \frac{8+P}{0.50} = 2.5 + 0.50P = 3.20 + 0.40P = 0.10P = 0.70 = P = 7$$

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Substituting,

$$S = \frac{5+7}{0.4} \Rightarrow \frac{8+7}{0.50} \text{ Rs. 30 lakhs}$$

(iii) *RANGE of sales over which one model is better than the other:*
In the light of Supra-Comparative parameters, up to Rs. 30 lakhs annual sales *M*odel *M*1 will be more profitable than Model *M*2, since it (*M*1) has lower Fixed Cost and a lower Break-even Point and, at an annual sale of Rs. 30 lakhs both will have the same profit of Rs. 7 lakhs.
Model *M*2 having higher Fixed Cost and a higher Break-Even Point will be more profitable than Model *M*1 when the annual sale for the product exceeds Rs. 30 lakhs.

(b) If the company makes the component now, the effective cost would be Rs. 52 per unit that is, variable cost of Rs. 42 plus contribution of Rs. 10 foregone for the one hour diverted from current production.

Since it is available at Rs. 45 in the market, purchase from the market may be made. Since repeat orders are very likely, purchase from the market may continue.

If the capacity becomes available in the factory and the market price and variable cost of making continue to be Rs. 45 and Rs. 42 respectively, the component may be made in the company since it is cheapter to make. Similarly if the market price rises above Rs. 52 then also it is cheaper to make the component curtailing current production.

Example 16.35

The comparative profit statement of two quarters of a firm is as under:

	Quarter I	*Quarter II*
Units sold	2,500	3,750
	Rs.	Rs.
Direct materials	87,500	?
Direct wages	62,500	?
Fixed and variable Factory overheads	75,000	95,000
Sales	2,75,000	?
Profit	50,000	66,250

In the second quarter, the direct material price has increased by 20%. There was a saving of Rs. 5,000 in fixed overheads in the second quarter. The other costs and selling price remained the same. Determine the quantity that should have been sold in the second quarter to maintain the same amount of profit per unit as in the first quarter. *(CA Inter, May 2000)*

Solution:

Working Notes:

1. *Direct material, Direct wages, Selling price and Profit per unit*

$$\text{Direct material (p.u)} = \frac{\text{Rs. } 87{,}500}{2500 \text{ units}} = \text{Rs. } 35$$

$$\text{Direct wages (p.u)} = \frac{\text{Rs. } 62{,}500}{2500 \text{ units}} = \text{Rs. } 25$$

$$\text{Selling price (p.u)} = \frac{\text{Rs. } 2{,}75{,}000}{2500 \text{ units}} = \text{Rs. } 110$$

$$\text{Profit (p.u)} = \frac{\text{Rs. } 50{,}000}{2500 \text{ units}} = \text{Rs. } 20$$

2. *Variable factory overhead per unit and Fixed factory overheads for II Quarter*

$$\text{Variable factory overhead (p.u)} = \frac{\text{Changes in semi-variable overheads}}{\text{Changes in production volume}}$$

$$= \frac{\text{Rs. } 1{,}00{,}000^{**} - \text{Rs. } 75{,}000}{3750 \text{ units} - 2500 \text{ units}}$$

$$= \frac{\text{Rs. } 25{,}000}{1250 \text{ units}} = \text{Rs. } 20/-$$

Fixed factory overheads for II Quarter

	Rs.
Total factory overheads of II quarter	1,00,000
Less: Variable factory overheads (3,750 units × Rs. 20)	75,000
Total fixed factory overheads for II quarter	25,000
Less: Saving of fixed factory overheads	5,000
Net fixed factory overheads for II quarter	20,000

Statement of quantity of units to be sold in second quarter to maintain same amount of profit per unit as in the first Quarter

	Rs	*Rs*
Selling price per unit: (A) *(Refer to Working Note 1)*		110
Variable costs: (per unit):		
Direct materials $\left(\text{Rs. } 35 \times \frac{120}{100}\right)$	42	
Direct wages	25	
Variable factory overheads *(Refer to Working Note 2)*	20	
Total variable cost: (B)		87
Contribution per unit: {(A – D)}		23
Less: Profit per unit *(Refer to Working Note 1)*		20
Balance for fixed cost per unit		3
Total fixed cost		20,000

Hence the number of units to be sold in the second quarter to maintain the same amount of profit p.u. as in the first quarter

$$= \frac{\text{Total fixed cost}}{\text{Balance for fixed cost p.u.}}$$

$$= \frac{\text{Rs. } 20{,}000}{\text{Rs. } 3 \text{ per unit}} = 6667 \text{ units (Approx.)}$$

** In fact the fixed and variable factory overheads during the quarter (II) were Rs. 1,00,000 but due to saving of Rs. 5,000 the balance amount of Rs. 95,000 was paid.

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Example 16.36

A Company manufactures a product, currently utilising 80% capacity with a turnover of Rs. 8,00,000 at Rs. 25 per unit. The cost data are as under:

Material cost Rs. 7.50 per unit, Labour cost Rs. 6.25 per unit.

Semi-variable cost (Including variable cost of Rs. 3.75 per unit) Rs. 1,80,000.

Fixed cost Rs. 90,000 upto 80% level of output, beyond this an additional Rs. 20,000 will be incurred.

Calculate:

(i) Activity level at Break-Even-Point

(ii) Number of units to be sold to earn a net income of 8% of sales

(iii) Activity level needed to earn a profit of Rs. 95,000

(iv) What should be the selling price per unit, if break-even-point is to be brought down to 40% activity level? *(C.A. Inter Nov. 2000)*

Solution:

Working Notes:

1. (i) *Number of units sold at 80% capacity*

$$= \frac{\text{Turnover}}{\text{Selling price p.u}} = \frac{\text{Rs. 80,000}}{\text{Rs. 25}} = \text{Rs. 32,000 units}$$

(ii) *Number of units sold at 100% capacity*

$$= \frac{32000 \text{ units}}{80} \times 100 = 40000 \text{ units}$$

2. *Component of fixed cost included in semi-variable cost of 32000 units*

Fixed cost = {Total semi-variable cost – Total variable cost}

= Rs. 1,80,000 – 32,000 units × Rs. 3.75

= Rs. 1,80,000 – Rs. 1,20,000

= Rs. 60,000

3. (i) *Total fixed cost beyond 80% capacity*

= Fixed cost + Component of fixed cost included in semi-variable cost *(Refer to Working Note 2)*

= Rs. 90,000 + Rs. 60,000 = Rs. 1,50,000

(ii) *Total fixed cost beyond 80% capacity*

= Total fixed cost at 80% capacity + Additional fixed cost to be incurred

= Rs. 1,50,000 + Rs. 20,000 = Rs. 1,70,000

4. *Variable cost and contribution per unit*

Variable cost per unit = Material cost + Labour cost + Variable cost component in semi-variable cost

= Rs. 7.50 + Rs. 6.25 + Rs. 3.75 = Rs. 17.50

Contribution per unit = Selling price per unit – Variable cost per unit

= Rs. 25 – Rs. 17.50 = Rs. 7.50

5. *Profit at 80% capacity level*

= Sales revenue – Variable cost – Fixed cost

= Rs. 8,00,000 – Rs. 5,60,000 (32,000 units × Rs. 17.50) – Rs. 1,50,000 = Rs. 90,000

(i) *Activity level at Break – Even-Point*

$$\text{Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs. 1,50,000}}{\text{Rs. 7.50}} = 20000 \text{ units}$$

(Refer to Working Notes 3 & 4)

$$\text{Activity level at Break-Even-Point} = \frac{\text{Break-Even point (units)}}{\text{No. of units at 100\% capcity level}} \times 100$$

(Refer to Working Note 1(ii))

$$= \frac{20000 \text{ units}}{40000 \text{ units}} \times 100 = 50\%$$

(ii) *Number of units to be sold to earn a net income of 8% of sales*

Let x be the number of units sold to earn a net income of 8% of sales.

Mathematically, it means that:

(Sales revenue of x units) = Variable cost of x units + Fixed cost + Net income

or $\text{Rs. } 25x = \text{Rs. } 17.5x + \text{Rs. } 1,50,000 + \frac{8}{100} \times (\text{Rs. } 25x)$

or $\text{Rs. } 25x = \text{Rs. } 17.5x + \text{Rs. } 1,50,000 + \text{Rs. } 2x$

or $x = (\text{Rs. } 1,50,000 / \text{Rs. } 5.5) \text{ units}$

or $x = 27273 \text{ units.}$

(iii) *Activity level needed to earn a profit of Rs. 95,000*

The profit at 80% capacity level, is Rs. 90,000 which is less than the desired profit of Rs. 95,000. Therefore the needed activity level would be more than 80%. Thus the fixed cost to be taken to determine the activity level needed should be Rs. 1,70,000 *(Refer to Working Note 3(ii))*

$$\text{Units to be sold to earn a profit of Rs. 95,000} = \frac{\text{Fixed cost + Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{\text{Rs. } 1,70,000 + \text{Rs. } 95,000}{\text{Rs. } 7.5}$$

$$= 35333.33 \text{ units}$$

$$\text{Activity level needed to earn a profit of Rs. 95,000} = \frac{35333.33}{40000 \text{ units}} \times 100$$

$$= 88.33\%$$

(iv) *Selling price per unit, if break-even-point is to be brought down to 40% (16000 units) activity level*

Let x be the selling price per unit

Units at Break-even-point $= 16000 \text{ units}$

$$\text{Break-even-point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}}$$

$$\text{At 16000 units} = \frac{\text{Rs. } 1,50,000}{(x - \text{Rs. } 17.50)}$$

or $(x - \text{Rs. } 17.50) = \frac{\text{Rs. } 1,50,000}{16000 \text{ units}}$

or $(x - \text{Rs. } 17.50) = \frac{\text{Rs. } 75}{8 \text{ units}}$

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or	$8x - 8 \times$ Rs. 17.50	= Rs. 75
or	$8x$ – Rs. 140	= Rs. 75
or	$8x$	= Rs. 215
or	x	= Rs. 26.875
	Hence, Selling price (per unit)	= Rs. 26.875

Example 16.37

Fill in the blanks for each of the following independent situations:

	A	*B*	*C*	*D*	*E*
Selling Price per unit	...	Rs. 50	Rs. 20	–	Rs. 30
Variable Cost as % of Selling Price	60	–	75	75	–
No. of units sold	10,000	4,000	–	6,000	5,000
Marginal contribution	Rs. 20,000	Rs. 80,000	–	Rs. 25,000	Rs. 50,000
Fixed Costs	Rs. 12,000		Rs. 1,20,000	Rs. 10,000	–
Profit/Loss	–	Rs. 20,000	Rs. 30,000	–	Rs. 15,000

(CA Inter May 2001)

Solution:

Independent situation	*Blank space to be filled*	*Figure of blank*
A	Profit/(Loss) *[Refer to Working Note 1(i)]*	Rs. 8,000
	Selling price per unit *[Refer to Working Note 1(ii)]*	Rs. 5
B	Fixed costs *[Refer to Working Note 2(i)]*	Rs. 60,000
	Variable cost as % of selling price *[Refer to Working Note 2(ii)]*	60%
C	No. of units sold *[Refer to Working Note 3(ii)]*	30000 units
	Marginal contribution *[Refer to Working Note 3(i)]*	Rs. 1,50,000
D	Selling price per unit *[Refer to Working Note 4(ii)]*	Rs. 16.66
	Profit/(Loss) *[Refer to Working Note 4(i)]*	Rs. 15,000
E	Variable cost as % of selling price *[Refer to Working Note 5(ii)]*	66.66%
	Fixed costs *[Refer to Working Note 5(i)]*	Rs. 35,000

Working Notes:

1. (i) Profit/(Loss) = Contribution – Fixed costs
   = Rs. 20,000 – Rs. 12,000 = Rs. 8,000

   (ii) Let selling price per unit be (x)
   (Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{5}x\right) \times 10{,}000 \text{ units} = \text{Rs. } 20{,}000$

or $\frac{2}{5}x = \text{Rs. } 2$

or $x = \text{Rs. } 5$

2. (i) Fixed costs = Marginal contribution – Profit

= Rs. 80,000 – Rs. 20,000 = Rs. 60,000

(ii) Variable Cost as % of selling price

$$= \frac{\text{Selling price per unit} - \text{Marginal contribution per unit}}{\text{Selling price per unit}} \times 100$$

$$= \frac{\text{Rs. } 50 - \text{Rs. } 20}{\text{Rs. } 50} \times 100 = 60\%$$

3 (i) Marginal contribution = Fixed costs + Profit

= Rs. 1,20,000 + Rs. 30,000 = Rs. 1,50,000

(ii) No. of units sold $= \frac{\text{Marginal Contribution}}{\text{Contribution per unit}}$

$$= \frac{\text{Rs. } 1{,}50{,}000}{(\text{Rs. } 20 - \text{Rs. } 15)} = \frac{\text{Rs. } 1{,}50{,}000}{\text{Rs. } 5}$$

= 30000 units

4 (i) Profit/(Loss) = Marginal contribution – Fixed costs

= Rs. 25,000 – Rs. 10,000 = Rs. 15,000

(ii) Selling price per unit (x)

(Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{4}x\right) 6{,}000 \text{ units} = \text{Rs. } 25{,}000$

or $\frac{x}{4} \times 6{,}000 = \text{Rs. } 25{,}000$

or $x = \text{Rs. } 16.66 \text{ per unit}$

5 (i) Fixed costs = Marginal contribution – Profit

= Rs. 50,000 – Rs. 15,000 = Rs. 35,000

(ii) Variable cost per unit = Selling price – Marginal contribution per unit

= (Rs. 30 – Rs. 50,000/5,000)

= Rs. 20

Variable costs as % of selling price $= \frac{\text{Variable cost per unit}}{\text{Selling price per unit}} \times 100$

$$= \frac{\text{Rs. } 20}{\text{Rs. } 30} \times 100 = 66.66$$

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Example 16.38

ABC Ltd. which produces three products furnishes the following data for the year 1998.

	Products		
	Alfa	*Beta*	*Gamma*
Selling Price per unit	Rs. 100	75	50
Profit/Volume Ratio	10%	20%	40%
Maximum Sales Potential (units)	40,000	25,000	10,000
Raw Material as % of Variable Cost	50%	50%	50%

The company uses the same raw material for all the three products. Raw material is in short supply and the company has a quota for supply of raw material of the value of Rs. 18,00,000 for the year 1998 for manufacture of its products to meet its sales. Total fixed cost is Rs. 6,80,000.

You are required to:

(a) Determine a sales mix which will give the maximum overall profit keeping in view the short supply of raw material.

(b) Compute the maximum profit.

Solution:

Particulars		*Products*		
		Alfa	*Beta*	*Gamma*
Selling Price per unit	Rs.	100	75	50
Profit Volume Ratio		10%	20%	40%
Contribution per unit	Rs.	10	15	20
Variable Cost per unit	Rs.	90	60	30
Raw Material per unit	Rs.	45	30	15
Contribution per rupee of raw material	=	10/45	15/30	20/15
	=	2/9	1/2	4/3
Ranking		3	2	1

(a) Computation of Sales Mix

Product	*Units* Rs.	*Sales* Rs.	*Raw Material used*
Gamma	10,000	5,00,000	1,50,000
Beta	25,000	18,75,000	7,50,000
Alfa	20,000	20,00,000	9,00,000
Balance	55,000	43,75,000	18,00,000

(b) Computation of Profit

Product	*Sales* Rs.	*P/V Ratio*	*Contribution*
Gamma	5,00,000	40	2,00,000
Beta	18,75,000	20	3,75,000
Alfa	20,00,000	10	2,00,000
			7,75,000
	Less: Fixed Cost		6,80,000
	Net Profit		95,000

Example 16.39

An automobile manufacturing company produces different models of cars .The budget in respect of model 118 for the month of September, 1996 is as under:

Budgeted Output	*(Rs. in lakhs)*	*40,000 units (Rs. in lakhs)*
Net Realisation		700
Variable Costs:		
Materials	264	
Labour	52	
Direct Expenses	124	
Specific Fixed Costs	90	440
Allocated Fixed Costs	112.50	202.50
Total Costs		642.50
Profit		57.50
Sales		700.00

Calculate:

(i) Profit with 10 per cent increase in selling price with a 10 per cent reduction in sales volume.

(ii) Volume to be achieved to maintain the original profit after a 10 per cent rise in material costs, at the originally budgeted selling price per unit. *(C.A. Inter Nov. 1996)*

Solution:

(i) Statement of Profit

(with 10 per cent increase in selling price along with a 10 per cent reduction in sales-volume)

	(Rs. in Lakhs)
Sale Revenue: (A) *(See WN 1)*	693
Less: Variable Costs: (B) *(See WN 2)*	396
Contribution [(A) – (B)}	297
Less: Total Fixed Costs	202.5
Profit	94.5

Working Notes:

1. Selling Price (per unit) $= \frac{\text{Rs. } 7,00,00,000}{40000 \text{ units}} = \text{Rs. } 1,750$

   New Selling Price (per unit) = Rs. 1,750 + Rs. 175 = Rs. 1,925

   Reduced Sales Volume = 36000 units

   Total Sales Revenue = Rs. 1,925 × 36,000 = Rs. 693 lakhs

2. (i) *Variable Costs per Unit*

	Rs.
Materials Cost	= 660
Labour Cost	= 130
Direct Expenses	= 310
Total Variable Cost	= 1,100

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(ii) *Volume to be achieved to maintain original profit*

	Rs.	Rs.
Selling Price (per unit) (as per Working Note)		1,750
Less: Variable Costs		
Material Cost (Rs. 660 + Rs. 66)	726	
Labour Cost	130	
Direct Expenses	310	1,166
Contribution per unit		584

Desired Contribution = Fixed Cost + Original Profit

= Rs. 202.50 + Rs. 57.50

= Rs. 260 lakhs

$$\text{No. of cars to be sold to maintain original profit at original sales price} = \frac{\text{Rs. 260 lakhs}}{\text{Rs. 584}}$$

= 44,520.547 or say 44,521 cars.

Example 16.40

(a) A Company had incurred fixed expenses of Rs. 4,50,000, with sales of Rs. 15,00,000 and earned a profit of Rs. 3,00,000 during the first half year. In the second half, it suffered a loss of Rs. 1,50,000.

Calculate:

(i) The profit-volume ratio, break-even point and margin of safety for the first half year.
(ii) Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.
(iii) The break-even point and margin of safety for the whole year.

(b) A company manufactures and markets three products *X*, *Y* and *Z*. All the three products are made from the same set of machines. Production is limited by machine capacity. From the data given below, indicate priorities for Products *X*, *Y* and *Z* with a view to maximising profits:

Particulars		*Products*		
		X	*Y*	*Z*
Raw Material Cost per unit	(Rs.)	11.25	16.25	21.25
Direct Labour Cost per unit	(Rs.)	2.50	2.50	2.50
Other Variable Cost per unit	(Rs.)	1.50	2.25	3.55
Selling Price per unit	(Rs.)	25.00	30.00	35.00
Standard Machine time required per unit in minutes		39	20	28

(C.A. Inter May 1996)

Solution:

(a) (i) *Computation of Profit-Volume Ratio, Break-even Point and Margin of Safety: (for the first half year)*

$$\text{Profit-volume Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{\text{Fixed Expenses + Profit}}{\text{Sales}} \times 100$$

$$= \frac{\text{Rs. 4,50,000 + Rs. 3,00,000}}{\text{Rs. 15,00,000}} \times 100$$

$$= 50\%$$

Break-even Point $$= \frac{\text{Fixed Expenses}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 4,50,000}}{50\%}$$

$$= \text{Rs. 9,00,000}$$

Margin of Safety = Actual Sales – Break-even Sales
= Rs. 15,00,000 – Rs. 9,00,000
= Rs. 6,00,000

(ii) *Computation of Expected Sales Volume*

Expected Sales Volume $$= \frac{\text{Fixed Expenses + Loss}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 4,50,000 –Rs. 1,50,000}}{50\%}$$

$$= \text{Rs. 6,00,000}$$

(iii) *Computation of Break-even Point and Margin of Safety (for the whole year)*

Break-even Point $$= \frac{\text{Fixed Expenses for the whole year}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs 9,00,000}}{50\%} = \text{Rs. 18,00,000}$$

Margin of Safety $$= \frac{\text{Profit for the year}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs. 3,00,000 – Rs. 1,50,000}}{50\%}$$

$$= \text{Rs. 3,00,000}$$

(b) Statement showing Priorities for Products X, Y and Z to Maximise Profits

Products			*X*	*Y*	*Z*
Selling Price per unit	(Rs.)		25.00	30.00	35.00
Less: Variable Cost per unit (*See working note*)	(Rs.)		15.25	21	27.30
Contribution per unit	(Rs.)	(A)	9.75	9	7.70
Std. Machine time required in minutes per unit		(B)	30	20	28
Contribution per minute	(Rs.)	(A)/(B)	0.25	0.45	0.275
Priorities for Products			III	I	II

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Working Note:

Computation of Variable Cost per Unit

Particulars	*Products*		
	X	*Y*	*Z*
	Rs.	Rs.	Rs.
Raw Material Cost	11.25	16.25	21.25
Direct Labour Cost	2.50	2.50	2.50
Other Variable Cost	1.50	2.25	3.55
Total Variable Cost per unit	15.25	21.00	27.30

Example 16.41

A manufacturing company has an installed capacity of 1,20,000 units per annum. The cost structure of the product manufatured is as under:

	Rs.
(i) Variable cost per unit—	
Materials	8
Labour (Subject to a minimum of Rs. 56,000 per month)	8
Overheads	3

(ii) Fixed overheads — Rs. 1,68,750 per annum.

(iii) Semi-variable overheads Rs. 48,000 per annum at 60% capacity, which increase by Rs. 6,000 per annum for increase of every 10% of the capacity utilisation or any part thereof for the year as a whole.

The capacity utilisation for the next year is estimated at 60% for two months, 75% for six months and 80% for the remaining part of the year. If the company is planning to have a profit of 25% on the selling price, calculate the selling price per unit. Assume that there are no opening and closing stocks.

(C.A. Inter Nov. 1997)

Solution:

Statement of Selling Price and Profit

	Rs.
Materials 89,000 units × Rs. 8 per unit (WN 1)	7,12.000
Labour Cost (WN 2)	7,28,000
Variable Overheads (89,000 units × Rs. 3)	2,67,000
Semi-variable overheads (WN 3)	60,000
Fixed Overheads	1,68,750
Total Cost	19,35,750
Add: Profit @ 25% of selling price or 33 $\frac{1}{3}$% on cost	6,45,250
Total Sales Value	25,81,000
Selling Price per unit (Rs. 25,81,000/89,000 units)	29,00

Working Notes:

1. *Computation of Capacity Utilisation (for the next year):*

60% of capacity for first two months	= 2 months × 6,000 units	= 12,000 units
75% of capacity for next six months	= 6 months × 7,500 units	= 45,000 units
80% of capacity for the remaining four months	= 4 months × 8,000 units	= 32,000 units
Total capacity utilisation		= 89,000 units

$$\text{Capacity utilisation} = \frac{89{,}000 \text{ units}}{1{,}20{,}000 \text{ units}} \times 100 = 74\ \frac{1}{6}\ \%$$

2. *Computation of labour cost (subject to a minimum of Rs. 56,000 p.m.)*

	Rs.
Labour Cost of first two months 12,000 units × Rs. 8 = Rs. 96,000 However Minimum is 56,000 × 2	1,12,000
Labour cost of next six months 45,000 units × Rs. 8	3,60,000
Labour cost of last four months 32,000 units × Rs. 8	2,56,000
Total Labour Cost	7,28,000

3. *Computation of semi-variable overheads (per annum):*

	Rs.
Semi-variable Overheads (at 60% capacity)	48,000
Semi-variable Overheads for additional (14 – 1/6% capacity are the same as that for 20% of the capacity utilisation for the entire year)	12,000
	60,000

Example 16.42

A company has annual fixed costs of Rs. 14,00,000. In 1996 sales amounted to Rs. 60,00,000 as compared with Rs. 45,00,000 in 1995 and profit in 1996 was Rs. 4,20,000 higher than in 1995.

(i) At what level of sales does the company break-even?

(ii) Determine profit or loss on a forecast sales volume of Rs. 80,00,000.

(iii) If there is a reduction in selling price in 1997 by 10% and the company desires to earn the same profit as in 1996, what would be the required sales volume? *(B.Com. (Hons) Delhi 1997)*

Solution:

$$\text{P/V Ratio} = \frac{\text{Increase in Profit}}{\text{Increase in Sales}} \times 100$$

$$= \frac{4{,}20{,}000}{15{,}00{,}000} \times 100 = 28\%$$

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(i) Break-even Sales $= \dfrac{\text{Fixed Cost}}{\text{P V Ratio}}$

$= \dfrac{14,00,000}{28\%}$

$=$ Rs. 50,00,000

(ii) Profit on sales of Rs. 80,00,000

Total Contribution 80,00,000 × 28/100	= 22,40,000
Less: Fixed Cost	14,00,000
Profit	8,40,000

(iii)

If Present Selling Price is	Rs. 100
Variable Cost is (100 – 28)	Rs. 72
New Selling Price (100 – 10)	Rs. 90
New Contribution	Rs. 18
New P/V Ratio	$\dfrac{18}{90} \times 100 = 20\%$

Profit in 1996:

Contribution 60,00,000 × 28/100 =	16,80,000
Less: Fixed Cost	14,00,000
Profit	2,80,000

Sales for Desired Profit of Rs. 2,80,000 $= \dfrac{\text{Fixed Cost + Desired Profit}}{\text{New P/V Ratio}}$

$= \dfrac{14,00,000 + 2,80\,000}{20\%}$

$= \dfrac{16,80,000}{20\%} =$ Rs. 84,00,000

Example 16.43

A company has three factories situated in North, East and South with its Head Office in Mumbai. The Management has received the following summary report on the operations of each factory for a period:

Particulars	*Sales* (Rs. in '000)		*Profit* (Rs. in '000)	
	Actual	*Over/(Under) Budget*	*Actual*	*Over/(Under) Budget*
North	1,100	(400)	135	(180)
East	1,450	150	210	90
South	1,200	(200)	330	(110)

Calculate for each factory and for the company as a whole for the period:

(i) Fixed Costs.

(ii) Break-even Sales *(CA Inter Nov. 1996)*

Solution:

Computation of Profit Volume Ratio (Rs. '000)

	Sales			*Profit*			*P/V Ratio*
	Actual	*Over/ (Under) Budget*	*Budgeted Sales*	*Actual*	*Over/ (Under) Budget*	*Budgeted Profit*	*(Diff. between Profit) (Diff. between Sales)*
North	1,100	(400)	1,500	135	(180)	315	45% (180/400 × 100)
East	1,450	150	1,300	210	90	120	60% (90/150 × 100)
South	1,200	(200)	1,400	330	(110)	440	55% (110/200 × 100)

(i) Computation of Fixed Costs

(Rs. '000)

Particulars	*Actual sales*	*P/V Ratio %*	*Contribution*	*Actual Profit*	*Fixed Cost*
	(1)	*(2)*	*(3) = (1) × (2)*	*(4)*	*(5) = (3) – (4)*
North	1,100	45	495	135	360
East	1,450	60	870	210	660
South	1,200	55	660	330	330
Total	3,750	54	2,025	675	1,350

(ii) Computation of Break-Even Sales

(Rs. ('000)

Particulars	*Fixed Cost*	*P/V Ratio %*	*Break-even Sales*
	(a)	*(b)*	*(a)/(b)*
North	360	45	800
East	660	60	1,100
South	330	55	600
			2,500

Break-even Sales (company as whole): $\frac{\text{Fixed Cost}}{\text{Composite P/V Ratio}} = \frac{1,350}{54} = 2,500$ (in Rs. '000).

Example 16.44

The variable cost structure of a product manufactured by a company during the current year is as under:

	Rs. per unit
Material	120
Labour	30
Overheads	12

The selling price per unit is Rs. 270 and the fixed cost and sales during the current year are Rs. 14 lakhs and Rs. 40.5 lakhs respectively.

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During the forthcoming year, the direct workers will be entitled to a wage increase of 10% from the beginning of the year and the material cost, variable overhead and fixed overhead are expected to increase by 7.5%, 5% and 3% respectively.

The following are required to be computed:

(a) New sale price in the forthcoming year if the current P/V ratio is to be maintained.

(b) Number of units that would require to be sold during the forthcoming year so as to yield the same amount of profit in the current year, assuming that selling price per unit will not be increased.

(I.C.W.A. Inter June 1997)

Solution:

Current Year's Statement of Profitability

Units sold 15000

Particulars		*Rs.*	*Total*
Selling Price per unit (Rs.)		270	
Less: Variable Cost per unit:			
Material	120		
Labour	30		
Overheads	12		
		162	
Contribution per unit		108	
Total Contribution (15,000 units × Rs. 108)			16,20,000
Less: Fixed Cost			14,00,000
Profit			2,20,000
P/V Ratio (108/270)			40%

(a) Statement Showing New Selling Price for the Forthcoming Year (Retaining Current Year's P/V Ratio)

Particulars		*Rs.*
(1) Variable Cost per unit:		
Material	129.00	
Labour	33.00	
Overhead	12.60	
		174.60
(2) Selling Price (174.60 × 100/60)		291.00
(3) Contribution (2) – (1)		116.40
(4) P/V Ratio		40%

(b) Computation of Number of Units to be Sold during Forthcoming Year (Maintaining the Current Year's Profit)

Particulars	*Rs.*	*Rs.*
(i) Current Year Profit	2,20,000	
(ii) Revised Fixed Cost	14,42,000	16,62,000
(iii) Required Contribution (Rs. 270 – Rs. 174.60)		95.40
(iv) Number of Units to be sold (16,62,000/95.40)		17,422 units

Working Note:

Computation of Variable Cost per Unit

	Current Year	*Forthcoming Year*	
	Rs.	*Increase %*	*Total (Rs.)*
Material	120.00	7.5 (120 × 1.075)	129.00
Labour	30.00	10 (30 × 1.10)	33.00
Overhead	12.00	5 (12 × 1.05)	12.60
	162.00		174.60
Fixed Cost	Rs. 14,00,000	3 (14,00,000 × 1.03)	14,42,000

Example 16.45

A company manufactures a single product with a capacity of 1,50,000 units per annum. The summarised profitability statement for the year is as under:

	Rs.	Rs.
Sales: 1,00,000 units @ Rs. 15 per unit		15,00,000
Cost of Sales:		
Direct Materials	3,00,000	
Direct Labour	2,00,000	
Production Overhead: Variable	60,000	
Fixed	3,00,000	
Administration Overheads (Fixed)	1,50,000	
Selling and Distribution Overheads: Variable	90,000	
Fixed	1,50,000	12,50,000
Profit		2,50,000

You are required to evaluate the following options:

(i) What will be the amount of sales required to earn a target profit of 25% on Sales, if the packing is improved at a cost of Re. 1 per unit?

(ii) There is an offer from a large retailer for purchasing 30,000 units per annum, subject to providing a packing with a different brand name at a cost of Rs. 2 per unit. However, in this case there will be no selling and distribution expenses. Also this will not, in any way, affect the company's existing business. What will be the break-even price for this additional offer?

(iii) If an expenditure of Rs. 3,00,000 is made on advertising, the sales would increase from the present level of 1,00,000 units to 1,20,000 units at a price of Rs. 18 per unit. Will that expenditure be justified?

(iv) If the selling price is reduced by Rs. 2 per unit, there will be 100% capacity utilisation. Will the reduction in selling price be justified? *(C.A. Inter May 2001)*

Solution:

Working Notes:

	Rs.
(1) *Contribution per unit:*	
Selling price per unit: (A)	15.00

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Variable cost per unit:	
Direct materials (Rs. 3,00,000/1,00,000 units)	3.00
Direct labour (Rs. 2,00,000/1,00,000 units)	2.00
Variable production overheads (Rs. 60,000/1,00,000 units)	0.60
Variable selling and distribution overheads (Rs. 90,000/1,00,000 units)	0.90
Total variable cost per unit: (B)	6.50
Contribution per unit: {(A) – (B)} (Rs. 15 – Rs. 6.50)	8.50

(2) *Total fixed cost:*

	Rs.
Production overheads	3,00,000
Administration overheads	1,50,000
Selling and distribution overheads	1,50,000
Total fixed cost	6,00,000

(i) Amount of sales required to earn a target profit of 25% on sales after improving the packing

	Rs.
Present variable cost per unit *(Refer to Working Note 1)*	6.50
Improved packing cost per unit	1.00
Revised variable cost per unit	7.50

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \left\{\frac{\text{Rs } 15 - \text{Rs } 7.50}{\text{Rs } 15} \times 100\right\} = 50\%$$

Let x is the desired sales revenue to earn a target profit of 25% on sales; then the desired contribution would be: Total fixed cost + 25% × x

$$\text{Since P/V ratio} = \frac{C}{S} \times 100 = \frac{\text{Fixed Cost + Profit}}{x} \times 100$$

$$\therefore \quad x = \frac{\text{Rs. } 6,00,000 + 25\%\, x}{50\%} \quad \textit{(Refer to Working Note 2)}$$

or $x \times 50\% = \text{Rs. } 6,00,000 + 25\%\, x$

or $\left[\frac{x}{2} - \frac{x}{4}\right] = \text{Rs. } 6,00,000$

or $x = \text{Rs. } 24,00,000$

Hence, the desired amount of sales required to earn a target profit of 25% on sales is Rs. 24,00,000. On the sale of Rs. 24,00,000, the desired contribution is 50% of sales that is Rs. 12,00,000 and profit is 25% of sales that is Rs. 6,00,000.

(ii) Evaluation of an offer of purchasing 30,000 units per annum (subject to providing a packing with a different brand name at a cost of Rs. 2 per unit) from a large retailer. Determine also the break-even price for this additional offer.

	Rs.
Present variable cost per unit	6.50
Less: Variable selling and distribution overheads per unit	0.90
	5.60
Add: Special packing cost per unit	2.00
Revised variable cost per unit	7.60

The break-even price per unit for this additional offer of 30,000 units would be Rs. 7.60 per unit. In other words the break-even price for this additional offer here means the price per unit at which 30,000 units offer can be accepted without earning any profit on it.

Note: The existing business will bear the impact of fixed cost. Fixed costs will not affect this additional offer of 30000 units.

(iii) Justification of incurring advertisement expenses of Rs. 3,00,000 for increasing the sale from 1,00,000 units to 1,20,000 units.

	Rs.
New selling price per unit	18.00
Less: Variable cost per unit	6.50
(Refer to Working Note 1)	
Contribution per unit	11.50
Total contribution	13,80,000
(1,20,000 units × Rs. 11.50)	
Less: Present fixed cost	(6,00,000)
Less: Additional expenditure on advertising	(3,00,000)
Profit	4,80,000

Justification: The amount of profit on the sale of 1,00,000 units was Rs. 2,50,000 *(Refer to the statement of the question)*. On increasing the sale of product units from 1,00,000 to 1,20,000 the profit of the concern increased from Rs. 2,50,000 to Rs. 4,80,000. Therefore, the expenditure on advertisement is justifiable and the proposal under consideration is viable.

(iv) Justification of reduction in selling price to increase capacity utilisation to 100%

	Rs.
Revised selling price per unit	13.00
Less: Variable cost per unit	6.50
(Refer to Working Note 1)	
Contribution per unit	6.50
Total contribution at 100% capacity utilisation	9,75,000
(1,50,000 units × Rs. 6.50)	
Less: Fixed cost	6,00,000
Profit	3,75,000

Justification: A reduction in selling price by Rs. 2 per unit for 100% capacity utilisation, increases the present profit of Rs. 2,50,000 to Rs. 3,75,000. Hence the reduction in selling price is justified.

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Example 16.46

The PTO Division of *XYZ* manufacturing company produces power take-off units for the farm equipment business. The PTO Division headquartered in Mumbai has a newly renovated, automated plant in Mumbai and an older, less-automated plant in Pune. Both plants produce the same power take-off units for farm tractors that are sold to most domestic and foreign tractor manufacturers.

The PTO Division expects to produce and sell 1,92,000 power take-off units during the coming year. The division production manager has the following data available regarding the unit costs, unit prices and production capacities for the two plants:

- All fixed costs are based on a normal year of 240 working days. When the number of working days exceed 240, variable manufacturing costs increase by Rs. 3 per unit in Mumbai and Rs. 8 per unit in Pune. Capacity for each plant is 300 working days.
- *XYZ* manufacturing Co. charges each of its plants a per unit fee for administrative services such as payroll, general accounting and purchasing, because management considers these services to be a function of work performed at the plants. For each of the plants at Mumbai and Pune, the fee is Rs. 6.50 and represents the variable portion of general and administrative expense.

Wishing to maximise the higher unit profit at Pune, the PTO's production manager has decided to manufacture 96000 units at each plant. This production plan results in Pune's operating at capacity and Mumbai's operating at its normal volume. *XYZ*'s Corporate Controller is not happy with this plan, because she does not believe it represents optimal usage of PTO's plants.

	Mumbai	Pune
Selling price	Rs. 150.00	Rs. 150.00
Variable manufacturing cost	72.00	88.00
Fixed manufacturing cost	30.00	15.00
Commission (5%)	7.50	7.50
General & Administrative expenses	25.50	21.00
Total unit cost	135.00	131.00
Unit profit	Rs. 15.00	Rs. 18.50
Production rate per day	400 units	320 units

Required:

(i) Determine the annual break-even units for each of the PTO's plants.

(ii) Determine the operating income that would result from the division production manager's plan to produce 96000 units at each plant.

(iii) Determine the optimal production plan to produce the 1,92,000 units at PTO's plants in Mumbai and Pune and determine the resulting operating income for the PTO Division. *(CA Inter, May 2000)*

Solution:

Working Note:

Total fixed cost based on a normal year of 240 working days.

	Mumbai plant	*Pune plant*
Production rate per day (units)	400	320
No. of days	240	240
Total production (units) in 240 days	96,000 (400 units × 240 days)	76,800 (320 units × 240 days)
Fixed manufacturing cost per unit (Rs.)	30	15

(*Contd.*)

Total fixed manufacturing cost based on a normal year of 240 working days (Rs.): (A)	28,80,000 (96,000 units × Rs. 30)	11,52,000 (76,800 units × Rs. 15)
Fixed General & Administrative expenses (Rs.): (B)	18,24,000 (96,000 units × Rs. 19)	11,13,600 (76,800 × Rs. 14.50)
Total fixed cost (Rs.): {(A) + (B)}	47,04,000	22,65,600

(i) Annual Break-even units for each of the P.T.O's Plants

	Mumbai plant	*Pune plant*
Selling price p.u. (Rs.): (A)	150.00	150.00
Total variable cost:		
Variable manufacturing cost at normal volume (p.u.) (Rs.)	72.00	88.00
Commission (p.u.) (Rs.)	7.50	7.50
Variable General & Administrative expenses (p.u.): (Rs.)	6.50	6.50
Total variable cost (p.u) (Rs.): (B)	86.00	102.00
Contribution (p.u.) (Rs.): {(A) – (B)}	64.00	48.00
Annual-break-even (units)	73,500	47,200
Fixed cost/Contribution (p.u.) (Refer to Working Note)	(Rs. 47,04,000/Rs. 64)	(Rs. 22,65,600/Rs. 48)

(ii) Operating Income Statement
(as a result of Divisional Production Manager's plan to produce 96,000 units at each plant)

	Mumbai plant	*Pune Plant*
Normal capacity (units)	96,000 (400 units × 240 days)	76,800 (320 units × 240 days)
Full capacity (units)	1,20,000 (400 units × 300 days)	96,000 (320 units × 300 days)
Sales revenue (Rs.): (A)	1,44,00,000 (96,000 units × Rs. 150)	1,44,00,000 (96,000 units × Rs. 150)
Variable costs:		
Variable manufacturing cost (Rs.)	69,12,000 (96,000 units × Rs. 72)	92,16,000 (96,000 units × (Rs. 88 + Rs. 8)
Commission (Rs.)	7,20,000 (96,000 units × Rs. 7.50)	7,20,000 (96,000 units × Rs. 7.50)
Variable general & administrative expenses (Rs.)	6,24,000 (96,000 units × Rs. 6.50)	6,24,000 (96,000 units × Rs. 6.50)
Total variable cost (Rs.): (B)	82,56,000	1,05,60,000
Contribution margin (Rs.): {(A) – (B)}	61,44,000	38,40,000
Less: Fixed cost (Rs.) *(Refer to Working Note 3)*	47,04,000	22,65,600
Operating Income (Rs.)	14,40,000	15,74,400
Total Operating income of both the plants	= Rs. 14,40,000 + Rs. 15,74,400 = Rs. 30,14,400	

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Note: The question does not clarify that whether the variable cost will increase in respect of additional units only when the working days exceeds 240 days or against all the units. Operating income in the above statement of Pune plant, has been arrived at by assuming an increase in variable cost by Rs. 8 on all the units produced in the plant. An alternative operating income figure of Pune plant can also be obtained by considering increase in variable cost on only 19200 units. In the alternative case the operating income of Pune plant will come to Rs. 21,88,800 (Rs. 15,74,400 + 76800 units × Rs. 8)

(iii) Statement of Resulting Operating Income (for the PTO's plants in Mumbai and Pune)

	Mumbai plant	*Pune plant*
Optimal production plan		
Capacity of production (units)	1,20,000*	72,000
Sales revenue (Rs.): (A)	1,80,00,000	1,08,00,000
	(1,20,000 units × Rs. 150)	(72000 units × Rs. 150)
Variable cost:		
Variable manufacturing cost (Rs.)	90,00,000	63,36,000
	(120000 units × Rs. 72 + Rs. 3)	(72000 units × Rs. 88)
Commission	9,00,000	5,40,000
	(120000 units × Rs. 7.50)	(72000 units × Rs. 7.50)
Variable general & administrative expenses (Rs.)	7,80,000	4,68,000
	(120000 units × Rs. 6.50)	(72000 units × Rs. 6.50)
Total variable cost (Rs.): (B)	1,06,80,000	73,44,000
Contribution margin (Rs.): {(A) – (B)}	73,20,000	34,56,000
Less: Fixed cost	47,04,000	22,65,600
(Refer to Working Note)		
Operating Income	26,16,000	11,90,400
Total Operating Income for PTO's division = Rs. 38,06,400		

* Mumbai plant is utilized at full capacity level because the variable cost of manufacturing is lower vis-a-vis Pune plant.

Note: The operating income of the Mumbai plant in the above statement has been arrived at by assuming an increase in variable cost by Rs. 3 on all the units produced in the plant. An alternative operating income figure of the Mumbai plant can also be obtained by considering increase in variable cost on only 24000 units (that is in respect of additional units when working days exceeds 240 days). In the alternative case the operating income of Mumbai plant will come to Rs. 29,04,000 (Rs. 26,16,000 + 96000 units × Rs. 3).

THEORY QUESTIONS

1. What do you mean by marginal costing? Discuss its usefulness and limitations. *(B. Com. (Hons), Delhi, 2004)*
2. Write a lucid note on marginal costing indicating its effect on profit computations. *(B. Com. (Hons), Delhi)*
3. What are the most important areas of management decisions opened up by the application of the marginal (direct) costing method? *(ICWA, Inter, Stage 1, Dec. 2003)*
4. Marginal costs reveal the lowest price at which a product can be sold during a trade depression, but they also reveal to management the most profitable lines during the period of intense trade activity. Explain with examples, the second part of this statement. *(ICWA Inter)*

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5. Discuss the following terms in relation to marginal costing.
(a) Key factor, (b) P/V ratio, and (c) Margin of safety. *(ICWA Inter)*
6. (a) What do you understand by the term "margin of safety" with reference to volume of production?
(b) How do the following reflect on a break-even volume and on a P/V ratio; (i) increase in total fixed cost; (ii) increase in total physical sales; (iii) decrease in variable costs per unit. *(ICWA Inter)*
7. What do you understand by the term "break-even analysis"? Enumerate its uses. *(B.Com. (Hons), Delhi)*
8. How do income statements prepared under the absorption costing and marginal costing concepts differ?
9. Compared with absorption costing when will variable costing report lower profits, higher profits, the same profits?
10. In what ways is variable costing better adapted to managerial use in profit planning, decision-making and control?
11. Why do the supporters of marginal costing state that fixed costs are not to be included in inventories?
12. Discuss the uses of CVP analysis and its significance to management.
13. "In classifying a particular cost as fixed or variable, the volume or activity level is extremely important." Discuss and illustrate this statement.
14. "The contribution approach is the foundation of CVP logic and related techniques." Discuss.
15. Discuss the role of contribution in marginal costing in decisions relating to fixation of selling price. *(ICWA Inter)*
16. State with reasons whether the following propositions are correct.
(a) In an undertaking with a high fixed cost, break-even point can be attained at a lower level of activity.
(b) Profit is represented by the product of the margin of safety and the P/V ratio.
(c) In relation to normal sales, a low margin of safety along with a high P/V ratio is generally an indication of high fixed costs. *(ICWA Inter)*
17. Distinguish between absorption costing and variable costing. *(B.Com. (Hons), Delhi, 2007)*
18. Enumerate the factors which can change the break-even point. *(B.Com. (Hons), Delhi, 2002)*
19. "Marginal costing rewards sales whereas absorption costing rewards production. Comment. *(B.Com. (Hons) Delhi, 2003)*
20. "Absorption costing obscures the total amount of fixed costs whereas variable costing highlights it" Comment. *(B.Com. (Hons), Delhi, 2004)*
21. Mention some possible courses of action to improve profit-volume ratio. *(ICWA Inter, Stage 1, June 2005)*
22. What is meant by cost-volume-profit analysis? How CVP analysis is useful for the management? *(ICWA Stage II, Dec. 2003)*
23. Mention the basic assumption made for 'Break-even Analysis' and examine how far they are valid. *(ICWA, Inter, Stage 1, Dec. 2006)*
24. What is profit-volume graph? Explain how it is drawn? What are its important limitations? *(ICWA, Inter, Stage 1, June 2007)*
25. What are the limitations of break-even analysis? *(B.Com. (Hons), Delhi, 2007)*
26. "The techniques of variable costing is more used to provide a reasonable and sound basis for managerial decisions than to arrive at product cost. "Explain this statement with reference to the various types of decisions in which variable costing is useful. *(B.Com. (Hons), Delhi, 2007)*
27. Discuss the importance of fixed and variable costs for decision making at project stage and at operations stage. *(B.Com. (Hons), Delhi, 2007)*
28. Distinguish between "marginal costing" and "absorption costing". *(B.Com. (Hons), Delhi, 1999)*
29. "The effect of a price reduction is always to reduce the P/V ratio, to raise the break-even point, and to shorten the margin of safety." Explain with a suitable illustration. *(CA Inter)*
30. Define break-even point. How can the break-even point be computed?
31. How is a break-even chart prepared? What information does the break-even chart give?
32. What are the basic assumptions in cost-volume-profit analysis under (a) absorption costing, and (b) variable costing?
33. Describe how a P/V chart is drawn. How does the P/V chart differ from a break-even chart?
34. For product-mix decisions, what criteria can be used to select products that will maximise net income?

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35. Break-even analysis assumes that variable costs and revenues are linear and that fixed costs are fixed. Briefly explain why these assumptions may not be realistic. *(B. Com. (Hons), Delhi)*

36. "Marginal costs reveal the lowest price at which a product can be sold during a trade depression, but they also reveal to management the most profitable lines during a period of intense trade activity." Explain, with examples, the second part of this statement.

37. Can there be two break-even points. Show with the help of a graph. *(B. Com. (Hons), Delhi, 1999)*

38. Distinguish between contribution and profit. *(B. Com. (Hons), Delhi 2001)*

SELF EVALUATION QUESTIONS

I. Choose the correct answer for the following multiple choice questions:

(i) To obtain the break-even point in rupee sales value, total fixed costs are divided by:
- (a) Variable cost per unit;
- (b) Contribution margin per unit;
- (c) Fixed cost per unit;
- (d) Profit/volume ratio.

(ii) The break-even point is the point at which:
- (a) There is no profit, no loss;
- (b) Contribution margin is equal to total fixed cost;
- (c) Total revenue is equal to total cost;
- (d) All of the above.

(iii) The primary difference between a fixed budget and a variable (flexible) budget is that a fixed budget:
- (a) includes only fixed costs, while a variable budget includes only variable costs.
- (b) is concerned with only further acquisitions of fixed costs, while a variable budget is concerned with expenses which vary with sales.
- (c) cannot be changed after the period begins, while a variable budget can be changed after the period begins.
- (d) is a plan for a single level of sales (or other measure of activity), while a variable budget consists of several plans, one for each of several levels of sales (or other measures of activity).

(iv) Margin of safety is referred to as:
- (a) Excess of actual sales over fixed expenses;
- (b) Excess of actual sales over variable expenses;
- (c) Excess of actual sales over break-even sales;
- (d) Excess of budgeted sales over fixed costs.

(B.Com. (Hons), Delhi, 1997)

Ans: (i) d (ii) a (iii) d (iv) c

II. Attempt the following (working notes should form part of the answer):

(i) Total fixed cost Rs. 12,000; Contribution Rs. 20,000, No. of units sold 10000; Variable cost is 60% of sales. Determine selling price per unit and also the total profit/loss.

(ii) Total fixed cost Rs. 12,000, Actual sales Rs. 48,000, Margin of safety Rs. 8,000. Determine the P/V ratio.

(iii) When output is 3,000 units, the average cost per unit is Rs. 4. When output is increased to 4000 units, the average cost is Rs. 3.50 per unit. The break-even point is 5,000 units. Find the P/V ratio.

(B.Com. (Hons), Delhi, 2007)

Ans: (i) Rs. 5 (ii) 30% (iii) 37.5%

III. Chose the correct answer for the following multiple choice questions:

(i) Contribution margin is known as
- (a) Marginal income
- (b) Gross profit
- (c) Net income
- (d) Net profit

(ii) The break-even analysis may be described as
  (a) Comparison between production and sales
  (b) Comparison to make out capacity utilisation
  (c) Comparison between target set and actual achievement
  (d) Comparison between sales and costs

(iii) An increase in sales price
  (a) Does not affect the break-even point
  (b) Lowers the net profit
  (c) Increases, the break-even point
  (d) Lowers the break-even point

(iv) Profit under traditional costing and marginal costing system will be the same if
  (a) there are no opening and closing stocks
  (b) there is opening stock and no closing stock
  (c) there is closing stock and no opening stock
  (d) there are opening and closing stocks

(v) A decrease in sales price
  (a) does not affect the break-even point
  (b) lowers the net profit
  (c) increases the break-even point
  (d) lowers the break-even point

(vi) Fixed cost per unit decrease when
  (a) Production volume increases
  (b) Production volume decreases
  (c) Variable costs per unit decreases
  (d) Prime costs per unit decreases

(vii) Within a relevant range, the amount of variable costs per unit
  (a) Differs at each production level
  (b) Remains constant at each production level
  (c) Increases as production increases
  (d) Decreases as production increases

(viii) Margin of safety is referred to as
  (a) Excess of budgeted or actual sales over the variable expenses and fixed expense, at break-even.
  (b) Excess of budgeted or actual sales revenue over the fixed expenses.
  (c) Excess of actual sales over budgeted sales.
  (d) Excess of sales revenue over the variable expenses.

(ix) The most useful information derived from a break-even chart is the
  (a) Amount of sales revenue needed to cover variable costs.
  (b) Amount of sales revenue needed to cover fixed costs.
  (c) Relationship among revenues, variable costs and fixed costs at various levels of activity.
  (d) Volume or output level at which the enterprise break-even.

(x) Each of the following would affect the break-even point except a change in the
  (a) Number of units sold
  (b) Variable cost per unit
  (c) Total fixed costs
  (d) Sales price per unit

(xi) Under marginal costing system, the contribution margin discloses the excess of
  (a) Revenue over fixed costs
  (b) Projected revenues over the break-even point
  (c) Revenues over variable costs
  (d) Variable costs over fixed costs

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(xii) The method of cost accounting that lends itself to break-even analysis is
(a) Variable (Marginal)
(b) Standard
(c) Absolute
(d) Absorption

(xiii) Cost volume profit analysis allows management to determine relative profitability of a product by
(a) Highlighting potential bottlenecks in the production process.
(b) Keeping fixed costs to an absolute minimum.
(c) Determining contribution margin per unit and projected profits at various levels of production.
(d) Assigning costs to a product in a manner that maximises the contribution margin.

(xiv) To obtain the break-even point in rupees, total fixed costs are divided by which of the following:
(a) Variable cost per unit
(b) Fixed cost per unit
(c) Variable cost per unit ÷ Sales price per unit
(d) (Sales price per unit – Variable cost per unit) ÷ Sales price per unit.

(xv) Given the following notations, what is the break-even sales in rupees?

(a) $\frac{SP}{FC \div VC}$ (b) $\frac{VC}{SP - FC}$

(c) $\frac{FC}{VC \div SP}$ (d) $\frac{FC}{(SP - VC) \div SP}$

(xvi) What is the term that means all manufacturing costs (direct and indirect, variable and fixed) which contribute to the production of the product and are traced to output and inventories.
(a) Job-order costing
(b) Process costing
(c) Full or absorption costing
(d) Variable or marginal or direct costing

(xvii) What costs are treated as product costs under variable (marginal) costing?
(a) Only direct costs
(b) Only variable production costs
(c) All variable costs
(d) All variable and fixed manufacturing costs

PROBLEMS

1. Hind General Corporation produces only one product which had the following costs.

Variable manufacturing costs	Rs. 4 per unit
Fixed Manufacturing costs	Rs. 2,00,000 per year

The normal capacity is set at 200,000 units. There are no work-in-progress inventories.
In 2001, the company produced 200000 units and sold 90 per cent of them at a price of Rs. 7 per unit. In 2002, the company produced 210000 units and sold 215,000 units at the same price.
You are required to prepare income statements for 2001 and 2002 based on absorption costing and marginal costing.

Ans:

	2001 (Rs.)	*2002* (Rs.)
Profit (marginal costing)	3,40,000	4,45,000
Profit (Absorption costing)	3,60,000	4,40,000

2. The following cost information relates to factory for two years.

	2001	*2002*
Installed capacity (units)	10000	10000
Opening stock (units)	Nil	1000
Closing stock (units)	1000	Nil
Output (units)	10000	9000
Selling price per unit	14	14
Fixed costs for the year	85000	85000
Variable cost per unit	2.90	2.90

Work out the profit under absorption costing and marginal costing for the two years. Also state any abnormality in the results disclosed by absorption costing. Assume FIFO basis.

Ans:

	2001	*2002*
Profit (Absorption)	Rs. 23,400	17,500
Profit (Marginal)	Rs. 14,900	26,000

3. Using the information below prepare profit statements for the months of June and July using (i) marginal costing (ii) full absorption costing. Also, explain why the two methods disclose different amounts of profit for June and July.

Data per unit:	Rs.
Selling price	50
Direct material cost	18
Direct labour cost	4
Variable production overheads	3
Monthly costs:	
Fixed production overheads	99000
Fixed selling expenses	15000
Fixed administration expenses	25000

Variable selling costs are 10% of sales revenue and normal production capacity is 11,000 units per month.

	Sales (units)	*Production (units)*
June	10000	12000
July	12000	10000

Ans:

	June	*July*
Profit (Marginal costing)	Rs. 61,000	1,01,000
Profit (Absorption costing)	Rs. 79,000	83,000

4. Stock, production and sales data for Industrial Detergents Ltd. are given below:

		Period 1	*Period 2*	*Period 3*	*Period 4*
Production	(litres)	60,000	70,000	55,000	65,000
Sales	(litres)	60,000	55,000	65,000	70,000
Opening Stock	(litres)	–	–	15,000	5,000
Closing Stock	(litres)	–	15,000	5,000	–

The company has a single product, for which the financial data, based on an activity level of 60,000 litres per period, are as follows:

	Cost per litre Rs.
Direct Material	2.50
Direct Labour	3.00
Production Overheads = 200% of direct labour	6.00
= Total cost/litre	Rs. 11.50
Selling price per litre	Rs. 18.00

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Administrative overheads are fixed at Rs. 1,00,000 per period and half of the production overheads are fixed. From the above information prepare operating statements on marginal and absorption costing principles.

Ans:

	Period			
	(1)	(2)	(3)	(4)
Marginal costing profit (Rs.)	2,90,000	2,42,500	3,37,500	3,85,000
Absorption costing profit	2,90,000	2,57,500	3,22,500	3,55,000

5. The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are Rs. 90,000. Also compute profit at 75% of the capacity sales.

(B. Com.(Hons), Delhi, 2004, CA Inter Nov. 1997)

Ans: Capacity sales Rs. 5,00,000
Profit at 75% capacity Rs. 22,500

6. Profit/Volume Ratio of a company is 50%, while its margin of safety is 40%. If sales volume of the company is Rs. 50 lakhs, find out its break-even point and net profit. *(B.Com. (Hons) Delhi 1999)*

Ans: Break-even-sales Rs. 30 lakhs
Net profit Rs. 10 lakhs

7. *X* Ltd. has earned contribution of Rs. 2,00,000 and net profit of Rs. 1,50,000 on sales Rs. 8,00,000. What is its margin of safety? *(B. Com.(Hons), Delhi, 2000, C.A. Inter May 1997)*

Ans: Rs. 6,00,000

8. If margin of safety is Rs. 2,40,000 (40% of sales) and P/V ratio is 30% of *AB* Ltd. Calculate its (1) Break-even Sales and (2) Amount of profit on sales of Rs. 9,00,000. *(CA Inter May 1997)*

Ans: Break-even sales Rs. 3,60,000
Profit Rs. 1,62,000

9. (i) Ascertain profit, when sales = Rs. 2,00,000
Fixed Cost = Rs. 40,000
BEP = Rs. 1,60,000
(ii) Ascertain sales, when fixed cost = Rs. 20,000
Profit = Rs. 10,000
BEP = Rs. 40,000

(CA Inter May 1999)

Rs.*Ans:* (i) Rs. 10,000 (ii) Rs. 60,000

10. The profit volume ratio of *X* Ltd. is 50% and the margin of safety is 40%. You are required to calculate the net profit if the sales volume is Rs. 1,00,000. *(CA Inter Nov. 1998)*

11. B & Co. has recorded the following data in the two most recent periods:

Total Cost of Production (Rs.)	*Volume of Production (units)*
14,600	800
19,400	1,200

What is the best estimate of the firm's fixed costs per period? *(CA Inter Nov 1995)*

Ans: Rs. 5,000

12. *XYZ* Ltd. furnishes you the following income information:

Particulars	*Year 1994*	
	First-half (Rs.)	*Second-half (Rs.)*
Sales	8,10,000	10,26,000
Profit earned	21,600	64,800

From the above, you are required to compute the following assuming that the fixed cost remains the same in both the periods:

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(i) P/V Ratio
(ii) Fixed Costs
(iii) The amount of profit or loss where sales are Rs. 6,48,000.
(iv) The amount of sales required to earn a profit of Rs. 1,08,000. *(B. (Com.) Hons Delhi 1996)*

Ans: (i) 20% (ii) Rs. 1,40,400 (iii) Rs. 10,800 (iv) Rs. 12,42,000

13. A company producing a single product sells it at Rs. 50 per unit. Unit variable cost is Rs. 35 and fixed cost amounts to Rs. 12 lakhs per annum. With this data you are required to calculate the following, treating each independent of the other:
(a) P/V Ratio and Break-even Sales
(b) New Break-even Sales if variable cost increases by Rs. 3 per unit, without increase in selling price.
(c) Increase in sales required if profits are to be increased by Rs. 24 lakhs.
(d) Percentage increase/decrease in sales volume units to off-set
(i) an increase of Rs. 3 in the variable cost per unit.
(ii) a 10% increase in selling price without affecting existing profits quantum.
(e) Quantum of advertisement expenditure permissible to increase sales by Rs. 1.2 lakhs, without affecting existing profits quantum. *(CA Inter June 1995)*

Ans: (a) 30%, Rs. 40 lakhs (b) Rs. 50 lakhs (c) Rs. 8 lakhs (d) (i) 25% (ii) 25% (e) Rs. 36,000

14. Two firms A & Co. and B & Co. sell the same type of product in the same market. Their budgeted Profit & Loss Account for the year ending 31st March, 1996 are as follows:

Particulars	*A & Co.*		*B & Co*	
	Rs.	*Rs.*	*Rs.*	*Rs.*
Sales		5,00,000		6,00,000
Variable Costs	4,00,000		4,00,000	
Fixed Costs	30,000	4,30,0000	70,000	4,70,000
Net Profit		70,000		1,30,000

Required:
1. Calculate at which sales volume both the firms will earn equal profit.
2. State which firm is likely to earn greater profits in condition of:
(i) heavy demand for the product, and
(ii) low demand for the product
Give reasons. *(CA Inter Nov. 1995)*

Ans: (i) Rs. 3,00,000
(ii) B and Co. is likely to earn higher profits under conditions of heavy demand, A Co. is likely to earn higher profits under conditions of low demand

15. Indian Plastics make plastic buckets. An analysis of their accounting reveals:

Variable cost per bucket	Rs. 20
Fixed cost	Rs. 50,000 for the year
Capacity	2,000 buckets per year
Selling price per bucket	Rs. 70

Required:
(i) Find the break-even point.
(ii) Find the number of buckets to be sold to get a profit of Rs. 30,000.
(iii) If the company can manufacture 600 buckets more per year with an additional fixed cost of Rs. 2,000, what should be the selling price to maintain the profit per bucket as at (ii) above?
(B.Com. (Hons), Delhi)

Ans: (i) 1000 buckets (ii) 1600 buckets (iii) Rs. 62.39 per bucket

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16. A retail dealer in garments is currently selling 24000 shirts annually. He supplies the following details for the year ended 31st December, 2007

	Rs.
Selling price per shirt	40
Variable cost per shirt	25
Fixed Cost: Staff salaries for the year	1,20,000
General office costs for the year	80,000
Advertising costs for the year	40,000

As a cost accountant of the firm, you are required to answer the following each part independently:

(i) Calculate the break-even point and margin of safety in sales revenue and number of shirts sold.

(ii) Assume that 20000 shirts were sold in a year. Find out the net profit of the firm.

(iii) If it is decided to introduce selling commission of Rs. 3 per shirt, how many shirts would require to be sold in a year to earn a net income of Rs. 15,000.

(iv) Assuming that for the year 2008 an additional staff salary of Rs. 33,000 is anticipated, and price of a shirt is likely to be increased by 15% what should be the break-even point in number of shirts and sales revenue?

(B. Com. (Hons), Delhi)

Ans: (i) BEP Rs. 6,40,000; Margin of safety Rs. 3,20,000
(ii) Rs. 60,000
(iii)21,250 shirts
(iv) BEP 13000 shirts, Rs. 5,98,000

17. An enthusiastic marketing manager suggests to his managing director that only if he is permitted to reduce the selling price of a product by 20%, he would be able to achieve a 30% increase in sales volume. The managing director, finding that the sales volume increase exceeds in percentage the extent of requested reduction in price, gives the clearance.

You are given the following information:

Present selling price per unit	Rs. 7.50	
Present volume of sales	2,00,000	Nos.
Total variable costs	Rs. 10,50,000	
Total fixed costs	Rs. 3,60,000	

Assuming no changes in the costs pattern in the coming period.

(i) Examine the consequences of the managing director's decision assuming that 30% increase in sales is realised.

(ii) At what volume of sales can the present quantum of profits be sustained, after effecting the price reduction.

(B. Com. (Hons), Delhi)

Ans: (i) Profit will decrease by Rs. 2,55,000 (ii) 6,00,000 units

18. Cadbury Schweppes Limited, a British chocolate and soft drink company, is planning to establish a subsidiary company in India to produce, Schweppes Mineral Water.

Based on the estimated annual sales of 40,000 bottles of the mineral water, cost studies produced the following estimates for the Indian subsidiary:

	Total annual costs	*Per cent of total annual cost that is variable*
Material	Rs. 1,93,600	100%
Labour	90,000	70%
Overhead	80,000	64%
Administration	30,000	30%

The Indian production will be sold by manufacturer's representatives who will receive a commission of 8 per cent of the sale price. No portion of the British office expenses is to be allocated to the Indian subsidiary.

It is required to:

(i) compute the sale price per bottle to enable management to realise an estimated 10 per cent profit on sale proceeds in India, and

(ii) calculate the break-even point in rupee sales for the Indian subsidiary on the assumption that the sale price is Rs. 11 per bottle. *(B.Com. (Hons), Delhi, CA Inter)*

Ans: (i) Rs. 12 (ii) Rs. 3,84,000

19. Triple *X* company produces these products with the following characteristics:

	Product I	*Product II*	*Product III*
Price per unit	Rs. 5	Rs. 6	Rs. 7
Variable cost per unit	3	2	4
Expected sales (units)	100,000	150,000	250,000

Total fixed costs for the company are Rs. 12,40,000.

Assuming that the product mix would be the same at the break-even point, compute the break-even point in:

(a) Unit (total and by product line)

(b) Sales Rupees (total and by product line)

Ans: (a) 400,000 units

(b) Rs. 25,20,000 approx.

20. The following figures are available from the records of Venus Enterprises as at 31st March:

	2001	*2002*
	Rs. lakhs	Rs. lakhs
Sales	150	200
Profit	30	50

Calculate:

(a) The P/V ratio and total fixed expenses;

(b) The break-even level of sales:

(c) Sales required to earn a profit of Rs. 90 lakhs;

(d) Profit or loss that would arise if the sales were Rs. 280 lakhs.

(B. Com.(Hons), Delhi, 2004, CA Inter)

Ans: (a) 40% 130 lakhs (b) Rs. 75 lakhs
(c) Rs. 300 lakhs (d) Rs. 82 lakhs

21. Two manufacturing companies which have the following operating details decide to merge.

	Company No. 1	*Company No. 2*
Capacity utilization %	90	60
Sales (Rs. lakhs)	540	300
Variable cost (Rs. lakhs)	396	225
Fixed costs (Rs. lakhs)	80	50

Assuming that the proposal is implemented, calculate:

(i) Break-even sales of the merged plant and the capacity utilisation at that stage.

(ii) Profitability of the merged plant at 80% capacity utilization.

(iii) Sales turn over of the merged plant to earn a profit of Rs. 75 lakhs.

(iv) When the merged plant is working at a capacity to earn a profit of Rs. 75 lakhs what percentage increase in selling price is required to sustain an increase of 5% of fixed overheads.

(ICWA, Inter, Stage I, Dec. 2004, Dec. 2006)

Ans: (i) 25.909% P/V ratio, Rs. 501.67 lakhs, 45.6% (ii) Rs. 98 lakhs (iii) Rs. 791.23 lakhs (iv) 0.8215%

22. Company *A* and Company *B*, both under the same management, make and sell the same type of product. Their budgeted profit and loss accounts for January–June 2002 are as under:

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		Company A		*Company B*	
		Rs.	Rs.	Rs.	Rs.
Sales			3,00,000		3,00,000
Less:	Variable cost	2,40,000		2,00,000	
	Fixed costs	30,000	2,70,000	70,000	2,70,000
			30,000		30,000

You are required to

(i) Calculate the break-even point for each company.
(ii) Calculate the sales volume at which each of the two companies will make a profit of Rs. 10,000.
(iii) Assess how their profitability will change with decrease or increase in volume. *(ICWA Inter)*

Ans: (i) *A* Rs. 1,50,000 *B* Rs. 2,10,000
(ii) *A* Rs. 2,00,000 *B* Rs. 2,40,000

23. Tractors Ltd. have an installed capacity of 5000 tractors per annum. They are presently operating at about 35% of installed capacity. For the coming year, they have budgeted as follows:

Production/Sales	4000 units
Costs	*Rs. (Crore)*
Direct materials	8.00
Direct wages	0.60
Factory expenses	0.80
Administrative expenses	0.20
Selling expenses	0.20
Profit	1.00

Factory expenses as well as selling expenses are variable to the extent of 20%.
Calculate the break-even capacity utilisation percentage.

Ans: 40%

24. S.M. Ltd. produces two products and the Budget for 60% level of activity for the year 2001–2002 gives the following information:

	Product A	*Product B*
	Rs.	Rs.
Raw material cost per unit	7.50	3.50
Direct labour cost per unit	4.00	3.00
Variable overheads per unit	2.00	1.50
Fixed overheads per unit	6.00	4.50
Selling price per unit	20.00	15.00
Production and sales	4,000 units	6,000 units

The Managing Director not being satisfied with the projected results as stated above, referred the budget to the marketing director for improvement of the performance. The marketing director proposed that the sales quantities of Product *A* and *B* could each be increased by 50% provided the selling prices were reduced by 5% in the case of Product *A* and 10% in the case of Product *B*. The price reduction should be made applicable to the entire quantity of sales of each of the two products.

Required: (i) Present the overall profitability under the original budget and the revised budget after taking the increased sales into consideration.
(ii) Find the over all Break-even sales under the original budget and the revised budget. *(CA Inter)*

Ans:

		Original budget	*Revised budget*
(i)	Total Profit (Rs.)	17,000	31,500
(ii)	Overall break-even sales	1,27,500	1,45,715

25. Mansarovar Auto products produces and sells two small components *P* and *Q* used in automobiles. The details regarding unit income and costs of these components are as under:

	Products	
	P	*Q*
Selling price	Rs. 12	Rs. 20
Direct materials	2	4
Direct labour	2	1
Variable factory overhead	2	4
Fixed factory overhead	2	4
Total cost of goods sold	8	13
Gross profit per unit	4	7

Factory overheads, both fixed and variable, have been accounted for on a machine hour basis. As far as can be determined, the sales outlook is such that the plant could operate at full capacity on either or both products. Both *P* and *Q* are processed through the same cost centres. Selling costs are all fixed.

Which product should be preferred? Give a brief explanation in support of your answer. *(B. Com. (Hons), Delhi)*

Ans: P should be preferred.

26. Delhi Equipments Ltd., manufactures four components, the cost particulars of which are given below:

	Components			
	A	*B*	*C*	*D*
Elements of cost:				
Direct material	Rs. 80	100	100	120
Direct labour	20	25	25	30
Variable overhead	10	12	15	10
Fixed overhead	15	23	20	20
	125	160	160	180
Output per machine hour (units)	4	2	3	3

The key factor is shortage of machine capacity.

You are required to advise management as to whether they should continue to produce all or some of these components (which are used in its main product) or they should buy them from a supplier who has quoted the following prices:

A = Rs. 115; *B* = Rs. 175; *C* = Rs. 135; *D* = Rs. 185.

Ans: Component *C* should be purchased from outside. Continue the production of *A*, *B* and *D*.

27. From, the following data, which product would you recommend for manufacture in the factory?

Per unit of	*Product A*	*Product B*
Standard manufacturing time	2 hours	3 hours
Direct materials	50	30
Direct labour @ Rs. 10 per hour	20	30
Variable over head @ Rs. 6 per hour	12	18
Selling price	200	240

Total machine hours available in the factory are 60000.

Ans: Product *A*

28. Calculate the effect on profit of a proposed change in "Sales Mix" from the following data:

Existing sales mix	*M*	*N*	*O*	*P*	*Total*
Sales (in Rs.)	80,000	1,00,000	40,000	20,000	2,40,000
Variable cost (in Rs.)	48,000	68,000	32,000	8,000	1,56,000
Fixed cost (in Rs.)	–	–	–	–	58,800
Proposed sales mix	Rs. 60,000	88,000	80,000	12,000	2,40,000

(ICWA Inter)

Ans: Proposed sales mix is less profitable as profit will decline by Rs. 8,640

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29. *SV* Ltd., a multi-product company furnishes you the following data relating to the year 2005:

	First half of the year Rs.	*Second half of the year* Rs.
Sales	45,000	50,000
Total Cost	40,000	43,000

Assuming that there is no change in prices and variable cost and that the fixed expenses are incurred equally in the two half year periods, calculate for the year 2005:

(i) The P/V ratio
(ii) Fixed expenses
(iii) Break-even sales
(iv) Percentage of margin of safety *(ICWA, Inter, June 1999, CA Inter)*

Ans: (i) 40% (ii) 26,000;
(iii) 65,000 (iv) 31.58%

30. The Chief Cost Accountant of Vikas Limited found to his surprise that the actual profit for the period ending 30th June 2007 was the same as budgeted in spite of realising 10% more than the budgeted selling prices. The following were the results:

Particulars	*Budget* Rs.	*Actuals* Rs.
Sales	5,00,000	8,25,000
Variable costs of sales	3,00,000	5,75,000
Fixed costs	1,00,000	1,50,000
Profit	1,00,000	1,00,000

You are required to assist the Chief Cost Accountant in preparing the necessary explanations as to why the profit remained the same despite an increase in sales. *(ICWA Inter)*

Ans: Increase in profit equals to the increase in cost. Therefore, profit of the firm has remained the same.

31. Taurus Ltd. produces three products—*A*, *B* and *C*, from the same manufacturing facilities. The cost and other details of the three products are as follows:

	A	*B*	*C*
Selling price/unit (Rs.)	200	160	100
Variable cost/unit (Rs.)	120	120	40
Fixed expenses/month (Rs.)			2,76,000
Maximum production per month (units)	5,000	8,000	6,000
Total hours available for the month	200 hours		
Maximum demand per month (units)	2,000	4,000	2,400

The processing hours cannot be increased beyond 200 hours per month.
You are required to:
(a) Compute the most profitable product-mix:
(b) Compute the overall break-even sales of the company for the month based on the mix calculated in (a) above. *(CA, Inter)*

Ans: (a) *A* 2000 units, *B* 1600 units, *C* 2,400 units
(b) Rs. 6,72,000

32. The budgeted income statement by product lines of Multiproducts Ltd. for 2007 is as follows:

	Product A Rs.	*Product B* Rs.	*Product C* Rs.
Sales	2,00,000	5,00,000	3,00,000
Variable Expenses:			
Cost of goods sold	90,000	2,70,000	1,50,000
Selling	30,000	90,000	45,000

Fixed Expenses:			
Overhead	36,000	90,000	54,000
Administrative	16,000	40,000	24,000
Income before tax	28,000	10,000	27,000
Income tax @ 40%	11,200	4,000	10,800
Net income	16,800	6,000	16,200

All products are manufactured in the same facilities under common administrative control. Fixed expenses are allocated among the products in proportion of their budgeted sales volume:

(a) Compute the budgeted break-even point of the company as a whole, from the data provided.
(b) What would be the effect on Budgeted Income, if half of the budgeted sales volume of product *B* were shifted to product *A* and *C* in equal rupee amounts, so that the total budgeted sales in rupees remain the same.
(c) What would be the effect of the shift in the product mix suggested in (b) above on the budgeted break-even point of the whole company?

Ans: (a) Rs. 8,00,000
(b) Total income will increase by Rs. 14,250
(c) BEP will reduce to sales of Rs. 7,45,520 from Rs. 8,00,000.

33. Mr. *X* has Rs. 2,00,000 investments in his business firm. He wants a 15% return on his money. From the analysis of recent cost figures, he finds that his variable operating cost is 60% of sales and his fixed costs are Rs. 80,000 per year. Show computations to answer the following questions:

(a) What sales volume must be obtained to break-even?
(b) What sales volume must be obtained to get 15 per cent return on investment?
(c) Mr. *X* estimates that even if he closed the doors of his business, he would incur Rs. 25,000 as expenses per year. At what sales would he be better off by locking his business up? *(ICWA, Inter)*

Ans: (a) Rs. 2,00,000
(b) Rs. 2,75,000
(c) Mr. *X* will be better off by locking his business, if sales falls below Rs. 1,37,500.

34. The following set of information is presented to you by your client AB Ltd., producing two products X and Y.

	X (Rs.)	*Y* (Rs.)
1. Direct material per unit	20	18
2. Direct wages (per unit)	6	4
3. Fixed overhead during the period is expected to be Rs. 1,660		
4. Variable overhead is allocated to products at the rate of 100% of direct wages		
5. Sales price per unit	Rs. 40	Rs. 30
6. Proposed sales-mix		
(a) 100 units of *X* and 200 units of *Y*		
(b) 150 units of *X* and 150 units of *Y*		
(c) 200 units of *X* and 100 units of *Y*		

As a cost accountant, you are requested to present to the management of *AB* Ltd. the following:
(a) The unit marginal cost and unit contribution
(b) The total contribution and the resultant profit from each of the above sales-mixes
(c) The proposed sales mixes to earn a profit of Rs. 300 and Rs. 600 with the total sales of *X* and *Y* being 300 units.
(ICWA, Inter)

Ans:		*Product X*	*Product Y*
(a)	Unit marginal cost	Rs. 32	26
	Unit contribution	8	4

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	Mix (a)	Mix (b)	Mix (c)
(b) Profit under proposed sales mix (Rs.)	NIL	200	400

(c) Proposed sales mix

Profit Rs. 300 — *X* 175 units, *Y* 125 units

Profit Rs. 600 — *X* 250 units *Y* 50 units

35. A company seeking to improve its competitive position, has launched a cost reduction programme in its existing plants, apart from trying to increase output.

The present profit before tax comes to 15% of turnover and 30% of capital employed. Other relevant working ratios are:

Gross margin	35%
Margin of safety	43%
Capital turnover ratio	2

The operating figures for the last year were as follows:

Total sales value	Rs. 12,00,000
Variable costs	7,80,000
Fixed costs	2,40,000
Capital employed	6,00,000
Break-even sales	6,84,000

It has been proposed to reduce the sale price by 10% and increase the output by 20%. No change in fixed costs is expected. The estimated cost reduction amounts to Rs. 42,000.

You are required to work out the relevant figures and ratio based on the proposal and present those along with the existing ones in a meaningful manner and offer your comments. *(ICWA, Inter)*

Ans:

	Existing	*Proposed*
Profit	Rs. 180	162
Return on capital	30%	27%

The proposal should not be accepted as it will adversely affect the overall profitability of the company.

36. The following data are available from the budget records of Fitwell Shoe Company for the forthcoming budget period

	Rs.
Selling price	100.00
Variable cost:	
Cost of shoes	75.00
Sales commission	5.00
Total	80.00
Annual fixed expenses:	
Rent	80,000
Salaries	2,20,000
Other fixed expenses	60,000
	Rs. 3,60,000

Although the firm manufactures shoes with different styles, they have identical purchase costs and selling price. You are required to consider the following questions. Each question is to be treated independently.

(a) What is the annual break-even point both in terms of units and value?

(b) if the store manager is paid 0.3 per cent commission on sales, what would be the annual break-even point both in terms of units and value?

(c) If the firm decides to pay a fixed salary of Rs. 1,00,000 in lieu of sales commission, what would be the annual break-even point in terms of units and value. Compute the point of indifference.

(d) If the stores manager is paid 0.3 per cent commission on each paid sold in excess of the break-even point, what would be the profit if 30000 pairs were sold. *(CA, Inter)*

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Ans: (a) BEP units 18000; BEP Rs. 18,00,000
(b) BEP units 18274, BEP Rs. 18,27,411
(c) BEP units 18400; BEP Rs. 18,40,000
Indifference point 20,000 units
(d) Profit Rs. 2,36,400

37. Flex Ltd. has been offered to buy machine *A* or machine *B*. The relevant data are given below:

	Machine A	*Machine B*
Annual output (in units)	10000	10000
Fixed cost (Rs.)	30000	16,000
Profit at the above level of production (Rs.)	30000	24,000

Market price of the product is expected to be Rs. 10 per unit
You are required to compute:
(i) Break-even point for each of the two machines.
(ii) Level of sales at which both the machines earn equal profit.
(iii) Range of sales at which Machine *B* is more profitable.
(iv) The level of sales above which Machine *A* is more profitable. *(B.Com. (Hons), Delhi 2007)*

ALTERNATIVE CHOICES DECISIONS

17

Learning Objectives

After reading this chapter, you should be able to:

1. Understand concept of decision making and importance of qualitative factors in managerial decision making;
2. Explain relevant information, relevant revenues, relevant costs, and
3. Discuss different choices decisions such as make or buy, add or drop products sell or process further, operate or shutdown, special orders, replace or retain.

DECISION-MAKING

Decision-making also known as decision model, is the process of evaluating two or more alternatives leading to a final choice, known as Alternative Choices Decisions. It is a formal method for making a choice, frequently involving both quantitative and qualitative analyses. Decision-making is closely associated with planning for the future and is directed towards a specific objective or goal. The care put into each decision often determines the level of outcome. Still the best process and even the best decision does not guarantee a successful outcome. The future determines its own fate, but the best prepared decision is more likely to produce the desired result than any other selection.[1] The overall decision process (also referred to as decision model) contains the following decision-making steps or elements:

(1) Identify and define the problem.
(2) Identify alternatives as possible solutions to the problem.
(3) Eliminate alternatives that are clearly not feasible.
(4) Collect relevant data (costs and benefits) associated with each feasible alternative.
(5) Identify costs and benefits (revenues) as relevant or irrelevant and eliminate irrelevant costs and benefits (revenues) from consideration.
(6) Identify, to the extent possible, non-financial advantages and disadvantages (also known as qualitative factors) about each feasible alternative.

1. Lane K. Anderson and Harold M. Sollenberger, *Managerial Accounting*, South Western Publishing Co., 1992 p. 548.

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(7) Total the relevant costs and benefits (revenue) for each alternative.
(8) Select the alternative with the greatest overall benefit, that is, make the decision.
(9) Implement or execute the decision.
(10) Evaluate the results of the decision made.

RELEVANT INFORMATION

Managerial decision making is a process of making choices. If a choice is to be made among alternatives, there must be differences among the alternatives. Relevant information should be used by the decision maker in evaluating the alternatives and in making decisions. Relevant information implies relevant costs and relevant revenues (benefits) which are useful to evaluate alternatives, to ascertain the effect of various alternatives on profit and to finally select the alternative with the greatest benefit.

Relevant revenues and relevant costs are defined as the current and the future values that differ among the alternatives under consideration. They are the differences between the alternatives under consideration. The amount of the such differences are called differentials and the (accounting) analysis concerned with the effect of alternatives on revenues and costs is called differential analysis. Relevant revenues and costs are also known as differential revenues and differential costs. Horngreen, Foster and Datar[2] have summarised the key features of relevant information as follows:

Key Features of Relevant Information

(i) Pat (historical) costs may be helpful as a basis for making *predictions*. However, past cost themselves are always irrelevant when making *decisions*.
(ii) Different alternatives can be compared by examining differences in expected total future revenues and costs.
(iii) Not all expected future revenues and costs are relevant. Expected future revenues and costs that do not differ across alternatives are irrelevant and hence can be eliminated from the analysis.
(iv) Due weight must be given to qualitative factors and quantitative nonfinancial factors.

Relevant (differential) analysis focuses on the future because every decision deals with selecting courses of action for the future. Nothing can be done to alter the past. This analysis provides a decision rule to managers in decision-making which is 'the alternative that gives the greatest incremental profit should be selected'. Incremental profit is the difference between the relevant revenues and relevant costs of each alternative.

RELEVANT REVENUES

Relevant (differential) revenue is the amount of increase or decrease in revenue expected from a particular course of action as compared with an alternative. For instance, assume that a plant is being used to manufacture product *A*, which gives revenue of Rs. 3,00,000. If the plant could be used to make product *B*, which will provide revenue of Rs. 3,50,000 the differential revenue from making and selling product *B* will be Rs. 50,000.

2. Charles T. Horngreen, George Foster and Srikant M. Datar, *Cost Accounting,* A Managerial Emphasis, Prentice Hall of India, New Delhi, 2000, p.380.

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Relevant revenues have two features:

(i) They are expected future revenues.

(ii) They differ between different alternatives.

Relevant revenues are like cash inflows. If the amount of accrual profit and cash flow differs, the manager should give importance to cash flow. For short-run managerial decisions, timing of cash flow, that is, when the cash flows are received, are not so important. However, for long-run decisions where the time span is usually for more than one year, the timing of cash flows is important in the evaluation of alternatives and in making decisions.

RELEVANT COSTS

Relevant Costs are also known as differential costs, decision making costs. Relevant or differential cost is the difference in the total costs between alternative choices. When a decision results in an increased cost, the differential cost may be referred to as an incremental cost. If the cost decreases, the differential cost may be referred to as a decremental cost. The incremental cost includes the change in fixed component as well as the variable component. Assume that a company has physical facilities to manufacture 20000 units of a product; production beyond that point would require the installation of additional equipment, that is, fixed costs as well as variable costs will have to be incurred if management desires to produce more than 20000 units.

Relevant costs vary with the type of decision. However, the following are the common characteristics of relevant costs:

(1) Relevant costs are expected future costs.

(2) They differ between different alternatives.

Expected future costs imply that the costs are expected to occur during the time period covered by the decision. For example, new product will need the incurrence of direct material, direct labour and other costs.

QUALITATIVE FACTORS

Differential analysis or relevant cost analysis should be considered as only one input for the final decision to be made by the managers. In fact, a number of qualitative factors may have vital impact on managerial decisions. Qualitative factors are those elements relating to a decision which cannot be expressed in monetary terms or can be expressed in monetary terms with great difficulty or inaccuracy. Managers should consider qualitative factors also while making decisions otherwise it is likely that a wrong decision will be made.

For example, in a make or buy decision, decision-makers should consider many qualitative factors such as quality of items being purchased from outside, reliability of supply sources, expected stability of prices over the next several years, service quality, labour relations in the supplier's company etc. It may also be found that decision to purchase from outside could result in closing down of the company's facilities for manufacturing the component. Such a decision will influence adversely the morale of company's employees which may, in turn, affect future production and plans of the company. Dependence on an outside supplier is also risky as the suppliers sometimes may not supply the components on time. In such a case, the buyer-company will not be in a position to fulfill customers orders and thus the company may lose its goodwill in the market resulting, further, in poor future sales.

Qualitative factors are difficult to quantify in monetary terms. However, the decision-maker should try to have as much quantifiable information as possible in these situations. For instance, the effect on customer goodwill due to delay on the part of supplier in meeting orders can be estimated. If there are many suppliers

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available in the market for the components, this qualitative factor can be ignored as components can be purchased from any supplier in case of delay. However, if the components can be purchased from a single supplier, these qualitative factors will be of great importance. In this situation the decision-maker should compare the cost savings due to purchasing the component from outside (rather than manufacturing within the company) with the risk associated with the supplier delaying the fulfilment of orders. If cost savings are more than the (quantifiable) risk, the company may continue to purchase from outside; if cost savings are insufficient to cover the risk related with this qualitative aspect, probably it may not be advisable to purchase the component from outside.

Other qualitative factors besides cost should also the given proper attention. The pressure of competition, the maintenance of source of supply and of certain marketing outlets, and the maintenance of the existing personnel organisation and morale, opportunity to balance risk, benefit of providing complete product line to attract new customers may often be the real determinants of business decisions. The quantitative information alone does not provide a solution to all business problems. Sometimes, other factors are more important than cost factors.

TYPES OF CHOICES DECISIONS

Most management decisions may be referred to as alternative choice decisions. Alternative choice decisions cover situations with two or more alternative courses of action from which the manager (decision-maker) must select the best alternative. A decision involving more than two alternatives is called a multiple alternative choice decision. Some examples of alternative choice decisions are: make or buy, own or lease, retain or replace, repair or renovate, now or later, change versus status quo, slower or faster, export versus local sales, shutdown or continue, expand or contract, change the produce-mix, take or refuse orders, place special orders, select sales territories, replace present equipment with new machinery, sell at split-up point or process further, etc.

Some of the above alternative choices decisions and the information relevant to the decisions are discussed below.

MAKE OR BUY (OUTSOURCING DECISION)

Make or buy decision is also referred to as outsourcing decision. Nowadays there is a growing trend toward outsourcing (buying) a large part of materials, components and services required by an enterprise.

Make or buy decisions arise when a company with unused production capacity consider the following alternatives:

(a) To buy certain raw materials or subassemblies from outside suppliers.

(b) To use available capacity to produce the items within the company.

A make or buy decision is basically one of determining which alternative is economically most desirable and most effectively utilises the firm's resources. These decisions can effect the firm's production methods and capacities, available working capital, cost of borrowing funds, and competitive position. Costs that will be incurred under both alternatives are not relevant to the analysis. The firm should make an analysis of the cost, quality and quantity considerations of the individual make or buy decisions. Differential cost analysis is especially useful if the company has idle capacity and idle workers that can be used to make the tools or parts. Other potential use of available capacity should also be considered; and qualitative factors must be evaluated in the decision process. These considerations include price stability from suppliers, reliability of delivery and quality of the material or component involved. Qualitative factors are not included in differential

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cost analyses, but they should be used to test the reasonableness of any decision based purely on quantitative cost studies. Figure. 17.1 presents the factors that should be considered in the outsourcing decision.

Relevant Quantitative Factors:
Incremental production costs for each unit
Unit cost of purchasing from outside supplier (price less any discounts available plus shipping, etc.)
Number of available suppliers
Production capacity available to manufacture components
Opportunity costs of using facilities for production rather than for other purposes
Amount of space available for storage
Costs associated with carrying inventory
Increase in throughput generated by buying components

Relevant Qualitative Factors:
Reliability of supply sources
Ability to control quality of inputs purchased from outside
Nature of the work to be subcontracted (such as the importance of the part to the whole)
Impact on customers and markets
Future bargaining position with supplier(s)
Perceptions regarding possible future price changes
Perceptions about current product prices (are the prices appropriate or, in some cases with international suppliers, is product dumping involved?)

Fig. 17.1 Outsource Decisions Considerations

Source: Jesset T. Barfield, Cecily A. Raiborn and Michael R. Kinney, *Cost Accounting: Traditions and Innovations*, 5th Ed., Thomson, 2003, p. 505.

For example, assume that a company can make a part that it has been purchasing at a unit cost of Rs. 30. The company has been operating at 75% of normal capacities and in the foreseeable future no use for the excess capacity is contemplated except for the possible production of the part. Fixed manufacturing cost amounts to Rs. 17,00,000 a year whether the plant operates at 75% or 100% of capacity. The cost to manufacture 50000 units of the part that will be needed has been estimated as follows:

	Units cost	*Total cost*
Direct materials	12.5	6,25,000
Direct labour	8.0	4,00,000
Variable manufacturing overhead	5.0	2,50,000
Total incremental cost	25.5	12,75,000
Cost to purchase part	30.0	15,00,000
Net advantage in parts production	4.5	2,25,000

In the above analysis the fixed manufacturing overhead has not been considered because it has to be incurred under both alternatives. Logically, the costs that will be increased or decreased as a result of making the part should be considered. In some cases, both the variable and fixed costs will be affected.

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Add or Drop Products

The decision to eliminate an unprofitable product is a special case of product profitability evaluation. To evaluate the financial consequences of eliminating a product, it is necessary to concentrate on the differential or incremental profit effect of the decision. An important factor in the decision to add or drop a product is whether it will increase or decrease the future income of the business. Appropriate cost and profit measures must be developed for each alternative.

Assume a company is considering dropping product *B* from its line because accounting statements show that product *B* is being sold at a loss.

Income Statement

	Product A	*Product B*	*Product C*	*Total*
Sales revenue	50,000	7,500	12,500	70,000
Cost of sales:				
Direct material	7,500	1,000	1,500	10,000
Direct labour	15,000	2,000	2,500	19,500
Indirect manufacturing cost (50% of direct labour)	7,500	1,000	1,250	9,750
	30,000	4,000	5,250	39,250
Gross margin on sales	20,000	3,500	7,250	30,750
Selling and administrative expenses (allocation on arbitrary basis)	12,500	4,500	4,000	21,000
	–	–	–	–
Net income (loss)	7,500	(1,000)	3,250	9,750

Additional Information

(i) Factory overhead costs are made up of fixed costs of Rs. 5,850 and variable costs of Rs. 3,900. Variable costs by products are; product *A* Rs. 3,000, product *B*, Rs. 400, and product *C* Rs. 500.

(ii) Fixed costs and expenses will not be changed if product *B* is eliminated.

(iii) Variable selling and administrative expenses to the extent of Rs. 11,000 can be traced to the product as follows: *A*, Rs. 7,500; *B*, Rs. 1,500; *C*, Rs. 2,000.

(iv) Fixed selling and administrative expenses are Rs. 10,000.

The decision to drop product *B* cannot be reasonably made from the above data prepared under a conventional income statement. This information together with the following statement may be helpful to management.

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	Product A	*Product B*	*Product C*	*Total*
	Rs.	Rs.	Rs.	Rs.
Sales revenue	50,000	7,500	12,500	70,000
Less: Variable production costs:				
Direct material	7,500	1,000	1,500	10,000
Direct labour	15,000	2,000	2,500	19,500
Factory overhead	3,000	400	500	3,900
Selling and administrative expenses	7,500	1,500	2,000	11,000
	33,000	4,900	6,500	44,400
Contribution margin	17,000	2,600	6,000	25,600
Less: Fixed costs:				
Factory overhead				5,850
Selling and administrative expenses				10,000
Total fixed costs				15,850
Net income				9,750

This statement shows that product *B* exceeds its variable costs by Rs. 2,600. If the sale of product *B* were discontinued, this marginal contribution would be lost and the net income of the firm would be reduced by Rs. 2,600. That is, net income will be Rs. 7,150 (Rs. 9,750 – Rs. 2,600). In this illustration it has been assumed that sales of products *A* and *C* will not be increased after product *B* is dropped. Further, it has been assumed that dropping product *B* will not change the fixed costs and expense. If these assumptions are not true, new analysis must be made. Assume, for example, that after dropping product *B*, the sales of product *A* increase by 10%. The total profit of the firm will not increase by this sales increase. Product *A* makes only a marginal contribution of 34%.

Sales revenue	Rs. 50,000	100%
Variable costs	33,000	66%
Marginal contribution	17,000	34%

On additional sales of Rs. 5,000, the marginal contribution would be Rs. 1,700;

Sales revenue	Rs. 5,000
Variable costs (66%)	3,300
Marignal contribution (34%)	1,700

This contribution is less than Rs. 2,600 now being realised on the sales of product *B*. It would take additional sales of product *A* of approximately Rs. 7,647 to equal the marginal contribution of Rs. 2,600 now being made by product *B*:

$$\frac{\text{Marginal contribution of product } B}{\text{Marginal contribution of product } A} = \frac{2,600}{34\%} = \text{Rs. } 7,647$$

It is possible that dropping product *B* may result in reduction in some of the fixed costs. Product *B* now contribute Rs. 2,600 towards recovery of fixed costs and expenses. Only if the fixed costs and expenses can be reduced by more than this amount will it be advisable to drop product *B*.

Sell or Process Further

The decision whether a product should be sold at the split-off point or processed further is faced by many manufacturers. The choice between selling a product at split-off or processing it further is a short-run operating decision. Additional processing adds value to a product and increases its selling price above the amount for which it could be sold at split-off. The decision to process further depends upon whether the increase in total revenues exceeds the additional costs incurred for processing beyond split-off. Generally speaking, there are two general conditions under which a sell or process further decision could occur.

1. The company is evaluating the possibility of processing beyond split-off and must incur certain equipment costs and other fixed costs if additional processing is to occur.
2. The company already processes a product beyond split-off and has invested in the equipment and required manpower.

The first situation is really a capital budgeting problem and here it is not sufficient to determine whether incremental revenues exceed incremental costs. Since new investments in machinery and building are involved, the rate of return on this investment must also be considered.

In the second situation, the relevent costs are only those costs which relate to the additional processing of each product beyond the split-off point. The joint costs are relevant to the further processing decisions. Certain fixed costs such as supervisory salaries are related to additional processing. If these costs are eliminated by selling products at split-off, they are incremental and should be included in the decision analysis. If salaried personnel are assigned other duties in the company when additional processing is discontinued, the salary costs are not incremental since they are incurred under either decision alternative. If the equipment used for additional processing sits idle or can be used in other processes, it should be ignored in the decision analysis. Depreciation expense is never relevant in short-run operating decisions, since depreciation is an allocation of costs incurred in a past period.

In deciding upon which course of action to follow, the company compares the contribution margin from the sale of the partially processed product with the contribution margin from the sale of the completely processed product. The revenue to be derived from the sale of the partially processed product is the opportunity cost attached to the decision of further processing. Assume, for example, a partially processed product can be sold for Rs. 90 per unit which is manufactured at a cost of Rs. 60. Further processing can be done at an additional cost of Rs. 30 per unit and the final product can be sold at Rs. 150 per unit. The firm can produce 10000 units. The analysis is shown below:

	Sell	*Process and Sell*
Sales revenue (10000 units)	Rs. 9,00,000	Rs. 15,00,000
Less: Manufacturing costs	6,00,000	9,00,000
	3,00,000	6,00,000

Net advantage in further processing Rs. 6,00,000 – 3,00,000 = Rs. 3,00,000

Thus, there is a net advantage of Rs 3,00,000 in processing the product further. The market value of the partially processed product (Rs. 9,00,000) is considered to be the opportunity cost of further processing.

The figure of net advantage of Rs. 3,00,000 can be arrived at in the following manner also:

Revenue from sale of final product (10,000 × 15)	Rs. 15,00,000

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Less: Additional processing cost (10,000 × 30)	3,00,000	
Revenue from sale of intermediate product	9,00,000	12,00,000
Net advantage in further processing		3,00,000

Operate or Shutdown

Differential cost analysis is also used when a business is confronted with the possibility of a temporary shutdown. This type of analysis has to determine whether in the short-run a firm is better off operating than not operating. As long as the products sold recover their variable costs and make a contribution towards the recovery of fixed costs, it may be preferable to operate and not to shutdown. Also management should consider the investment in the training of its employees which would be lost in the event of a temporary shutdown. Recruiting and training new workers would add to present costs. Another factor is the loss of established markets. Also, a temporary shutdown does not eliminate all costs. Depreciation, taxes, interest, and insurance costs are incurred during shutdown also. The other points (benefits) which should be considered are the following: avoiding operating losses, savings in maintenance and repair costs, savings in indirect labour costs, savings in fixed costs.

A company operating below 50% of its capacity expects that the volume of sales will drop below the present level of 10,000 units per month. Management is concerned that a further drop in sales volume will create a loss and has under consideration a recommendation that operations be suspended, until better market conditions prevail and also a better selling price. The present operating income statement is as follows:

Sales revenue (10000 units @ Rs. 3.00)		Rs. 30,000
Less: Variable costs @ Rs. 2.00 per unit	20,000	
Fixed costs	10,000	30,000
Net Income		0

The following income statements have been prepared for sales at different capacities:

	Units Produced					
	Shutdown	2,000	4,000	6,000	8,000	10,000
Sales revenue @ Rs. 3	0	6,000	12,000	18,000	24,000	30,000
Variable costs @ Rs. 2	0	4,000	8,000	12,000	16,000	20,000
Contribution	0	2,000	4,000	6,000	8,000	10,000
Fixed costs	4,000	10,000	10,000	10,000	10,000	10,000
Loss	(4,000)	(8,000)	(6,000)	(4,000)	(2,000)	0

It would appear that shutdown is desirable when the sales volume drops below 6,000 units per month, the point at which operating losses exceed the shutdown cost. This volume of 6,000 units could be arrived at without an income statement as follows:

Fixed costs if plant operates	Rs. 10,000
Fixed costs if plant shutsdown	4,000

(*Contd.*)

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Additional cost to be recovered when operating	6,000

Each unit of product sold contributes Re. 1.00 to fixed costs recovery:

Selling price per unit	Rs. 3.00
Variable cost per unit	Rs. 2.00
Contribution	Rs. 1.00

Sale of 6000 units is necessary to recover Rs. 6,000 of fixed costs.

$$\frac{\text{Rs. } 6,000}{\text{Re. } 1.00} = 6000 \text{ units}$$

If the selling price is cut to Rs. 2.80, the contribution margin will be Re. 0.80 per unit.
Required sale to recover an additional Rs. 6,000 of fixed costs.

$$\frac{\text{Rs. } 6,000}{\text{Re. } 0.80} = 7500 \text{ units}$$

That is, sales of 7500 units would be necessary to recover an additional Rs. 6,000 of fixed costs.

Special Orders

The question of special orders or one time orders arises when a company has excess or idle production capacity and management considers the possibility of selling additional products at less than normal selling prices, provided that such a special order will not affect the regular sales of the same product.

The basic problem is to determine an acceptable price for the special order units. Cost analysis using the contribution approach is a useful technique to determine the short-run profit effects of special order transactions. In deciding the pricing of special orders where normal operations are not disturbed and where unused production capacity exists, it is not advisable to attach fixed costs to products. Price determination should take into account the recovery of incremental (variable) costs caused by accepting the special order. If the normal fixed costs are included in the price of the special order, the price may be too high and the business firm could lose the entire order and the contribution margin to be earned on the special order. Only the relevant (variable) costs should be used in the decision analysis to arrive at an appropriate price. Fixed costs are relevant only if incurred to facilitate the special order.

The following example illustrates the special order decisions.

A manufacturing company produces 20,000 units by operating at 60% of the capacity and sells at a price of Rs. 30 per unit. The budgeted figures for the year 2003 are as follows:

	Production
	(20000 units)
Raw material @ Rs. 4.25	Rs. 85,000
Direct labour @ Rs. 5.75	1,15,000
Variable factory overhead @ 7.75	1,55,000
Fixed factory overhead	1,25,000
Variable selling costs 2.75% of selling price	
Fixed selling and administrative costs	72,500

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The company receives a special order for 10000 units from a firm. The company desires to earn a profit of Re 1.00 per unit and no selling expenses are to be incurred for the special order. The minimum price on the special order and income statements are as follows:

Pricing of Special Order

	(10000 units)
Variable costs to be incurred:	(Rs.)
Raw materials	4.25
Direct labour	5.75
Variable overhead	7.75
Variable cost per unit	17.75
(no selling expenses)	1.00
Desired profit	18.75
Minimum price	

Increase in sales = 10000 units × Rs. 18.75 = Rs. 1,87,500

Income Statement

	Without special order (Rs.)	*Special order (Rs.)*	*With special order (Rs.)*
Sales	6,00,000	1,87,500	7,87,500
Less: Variable costs:			
Raw materials	85,000	42,500	1,27,500
Direct labour	1,15,000	57,500	1,72,500
Variable factory overhead	1,55,000	77,500	2,32,500
Variable selling costs (2.75% of selling price)	16,500	–	16,500
Total variable costs	3,71,500	1,77,500	5,49,000
Less: Fixed costs:			
Fixed factory overhead	1,25,000	–	1,25,000
Fixed selling and administrative cost	72,500	–	72,500
Total fixed costs	1,97,500	–	1,97,500
Total costs	5,69,000	1,77,500	7,46,500
Net income before taxes	31,000	10,000	41,000

From the above analysis it is clear that the acceptance of the special order will increase the profit by Rs. 10,000. Also the bid price (Rs. 18.75) is significantly less than the normal price of Rs. 30. However, before arriving at a proper decision, management should consider some qualitative factors other than just the immediate impact on income. An important point is the effect on regular customers. If regular customers are paying more for the products, they may demand price reduction or quit buying from the firm and seek another source of supply. Another consideration is the possibility of special order customers being the regular customers.

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Replace or Retain

The decision to replace or retain plant and equipment is also an important decision and should be taken very carefully. The differential costs which are important in retain or replace decisions are the following: change in fixed overhead costs, loss on sale of old equipment, capital investment and related costs such as rate of return and interest. Management should also consider differential benefits likely to be derived such as higher production and increased sales, realisable value of old machine, savings in operating costs, tax advantages, if any. Suppose a company has purchased a plant for Rs. 1,00,000 five years ago which has a life of 10 years with no salvage value. The present book value is Rs. 50,000. Management is considering the replacement of this plant with a new plant costing Rs. 80,000 having a life of five years with no scrap value at the end of its life. The costs of operating present plant and the proposed palnt are as follows:

	Present plant	*Proposed plant*
	(Rs.)	(Rs.)
Variable costs:		
Labour, supplies, power, etc.	80,000	48,000
Fixed costs: Insurance, taxes, etc.	10,000	12,000
Depreciation	10,000	16,000
	1,00,000	76,000

It appears that the proposed plant would result into cost savings of Rs. 24,000 (Rs. 1,00,000 – 76,000). However, the book value of the present equipment is a sunk cost and not relevant in the decision. The following table helps in making a better analysis of the data:

	Present plant	*Proposed plant*
	(Rs.)	(Rs.)
Variable costs:		
Labour, supplies, power, etc.	80,000	48,000
Fixed costs: Insurance, taxes, etc.	10,000	12,000
Depreciation	0	16,000
	90,000	76,000

The purchase of the new plant results in a saving of Rs. 14,000 (Rs. 90,000 – 76,000). Management has to consider whether this benefit is enough to justify the investment of Rs. 80,000 in new machinery.

Example 17.1 (Product Mix Decision)

Super India Ltd. is producing three products *X*, *Y* and *Z*. The data for the three products is given below:

	X	*Y*	*Z*
Maximum capacity	5000 units	2000 units	3000 units
Direct material			
@ Rs. 10 per kg	Rs. 40	Rs. 10	Rs. 30
Other variable costs	Rs. 36	Rs. 25	Rs. 10
Selling price	Rs. 100	Rs. 50	Rs. 60
Fixed cost (unavoidable)	Rs. 20,000	Rs. 15,000	Rs. 10,000

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Calculate the best product-mix in each of the following three independent cases:

(i) Total availability of raw materials is limited to 18,000 kg

(ii) Under a trade agreement the firm cannot produce more than 7500 units of the three products taken together.

(iii) Total sales value of the three products can not exceed. Rs. 6,50,000 *(B.Com. (Hons), Delhi, 2007)*

Solution:

Contribution per unit of Key Factor

	X	*Y*	*Z*
Maximum capacity	5000 units	2000 units	3000 units
Fixed cost (unavoidable)	Rs. 20,000	Rs. 15,000	Rs. 10,000
Selling price	Rs. 100	Rs. 50	Rs. 60
Direct Material @ Rs. 10 per kg.	40	10	30
Other Variable cost	36	25	10
Total variable cost	– 76	– 35	– 40
Contribution per unit of product	24	15	20
Material (kg) per unit of product	40/10 = 4 kg	10/10 = 1 kg.	30/10 = 3 kg.
Contribution per kg. of material	24/4 = Rs. 6;	15/1 = Rs. 15;	20/3 = Rs. 6.67
P/V ratio = $\frac{\text{Contribution}}{\text{Sales}}$	24/100 = 0.24;	15/50 = 0.30;	20/60 = 0.33

(i) Material Limited to 18,000 kg

		Rs.
First produce 2,000 *Y* using 1 × 2,000 = 2,000 kg. material contributing 15 × 2,000	=	30,000
Next produce 3,0000 *Z* using 3 × 3,000 = 9,000 kg. material contribution 20/3 × 9,000	=	60,000
Next produce 1,750 *X* using 4 × 1,750 = 7,000 kg. material contributing 6 × 7,000	=	42,000
18,000 kg.		
Optimum Mix of 1,750 *X* + 2,000 *Y* + 3,000 *Z* gives total contribution		1,32,000
Less: Total fixed cost (20,000 + 15,000 + 10,000)		– 45,000
Profit		87,000

(ii) Total Output and Sale of X, Y and Z limited to 7500 units

	Rs.
First produce 5,000 *X* contribution 24 × 5,000	1,20,000
Next produce 2,000 *Z* contributing 20 × 2,500	50,000
Optimum mix of 5,000 *X* + 2,500 *Z* contributes	1,70,000
Less: Total fixed cost (20,000 + 15,000 + 10,000)	– 45,000
Profit	1,25,000

At operations stage all fixed costs are considered unavoidable. Hence, fixed costs even for *Y* which is not produced has been deducted.

(iii) Total sales of X, Y and Z cannot exceed Rs. 6,50,000 *Rs.*

First produce 3,000 Z with sales of $60 \times 3{,}000 = 1{,}80{,}000$ contributing $\frac{1}{3} \times 1{,}80{,}000$	= 60,000
Next produce 2,000 Y with sales of $50 \times 2{,}000 = 1{,}00{,}000$ contributing $0.3 \times 1{,}00{,}000$	= 30,000
Next produce 3,700 X with sales of $100 \times 3{,}700 = 3{,}70.000$ contributing $0.24 \times 3{,}70{,}000$	= 88,000
6,50,000	
Optimum mix of 3,700 X + 2000 Y + 3,000 Z contributes	1,78,800
Less: Total fixed cost (20,000 + 15,000 + 10,000)	– 45,000
Profit	1,33,800

Example 17.2 (Export order)

A company currently operating at 80% capacity has the following particulars:

	Rs.
Sales	32,00,000
Direct materials	10,00,000
Direct labour	4,00,000
Variable overheads	2,00,000
Fixed overheads	13,00,000

An export order has been received that would utilise half the capacity of the factory. The order cannot be split, that is, it has to be taken in full and executed at 10% below the normal domestic prices, or rejected totally. The alternatives available to the management are:

(i) Reject the order and continue with the domestic sales only (as at present); or

(ii) Accept the order, split capacity between overseas and domestic sales and turn away excess domestic demand.

Prepare, a comprehensive statement of profitability and suggest the best alternative.

(B.Com.(Hons), Delhi, 2007)

Solution:

Comparative Profitability Statement

	Domestic Sale only at 80% capacity	*50% for Domestic sales + 50% for Export*
	Rs.	Rs.
Domestic sales	32,00,000	20,00,000
Export sales	–	18,00,000
Total sales (a)	32,00,000	38,00,000
Direct material	10,00,000	12,50,000
Direct Labour	4,00,000	5,00,000
Variable Overheads	2,00,000	2,50,000
Total variable cost (b)	16,00,000	20,00,000
Contribution (a) – (b)	16,00,000	18,00,000
Less Fixed Cost	– 13,00,000	– 13,00,000
Profit	3,00,000	5,00,000

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Decision: The company should accept the order as it will give additional profit of Rs. 2,00,000 compared to existing profit of Rs. 3,00,000

Example 17.3 (Limiting Factor Decision)

The following particulars are extracted from the records of a company

	Product A	*Product B*
Sales (per unit)	Rs. 100	Rs. 120
Consumption of material	2 kg	3 kg
Material cost	Rs. 10	Rs. 15
Direct wages cost	Rs. 15	Rs. 10
Direct expenses	Rs. 5	Rs. 6
Machine hours used	3	2
Overhead expenses:		
Fixed	Rs. 5	Rs. 10
Variable	Rs. 15	Rs. 20

Direct wage per hour is Rs. 5. Comment on the profitability of each product (both use the same raw material) when

(a) (i) total sales potential in units is limited;

(ii) total sales potential in value is limited;

(iii) raw material is in short supply;

(iv) production capacity (in terms of machine hours) is the limiting factor.

(b) Assuming raw material is the key factor, availability of which is 10,000 kg and maximum sales potential of each product being 3500 units, find the product-mix which will yield the maximum profit. *(B.Com. (Hons), Delhi, 2007, ICWA, Inter)*

Solution:

(Per unit costs)

		Product A	*Product B*
(a)	Sales	Rs. 100	Rs. 120
(b)	Variable cost:		
	Direct material	10	15
	Direct wages	15	10
	Direct expenses	5	6
	Variable overheads	15	20
	Total variable cost	Rs. 45	Rs. 51
(c)	Contribution per unit (a – b)	Rs. 55	Rs. 69

(a) Ranking of products in terms of profitability

(*i*) *Total sales potential in units is limited.*

Basis: Contribution per unit: Product *A* Rs. 55

Product *B* Rs. 69

Ranking: 1st Product *B*
2nd Product *A*

(ii) Total sales potential in value is limited.

Basis: Contribution per rupee of sales value, that is,

$$\frac{\text{Contribution per unit}}{\text{Selling price per unit}}$$

Product *A* = Rs. 55/Rs. 100 = Re. 0.55

Product *B* = Rs. 69/Rs. 120 = Re. 0.575

Ranking: 1st Product *B*
2nd Product *A*

(iii) Raw material is in short supply.

Basis: Contribution per unit of raw material consumption, that is,

$$\frac{\text{Contribution per unit}}{\text{Material consumption (in quantity) per unit}}$$

Product *A* = Rs. 55/2 kg = Rs. 27.50 per kg.

Product *B* = Rs. 69/3 kg = Rs. 23.00 per kg.

Ranking: 1st Product *A*
2nd Product *B*

(iv) Production capacity (in terms of machine hours) is the limiting factor.

Basis: Contribution per unit of machine hour, that is

$$\frac{\text{Contribution per unit}}{\text{Machine hours used per unit}}$$

Product *A* = Rs. 55/3 hrs. = Rs. 18.33 per hour

Product *B* = Rs. 69/2 hrs. = Rs. 34.50 per hour

Ranking 1st Product *B*
2nd Product *A*

(b) When raw material is the key factor, our ranking is Product *A*—1st, and Product *B*—2nd. Therefore, the firm would like to produce only Product *A*, which best utilises the available raw material. However, there is another limiting factor in operation, that is, the maximum sales potential. This factor will set the limit for production of the Product. *A*. The following will be the allotment of available raw material between Product *A* and Product *B*:

Available raw material	10,000 kg
Maximum sales potential for Product *A* (ranked 1st) 3500 units	
Raw material required for Product *A* 3,500 × 2 kg =	(7,000 kg)
Balance available for Product *B*	3,000 kg

Maximum number of Product *B* that can be produced with available raw material is = 3,000/3 kg, that is 1000 units.

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Product-mix which will yield the maximum profit:

Product *A*	3500 units	
Product *B*	1000 units	

Total contribution:

Product *A*	3500 × Rs. 55	Rs. 1,92,500
Product *B*	1000 × Rs. 69	Rs. 69,000
	Total:	Rs. 2,61,500

Total fixed cost:

Product *A*	3500 × Rs. 5	Rs. 17,500
Product *B*	1000 × Rs. 10	Rs. 10,000
	Total:	Rs. 27,500

Total profit = Total contribution – Total fixed cost

= Rs. 2,61,600 – Rs. 27,500

= Rs. 2,34,000

Notes:

(i) Fixed cost per unit reflects only the allocated cost and is irrelevant for decision making.

(ii) In estimating the total fixed cost it is assumed that the total fixed cost is equal to the fixed cost absorbed by Product *A* and Product *B*. This is a simplistic assumption and not likely to hold good in most of the situations.

Example 17.4 (Make or Buy)

Auto Parts Ltd. has an annual production of 90,000 units for a motor component. The component's cost structure is as below:

	Rs.	
Materials	270	per unit
Labour (25% fixed)	180	per unit
Expenses:		
Variable	90	per unit
Fixed	135	per unit
Total	675	per unit

(a) The purchase manager has an offer from a supplier who is willing to supply the component at Rs. 5.40. Should the component be purchased and production stopped?

(b) Assume the resources now used for this component's manufacture are to be used to produce another new product for which the selling price is 485.

In the latter case the material price will be Rs. 200 per unit. 90000 units of this product can be produced on the same cost basis as above for labour and expenses. Discuss whether it would be advisable to divert the resources to manufacture the new products, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

(B.Com. (Hons), Delhi 2003, 2004, CA Inter)

Solution

(a) Statement showing the Variable Cost and Purchase Cost of Component... Used by Auto Parts Ltd.

Variable cost	*Per unit*	*Total for 90,000 units*
	Rs.	*Rs.*
Materials	270	2,43,00,000
Labour	135	1,21,50,000
Expenses	90	81,00,000
Total variable cost (when component is produced)	495	4,45,50,000
Cost of purchase (when component is purchased)	540	4,86,00,000
Difference, excess of purchase price over variable cost	45	40,50,000

Fixed expenses not being affected, it is evident from the above statement that if the component is purchased from the outside supplier, the company will have to spend Rs. 45 per unit more and on 90000 units the company will have to spend Rs. 40,50,000 more. Therefore, the company should not stop the production of the component.

(b) The following statement shows the cost implications of the proposal to divert the available facilities for a new product.

Statement showing the Contribution per Unit if the Existing Resources are Used for the Production of Another New Product

	Rs.	Rs.
Selling price of the new product per unit		485
Less: Materials cost	200	
Labour (variable)	135	
Expenses (variable)	90	425
Contribution per unit		60
Loss per unit if the present component is purchased:		
Purchase price of the existing product		540
Less: Total variable cost of producing the existing component		495
Excess cost		45

Thus, if the company diverts its resources for the production of another new product, it will benefit by Rs. 15 per unit that is Rs. 60 – 45 per unit. On 90,000 units the company will save Rs. 13,50,000. Therefore, it is advisable to divert the resources to manufacture the new product and the component presently being produced should be purchased from the market. This is also brought out by the following figures:

	Rs.
Total cost producing the component (90,000 × 675) (A)	6,07,50,000
Cost of purchasing the component (90,000 × 540)	4,86,00,000
Fixed expenses, not having been saved	1,62,00,000

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(90,000 × 180, that is, 675 – 495)	6,48,00,000
Less: Contribution from the new product (90,000 × 60)	54,00,000
Total cost if component is purchased and new product is made (B)	5,94,00,000
Savings (A – B)	13,50,000

Example 17.5 (Product Mix Decision)

From the following particulars, find the most profitable product mix and prepare a statement of profitability of that product-mix:

	Product A	*Product B*	*Product C*
Units budgeted to be produced and sold	1800	3000	1200
Selling price per Unit (Rs.)	60	55	50
Direct material required per unit (kg)	5	3	4
Direct labour per unit (hrs.)	4	3	2
Variable overheads (Rs.)	7	13	8
Fixed overheads (Rs.)	10	10	10
Cost of direct material per kg (Rs.)	4	4	4
Direct labour hour rate (Rs.)	2	2	2
Maximum possible units of sale	4000	5000	1500

All the three products are produced from the same direct material using the same type of machines and labour. Direct labour which is the key factor is limited to 18600 hours. *(B.Com.(Hons), Delhi, 2004)*

Solution:

Statement showing the Budgeted Profitability

	Per Unit		
	Product A Rs.	*Product B* Rs.	*Product C* Rs.
Selling Price Per Unit	60	55	50
Direct Material @ Rs. 4 per kg	20	12	16
Direct Labour @ Rs. 2 per hour	8	6	4
Variable Overheads	7	13	8
Marginal cost	35	31	28
Contribution per unit	25	24	22
Budgeted production in Units	1800	3000	1200
Total contribution	1800 × 25 = 45,000	3000 × 24 = 72,000	1200 × 22 = 26,400
Fixed cost @ Rs. 10 per Unit	18,000	30,000	12,000
Profit	27,000	42,000	14,400

Optimal Product Mix and Profit

	Per Unit		
	A Rs.	*B* Rs.	*C* Rs.
Sales per unit	60	55	50
Material @ Rs. 4 per kg	20	12	16
Labour @ Rs. 2 per hour	8	6	4
Variable Overhead	7	13	8
Marginal Cost	35	31	28
Contribution per Unit	25	24	22
Contribution per Rs. of sales $\left(\frac{C}{S.P}\right)$	$\frac{25}{60}$ = Rs. 0.417	$\frac{24}{55}$ = Rs. 0.436	$\frac{22}{50}$ = Rs. 0.44
Labour Required per Unit	4 hours	3 hours	2 hours
Contribution per hour of Labour	$\frac{25}{4}$ = Rs. 6.25	$\frac{24}{3}$ = Rs. 8	$\frac{22}{2}$ Rs. 11
Ranking	III	II	I

Product	*Maximum No.*	*Labour HR per unit*	*Labour Hrs used*	*Contribution*	*Total (Rs.)*
C	1500	2	3000	22	33,000
B	5000	3	15000	24	1,20,000
A	1500	4	600	25	3,750
			18600		1,56,750
Less: Fixed Cost *C* 1,200 × 10			12000		
B 3,000 × 10			30000		
A 1,800 × 10			18000		60,000
			Profit		**96750**

Example 17.6 (Limiting Factor Decision)

A company manufactures three products. The budgeted quantity, selling prices and unit costs are as under:

	A Rs.	*B* Rs.	*C* Rs.
Raw materials (@ Rs. 20 per kg)	80	40	20
Direct wages (@ Rs. 5 per hour)	5	15	10

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Variable overheads	10	30	20
Fixed overheads	9	22	18
Budgeted production (in units)	6400	3200	2400
Selling price per unit (in Rs.)	140	120	90

Required:

(i) Present a statement of budgeted profit.

(ii) Set optimal product-mix and determine the profit if the supply of raw materials is restricted to 18,400 kg. *(B.Com. (Hons), Delhi, 2002)*

Solution:

(i) Statement showing the Budgeted Profitability

(Rs.)

Selling price per unit	*Per Unit*		
	Product A 140	*Product B* 120	*Product C* 90
Raw Materials (@ Rs. 20 per kg)	80	40	20
Direct Wages (@ Rs. 5 per hour)	5	15	10
Variable Overheads	10	30	20
Marginal Cost	95	85	50
Contribution per Unit	45	35	40
Budgeted production (in units)	6400	3200	2400
Total Contribution	6400 × 45 = 2,88,000	3200 × 35 = 1,12,000	2400 × 40 = 96,000
Fixed Cost	6400 × 9 = 57600	320 0 × 22 = 70400	2400 × 18 = 43,200
Profit	2,30,400	41,600	= 52,800

(ii) Optimal Product Mix and Profit

	Per Unit		
	A	*B*	*C*
	Rs.	Rs.	Rs.
Sales	140	120	90
Materials (@ Rs. 20 per kg)	80	40	20
Direct Wages (@ Rs. 5 per hour)	5	15	10

(*Contd.*)

	Per Unit		
	A	*B*	*C*
Variable Overhead	10	30	20
Marginal Cost	95	85	50
Contribution per Unit	45	35	40
Contribution per Rs. of sale $\left(\frac{C}{S}\right)$	$\frac{45}{140}$ = Rs. 0.321	$\frac{35}{120}$ = Rs. 0.29	$\frac{40}{90}$ = Rs. 044
Material Required per Unit	$\frac{80}{20}$ = 4 kg	$\frac{40}{20}$ = 2 kg	$\frac{20}{20}$ = 1 kg
Contribution per kg. of material	$\frac{45}{4}$ = Rs. 11.25	$\frac{35}{2}$ = Rs. 17.5	$\frac{40}{1}$ = Rs. 40
Ranking	III	II	I

Product	Maximum No.	Consumption per unit (kg)	Material used (Kg) per unit	Contribution	Total
C	6400	1	6400	40	25600
B	3200	2	6400	35	112000
A	1400	4	5600	45	63000
			18,400		4,31,000

Less: Fixed Cost

C	6400 × 18 =	1,15,200
B	3200 × 22 =	70,400
A	2400 × 9 =	12,600
		1,98,200

Profit =	1,98,200 / 2,32,800

Thus product mix of 6400 units of *C*, 3200 units of *B* and 1400 units of *A* will give maximum profit of Rs. 2,32,800.

Example 17.7 (Differential Cost Analysis)

Pioneer Manufacturing Company, makers of a specialised line of toys, received an order for 2000 units of toy battle tank from a large mail-order house at a price of Rs. 3 per unit. The company sells this type of toy to its other customers at Rs. 5 each but it has surplus capacity and can take the special order without adversely affecting its regular operations for coming month.

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Product	*Output (kg)*	*Selling price/kg if sold without further processing*	*Further processing cost*	*Selling price/kg after further processing*
A	8000	Rs. 28	Rs. 56,000	Rs. 38
B	6000	30	60,000	42
C	5000	32	60,000	43
X	500	6	1,500	8

Required:

(a) If the company apportions the joint cost after taking credit for the sale value of the by-product, in proportion to the sale value of the three main products at the point of separation, what is the cost per kg of each production at that stage?

(b) Which of the products should be processed further? Show workigns.

(c) What is the profit earned if all the main products are sold without further processing? Give productwise details.

(d) If further processing is done as suggested in (b), what is the total profit earned? Give productwise details. *(ICWA, Inter, Stage 1, June 2004)*

Solution:

(a) Joint Processing Cost.

	Rs.
Raw materials input: 200,000 kg @ Rs. 15	3,00,000
Other materials	30,600
Direct labour: 4000 hrs. @ Rs. 20	80,000
Production overheads	1,00,000
	5,10,600
Less: Sale value of by-product X (500 kg @ Rs. 6)	3,000
Total (Net)	5,07.600

Apportionment of Joint Cost among main products and Determination of cost per kg.

Product	*Output/Sales*	*Sale value (Rs.)*		*Apportionment of joint cost of Rs. 5,07,600*	*Cost/kg*
	(kg)	*per kg*	*Total*	*(Rs.)*	*(Rs.)*
A	8000	28	2,24,000	2,01,600	25.2000
B	6000	30	1,80,000	1,62,000	27.0000
C	5000	32	1,60,000	1,44,000	28.8000
	19000		5,64,000	5,07,600	26.7158

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(b) Incremental sale value and additional cost, if processed further.

Product	Output/Sales (kg.)	Incremental sale value (Rs.) per kg.	Incremental sale value (Rs.) Total	Further Processing cost (Rs.)	Net Gain/(Loss) (Rs.)
A	8000	10	80,000	56,000	24,000
B	6000	12	72,000	60,000	12,000
C	5000	11	55,000	60,000	(5,000)
X	500	2	1,000	1,500	(500)

In the light of above statement, only Product A and Product B should be processed further.

(c) Determination of Profit earned if all products sold without further processing.

Product	Quantity (kg)	Share of Joint Cost (Rs.)	Sale Value (Rs.) Per kg	Sale Value (Rs.) Total	Profit/(Loss) (Rs.)
A	8000	2,01,600	28	2,24,000	22,400
B	6000	1,62,000	30	1,80,000	18,000
C	5000	1,44,000	32	1,60,000	16,000
Total		5,07,600		5,64,000	56,400

(d) Determination of total profit earned if sold after further processing as suggested in (b).

Product	Quantity (kg)	Share of Joint Cost (Rs.)	Further Processing Cost (Rs.)	Total Cost (Rs.)	Sale Value (Rs.) per kg	Total (Rs.)	Profit/(Loss) (Rs.)
A	8.000	2,01,600	56,000	2,57,600	38	3,04,000	46.400
B	6.000	1,62,000	60,000	2,22,000	42	2,52,000	30.000
C	5.000	1,44,000		1,44,000	32	1,60,000	16,000
Total		5,07.600	1,16,000	6,23.600		7,16.000	92.400

Example 17.22 (Alternative Plan Decisions)

A company manufactures and sells two standards products X and Y using the same raw material, labour and identical machines. Further particulars are given below:

	X		*Y*	
Selling price/unit	Rs.	80	Rs.	100
		Per unit		
Direct Materials @ Rs. 20/kg	Rs.	20	Rs.	30
Direct Labour @ Rs. 15/hr	Rs.	15	Rs.	15
Variable Overheads	Rs.	15	Rs.	15

Machine hours required		1/2 hr		3/4 hr
Fixed Overheads (allocated)	Rs.	12	Rs.	18
		Per annum		
Maximum Demand (units)		18000		15000
Current Production (units)		15000		12000

Labour and materials are available according to requirements. But machine capacity cannot be increased immediately and the available capacity has been fully utilised by the current production plan.

Required:

(i) Current contribution analysis.
(ii) Profit currently earned by the company.
(iii) Alternative production plan, if any, more profitable to the company.
(iv) Profit expected to be earned under the suggested plan. *(ICWA, Inter, Stage 1, Dec. 2003)*

Solution:

(i) Analysis of Current Contribution of two product

Products		*X* *Rs.*		*Y* *Rs.*
Selling price unit (S)		80.00		100.00
Less: Variable costs:				
Direct Materials	20.00		30.00	
Direct Labour	15.00		15.00	
Direct Overheads	15.00	50.00	15.00	60.00
Contribution per unit (C)		30.00		40.00
P/V Ratio = C/S × 100		37.50%		40.00%
Machine hours required per unit (hrs.)		1/2		3/4
Contribution per Machine Hour (limiting factor) (Rs.)		60.00		53.33

(ii) Profitability Statement for current year

Products	*X*	*Y*	*Total*
Production (current) in units	15,000	12,000	
Contribution/unit (Rs.) as above	30	40	
Total contribution (Rs.)	4,50,00	4,80,000	9,30,000
Less: Fixed Overheads (Rs.)			(3,96,000)
15,000 × 12 = 1,80,000			
12,000 × 18 = 2,16,000			
Profit (Earned)			5,34,000

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(iii) Alternative Production Plan Since Machine hour is the limiting factor, maximum demand and contribution per machine hour for Product X and Y are to be given weightage for preparation of Production Plan — more profitable to the company.

Production Plan

Products	*X*	*Y*	*Total*
Maximum demand (units)	18000	15000	
Available Machine hours: (15000 × 0.5 + 12000 × 0.75)			16,500
Optimum Product Mix			
Production (units)	18000	10000	28,000
Allocation of M/c hours	9000	(bal.) 7,500	16,500

(iv) Profit expected to be earned under the suggested Plan

Products	*X*	*Y*	*Total*
Production (suggested) in units vide Ref. (iii)	18000	10000	28000
Contribution/unit (Rs.)	30	40	
Total Contribution (Rs.)	5,40,000	4,00,000	9,40,000
Less: Fixed Ovd. cost (Rs.)			(3,96,000)
Profit (expected)			5,44,000

Example 17.23 (Alternative Proposals)

A review, made by the top management of M/s. Sweat and Struggle Ltd., which makes only one product, of the result of first quarter of the year revealed the following:

Sales in units	10000
Loss in Rs.	10,000
Fixed cost (for the year Rs. 1,20,000) in Rs.	30,000
Variable cost per unit in Rs.	8

The Finance Manager who feels perturbed suggests that the company should atleast break-even in the second quarter with a drive for increased sales. Towards this, the company should introduce a better packing which will increase the cost by Re. 0.50 per unit.

The Sales Manager has an alternate proposal. For the second quarter additional sales promotion expenses can be increased to the extent of Rs. 5,000 and a profit of Rs. 5,000 can be aimed at for the period with increased sales.

The Production Manager feels otherwise. To improve the demand, the selling price per unit has to be reduced by 3 percent. As a result, the sales volume can be increased to attain a profit level of Rs. 4,000 for the quarter.

The Managing Director asks you as a Cost Accountant to evaluate these three proposals and calculate the additional Sales Volume that would be required in each case, in order to help him take a decision.

(ICWA, Stage 2, June 2006)

Solution:

Results of the first quarter: Sales 10000 units

Particulars	*Per unit (Rs.)*	*Amount (Rs.)*
Variable cost (V)	8	80,000
Fixed cost	3	30,000
Total cost	11	1,10,000
Loss	1	10,000
Sales (S)	10	1,00,000
Contribution (S-V) =	2	20,000

Comparative Statement of three Proposals

Particulars	*Proposal of* *Finance Manager (Rs.)*	*Sales Manager (Rs.)*	*Production Manager (Rs.)*
Selling Price per unit	10.00	10.00	9.70
Variable Cost per unit (8.00 + 0.50)	8.50	8.00	8.00
Contribution per unit	1.50	2.00	1.70
Fixed Cost	30,000	35,000	30,000
Profit Required	Nil	5,000	4,000
B.E.P. (unit) = $\frac{\text{F.C.}}{\text{Contribution}}$		= 30,000/1.50 = 20,000	
Sales (unit) = (F + P)/C per unit		(35,000 + 5,000)/2.00 = 20,000	(30,000 + 4,000)/1.70 = 20,000
Additional Sales Volume required In second quarter as compared to first quarter	10,000	10,000	10,000

Example 17.24 (Export Order Decision)

Following data are in respect of a firm manufacturing a single product for a particular period:

	Rs.
Sales (20000 units)	2,00,000
Cost of production (20000 units)	1,20,000
Selling and distribution expenses	30,000
Maximum capacity 25000 units	

Fixed costs included in cost of production are Rs. 40,000 and only variable cost included in selling and distribution expenses are commission @ 10% on sales and packing expenses @ 20 p. per unit.

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(1) An offer for purchase of 4000 units is received from outside India. No sales commission is payable on such foreign order but packing costs will be 80 p. per unit.

What minimum price may be quoted for the foreign offer?

(2) What should be the minimum price had the offer size been 8000 units instead of 4000 units?

(ICWA Stage 2, June 2005)

Solution:

		Rs. (Total)	***Per unit (Rs.)***
Sales value of 20000 units at Rs. 10 each		2,00,000	10.00
Variable Costs:	Rs.		
Cost of Production	80,000		
Selling and distribution 10% of Sales	20,000		
Packing expenses @ 20 p/unit for 20000 units	4,000	1,04,000	5.20
Contribution		96,000	4.80
Fixed Costs			
Cost of Production	40,000		
Selling and Distribution Expenses	6,000	46,000	
Profit		50,000	

(i) When foreign offer is 4000 units

Additional production of 4000 units for foreign offer is within the maximum capacity so no additional fixed cost is to be incurred. To occupy the foreign market the minimum price would be the variable cost per unit.

Variable cost per unit for 4000 units for foreign demand:

Production	Rs.
(Rs. 80,000/20,000)	4.00
Packing cost	0.80
Minimum price to be quoted	Rs. 4.80

(ii) When foreign offer is 8000 units, to meet this, the domestic market is to be sacrificed of 3000 units, as maximum production is 25000 units. So contribution loss on these 3000 units is also to be added to the variable cost to determine the minimum price to be quoted for foreign offer:

	Rs.
Variable cost for 8000 units @ Rs. 4.80	= 38,400
Contribution loss on 3000 unit @ Rs. 4.80	= 14,400
Total cost to be covered by 8000 units	= 52,800
Minimum price 52,800/8,000	= Rs. 6.60/per unit

Example 17.25 (Profitability Decision)

A company produces a single product which is sold by it presently in the domestic market at Rs. 75 per unit. The present production and sale is 40000 units per month representing 50% of the capacity available. The cost data of the product are as under:

Variable costs per unit Rs. 50

Fixed costs per month Rs. 10 lakhs.

To improve the profitability, the management has 3 proposals on hand as under:

(a) to accept an export supply order for 30000 units per month at a reduced price of Rs. 60 per unit, incurring additional variable costs of Rs. 5 per unit towards export packing, duties, etc.;

(b) to increase the domestic market sales by selling to a domestic chain stores 30000 units at Rs. 55 per unit, retaining the existing sales at the existing price;

(c) to reduce the selling price for the increased domestic sales as advised by the sales department as under:

Reduce selling price per unit by Rs.	*Increased in sales expected (in units)*
5	10000
8	30000
11	35000

Prepare a table to present the results of the above proposals and give your comments and advice on the proposals. *(ICWA Inter June 1996)*

Solution:

The three proposals can be studied by differential cost analysis. The present capacity utilisation is only 50% and as such there is a scope to increase the sales up to another 4000 units. The comparison of proposals will depend on contribution generated since the fixed cost is not affected upto full utilisation and as such not relevant for decision-making.

Statement showing Contribution at Various Price Levels

Particulars	*Proposal (a)*		*Proposal (b)*	*Proposal (c)*		
	Present Level	*Export Order*	*Domestic Order*	*Price*	*Reduction*	
Selling Price per unit Rs.	75	60	55	70	67	64
Variable Cost per unit Rs.	50	55	50	50	50	50
Contribution per unit Rs.	25	05	05	20	17	14
Quantities in units	40000	30000 (addl.)	30,000 (addl.)	50,000 (total)	70,000 (total)	75,000 (total)
Existing Contribution (Rs. in lakh)	10	–	–	–	–	–
Additional Contribution (Rs. in lakh)		1.5	1.5			
Total Contribution for revised quantity (Rs. in lakhs)				10.0	11.9	10.5
Total Contribution Rs in lakhs	10.00	11.5	11.5	10.0	11.9	10.5
Proposal		(a)	(b)	c(i)	c(ii)	c(iii)

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Comments and Advice:

(1) In case only cost considerations are considered, proposal to reduce selling price by Rs. 8 to get a gross sales of 7000 units is most profitable since it yields a total contribution of Rs. 11.9 lakhs.

(2) In between export order as per proposal (a) and increased domestic order as per proposal (b) there is no change in additional profitability since both yield same results.

(3) However keeping in mind the impact on other domestic sale, if a part of production alone is sold at a drastically reduced price of Rs. 55 per unit, it is desirable to go for export order. This will also enable gaining valuable foreign exchange. Besides with exchange rate fluctuations it may result in higher profits, in case the selling price is quoted in foreign currency.

(4) Reduction in selling price against possible increased sales is full of doubt and has only a marginal effect of Rs. 40,000 as additional profit. (Rs 11,90,000—11,50,000).

Thus, on the whole it is better to go for export order.

Example 17.26 (Product Priority Decision)

Sum Toys (P) Ltd. manufactures and sells children's toys of high quality over an extensive market, utilising the services of skilled artists who are paid at an average rate of Rs. 15 per hour. The total no. of skilled labour hours available in a year is only 14000. The details of planned production for 1996–97, estimated cost and unit selling prices are given below:

Toy	*Production Plan (unit)*	*Cost of Production per Unit*			*Selling Price per unit*
		Direct Materials Rs.	*Direct Labour Rs.*	*Fixed Overheads Rs.*	*Rs.*
	A	3,000	20	10	
15	70				
	B	4,000	24	12	
18	92				
	C	4,000	32	12	
18	95				
	D	3,000	40	16	
24	110				
E	2,400	60	20	30	180

Variable overhead costs amount to 50% of the direct labour cost.
The company has estimated the following maximum and minimum demands for each product:

	A	*B*	*C*	*D*	*E*
	Maximum (units)	5,000	6,000	6,000	
4,000	4,000				
Minimum (units)	1,000	1,000	1,000	500	500

(ICWA Inter June 1996)

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The income statement of the company for the preceding year is as follows:

	Rs.
Net Sales—10,000 units @ Rs. 5 each	50,000
Costs:	
Direct material—Rs. 1.50 per unit	15,000
Direct labour—Re. 1 per unit	10,000
Factory overhead	10,000
Selling and administrative overheads	10,000
Total costs	45,000
Net profit	5,000

Direct material and direct labour costs to be incurred on the special order are estimated to be of the same amount per unit as for the regular business. Special tools costing Rs. 500 would be required to meet the specifications of the mail-order house.

You are required to prepare a differential costs statement for deciding about the acceptance of the order.

(B.Com.(Hons), Delhi, 2002)

Solution:

Differential Cost Analysis

Output (In Units)	*Selling price per Unit*	*Sales Value*	*Incremental Revenue*	*Variable Cost*	*Fixed Cost*	*Total Cost (V + F)*	*Differential Cost*
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
10,000	5	50,000	–	25,000	20,000	45,000	–
10,000	5	50,000	6000	30,500	20,000	50,500	5,500
2000	3	6,000	(56000 –	(12000			(50,500 –
2,000		56,000	50,000)	@ 2.50 + Rs. 500 special tool cost)			45,000)

From the above statement it is clear that incremental revenue of Rs. 6,000 is more than the differential cost of Rs. 5,500, so order of 2000 units at a price of Rs. 3 per unit from a large mail-order house should be accepted. The acceptance of the order will increase profit by Rs. 500.

Example 17.8 (Differential Cost Analysis)

P Ltd., is at present operating at 80% capacity level, the production being 15,000 units per annum. The company operates a flexible budgetary control system. The following relevant cost data are obtained from the company's budget at different capacity utilisation levels:

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Capacity utilisation level

	80%	*100%*
Sales	Rs. 20,00,000	Rs. 25,00,000
Variable overheads	Rs. 2,25,000	Rs. 2,50,000
Semi-variable Overheads	Rs. 1,05,000	Rs. 1,11,000
Fixed overheads	Rs. 4,00,000	Rs. 4,70,000
Output (in Units)	15,000	18,750

Material and labour cost per unit are constant under present conditions. The management expects a profit margin of 10% on sales.

You are required to compute the differential cost of producing the additional 3,750 units by increasing the capacity utilisation level to 100 per cent and the minimum price per unit at 10% profit on cost.

(B. Com. (Hons.) Delhi 2001)

Solution:

		Rs.
Sales at 80% capacity		20,00,000
Less: Profit 10% $\left(\frac{20,00,000 \times 100}{80}\right)$		2,00,000
Cost of goods sold:		18,00,000
Less: Expenses:	Rs.	
Variable overheads	2,25,000	
Semi-variable overheads	1,05,000	
Fixed overheads	4,00,000	7,30,000
Cost of material and labour at 80% capacity		10,70,000

Therefore, material and labour cost at 100% capacity

$$\frac{10,70,000 \times 100}{80} = \text{Rs. } 13,37,500$$

Differential cost analysis is as follows:

	80% Capacity 15000 units	*100% Capacity 18750 units*	*Differential cost*
	Rs.	Rs.	Rs.
Material and Labour	10,70,000	13,37,500	2,67,500
Variable Expenses	2,25,000	2,50,000	25,000
Semi-variable Exp.	1,05,000	1,11,000	6,000
Fixed Expenses	4,00,000	4,70,000	70,000
Total Cost	18,00,000	21,68,500	3,68,500

(a) Differential Cost for 3750 Units = Rs. 3,68,500

(b) Minimum Price = $\frac{\text{Rs. } 3,68,500}{3750 \text{ units}}$ Rs. 98.266

Add: 10% Profit on cost 9.826

108.092

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Example 17.9 (Differential Cost Computation)

A company has an installed production capacity of 1,00,000 units and presently it is working at 70% capacity utilisation. As production capacity utilisation increases, cost per unit decreases as follows:

Capacity utilisation	*Cost per unit*
70%	Rs 97
80%	Rs 92
90%	Rs 87
100%	Rs 82

The company has received three export orders from different sources as under:

Source *A*–5000 units at Rs. 55 per unit

Source *B*–10000 units at Rs. 52 per unit

Source *C*–10000 units at Rs. 51 per unit

Advise the company whether any or all the export orders should be accepted or not.

(B. Com. (Hons.) Delhi 2000)

Solution:

Statement showing Differential Costs at Different Capacity Utilisation Levels (Installed Capacity 100,000 units)

Capacity Utilisation (Percent)	*Production at different levels capacity utilisation* (Units)	*Unit cost* Rs.	*Total cost* Rs.	*Differential cost* Rs.	*Differential cost per unit* Rs.
70	$70{,}000\left(1{,}00{,}000\times\frac{70}{100}\right)$	97	67,90,000	–	–
80	$80{,}000\left(1{,}00{,}000\times\frac{80}{100}\right)$	92	73,60,000	5,70,000	$57\left[\frac{5{,}70{,}000}{10{,}000}\right]$
90	$90{,}000\left(1{,}00{,}000\times\frac{90}{100}\right)$	87	78,30,000	4,70,000	$47\left[\frac{4{,}70{,}000}{10{,}000}\right]$
100	1,00,000	82	82,00,000	3,70,000	$37\left[\frac{3{,}70{,}000}{10{,}000}\right]$

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Statement showing Profit or Loss Accepting the Various Export Orders

Export order source	*Export order unit*	*Capacity utilisation percent*	*Differential costs*		*Price per unit Rs.*	*Sales revenue from the order export Rs.*	*Profit or (loss) Rs.*
			Per unit Rs.	*Total Rs.*			
A	5000	75	57	2,85,000	55	2,75,000	(10,000)
B	10000	85	First 5000 units being upto 80% @ Rs. 57 Next 5000 units Rs @ Rs. 47	5,20,000	52	5,20,000	Nil
C	10000	95	First 5000 units being upto 90% @ Rs. 47 Next 5000 units @ Rs. 37	4,20,000	51	5,10,000	90,000
Total	25000	95%		12,25,000		13,05,000	80,000

It is clear from the above statement that it is advantageous for the company only when it accepts all the export orders. If the company accepts export orders only for one or two of three sources, it will suffer a loss. Therefore, the company should accept export orders from all the three sources to earn additional profits.

Example 17.10 (Material Procurement Decision)

A Company has the option to procure a particular material from two sources:

Source I assures that defectives will not be more than 2% of supplied quantity.

Source II does not give any assurance, but on the basis of past experience of supplies received from it, it is observed that defective percentage is 2.8%.

The material is supplied in lots of 1,000 units. Source II supplies the lot at a price, which is lower by Rs. 100 as compared to Source I. The defective units of material can be rectified for use at a cost of Rs. 5 per unit.

You are required to find out which of the two sources is more economical.

(CA Inter May 2001)

The McGraw-Hill Companies

Solution:

Comparative Statement of Procuring Material from Two Sources

	Material source I	*Material source II*
Defectives (in%)	2	2.8
	(Future estimate)	*(Past experience)*
Units supplied *(in one lot)*	1,000	1,000
Total defective units in a lot	20	28
	(1,000 units × 2%)	*(1,000 units × 2.8%)*
Additional price paid per lot (Rs.): (A)	100	–
Rectification cost of defect (Rs.) (B)	100	140
	(20 units × Rs. 5)	*(28 units × Rs. 5)*
Total additional cost per lot (Rs.): {(A) + (B)}	200	140

Decision: On comparing the total additional cost incurred per lot of 1,000 units, we observe that it is more economical, if the required material units are procured from material Source II.

Example 17.11 (Selling Price Decision)

The accounts of a company are expected to reveal a profit of Rs. 14,00,000 after charging fixed costs of Rs. 10,00,000 for the year ended 31st March, 2000. The selling price of the product is Rs. 50 per unit and variable cost per unit is Rs. 20.

Market investigations suggest the following responses to the price changes:

Alternatives	*Selling Price reduced by*	*Quantity Sold increased by*
I	5%	10%
II	7%	20%
III	10%	25%

Evaluate these alternatives and state which of the alternatives, on profitability consideration, should be adopted for the forthcoming year. *(CA Inter Nov. 2000; B. Com. (Hons) Delhi 2001)*

Solution

Statement for Evaluating three Alternatives on Profitability Consideration

	Alternatives		
	I	*II*	*III*
Selling price per unit (Rs.)	47.50	46.50	45.00
	(Rs. 50 – 5% of Rs. 50)	(Rs. 50 – 7% of Rs. 50)	(Rs. 50 – 10% of Rs. 50)
Less: Variable cost per unit (Rs.)	20.00	20.00	20.00
Contribution per unit (Rs.)	27.50	26.50	25.00
Revised quantity of units to be sold	88000	96000	100,000
(Refer to Working Note 3)			
Total contribution (Rs.)	24,20,000	25,44,000	25,00,000
	(88000 units × Rs. 27.50)	(96000 units × Rs. 26.50)	(100,000 units × Rs. 25)

Recommendation: An evaluation of the above three alternatives on profitability consideration clearly shows that alternative II is the best as it gives maximum contribution and hence profitability. Therefore this alternative should be adopted.

Working Notes:

1. *Contribution per unit*

= Rs. Selling price per unit – Variable cost per unit

= Rs. 50 – Rs. 20 = Rs. 30

2. *Expected quantity of units to be sold*

	(Rs.)
Profit	14,00,000
Add: Fixed costs	10,00,000
Total contribution	24,00,000

$$\text{Quantity of units sold} = \frac{\text{Total contribution}}{\text{Contribution per unit}} = \frac{\text{Rs. } 24,00,000}{\text{Rs. } 30} = 80000 \text{ units}$$

3. *Revised quantity of units to be sold*

Alternatives	*Units to be sold*
I	80000 units + 10% of 80000 units = 88000 units
II	80000 units + 20% of 80000 units = 96000 units
III	80000 units + 25% of 80000 units = 100,000 units

Example 17.12 (Cost Indifference Point)

XYZ Company is considering hiring a machine at an annual charge of Rs. 12,000 to increase the output of a product from its present level of 6,000 units. It is anticipated that with the introduction of the machine the variable cost per unit will be reduced by Re. 1.00 due to savings in labour cost. The new machine will not affect fixed cost in total, except for the hiring charges. The selling price of the product is Rs. 12 per unit. The present cost structure of the product is—Variable cost Rs. 9 per unit and fixed cost Re. 1.00 unit.

You are required to calculate the number of extra units, which must be produced and sold to justify hiring the machine, (that is the cost indifference point for the new machine). *(CA Inter)*

Solution:

Contribution per unit:

	Current	*Proposed*
Selling price per unit	Rs. 12.00	Rs. 12.00
Variable cost per unit	(Rs. 9.00)	(Rs. 8.00)
Contribution per unit	Rs. 3.00	Rs. 4.00
Total contribution required:		
Current contribution	6,000 × Rs. 3.00	Rs. 18,000.00
Hiring charges of the machine		12,000.00
Total		Rs. 30,000.00

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$$\text{Number of units to be sold: } \frac{\text{Total contribution required}}{\text{Proposed contribution per unit}} = \frac{\text{Rs. } 30.000}{\text{Rs. } 4.00} = 7{,}500$$

Additional number of units to be sold: (7,500 – 6,000) units = 1,500 units

Thus, 1,500 extra units to be manufactured and sold to justify hiring the machine.

Notes:

(i) Indifference point for the new machine refers to the extra units to be produced and sold to maintain the current level of profit. Additional contribution from extra units should equal the hiring charges, the incremental fixed cost.

(ii) Fixed cost per unit is irrelevant because that represents average fixed cost. Incremental fixed cost is relevant for decision making.

Example 17.13 (Capacity Decision)

A Ltd. Co. has capacity to produce 100,000 units of a product every month. It works cost at varying levels of production is as under:

Level	*Works cost per unit*
	Rs.
10%	400
20%	390
30%	380
40%	370
50%	360
60%	350
70%	340
80%	330
90%	320
100%	310

Its fixed administration expenses amount to Rs. 1,50,000 and fixed marketing expenses amount to Rs. 2,50,000 per month respectively. The variable distribution cost amount to Rs. 30 per unit.

It can market 100% of its output at Rs. 500 per unit provided it incurs the following further expenditure:

(a) it gives gift items costing Rs. 30 per unit of sale;

(b) it has lucky draws every month giving the first prize of Rs. 50,000; 2nd prize of Rs. 25,000, 3rd prize of Rs. 10,000 and three consolation prizes of Rs. 5,000 each to customers buying the product.

(c) it spends Rs. 1,00,000 on refreshments served every month to its customers;

(d) it sponsors a television programme every week at a cost of Rs. 20,00,000 per month.

It can market 30% of its output at Rs. 550 per unit without incurring any of the expense referred to in (a) to (d) above.

Advise the company on its course of action. Show the supporting cost sheets. *(CA Inter Nov. 1998)*

Solution:

Statement of Cost

Capacity Level	*30%*		*100%*	
Output Level (Units)	*30000*		*100,000*	
	Per unit Rs.	*Total* Rs.	*Per unit* Rs.	*Total* Rs.
Works cost	380.00	1,14,00,000	310.00	3,10,00,000
Add: Fixed Administration Expenses	5.00	1,50,000	1.50	1,50,000
Cost of Production	385.00	1,15,50,000	311.50	3,11,50,000
Add: Fixed Marketing Expenses	8.33	2,50,000	2.50	2,50,000
Add: Variable Distribution Cost	30.00	9,00,000	30.00	30,00,000
Add: Special cost:				
Gift items cost	—	—	30.00	30,00,000
Customer's prizes	—	—	1.00	1,00,000
Refreshments	—	—	1.00	1,00,000
Television programme Sponsorship cost	—	—	20.00	20,00,000
Cost of Sales	423.33	1,27,00,000	396.00	3,96,00,000
Profit	126.67	23,00,000	104.00	1,04,00,000
Sales	550.000	1,50,00,000	500.00	5,00,00,000

Advice

A Ltd. makes an extra profit of Rs. 81 lakhs (Rs. 104 lakhs – Rs. 23 lakhs) if it works at 100% capacity to produce 100,000 units of a product per month. Hence, the company is advised to produce 100,000 units and incur the special costs required for marketing its 100% output.

Example 17.14 (Product Mix Decision)

A company produces three products. The cost data are as under:

		A	B	C
Direct Materials	Rs.	64	152	117
Direct Labour:				
Deptt.	Rate per hour Rs.	hrs.	hrs.	hrs.
1	5	18	10	20
2	6	5	4	7
3	4	10	5	20
Variable Overheads		Rs. 16	9	21
Fixed Overheads		Rs. 4,00,000 per month		

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The budget was prepared at a time, when the market was sluggish. The budgeted quantities and selling prices are as under:

Product	*Budgeted Qty.*	*Selling Price (Rs.)/Unit*
A	9,750	270
B	7,800	280
C	7,800	400

Later the market improved and the sales quantities could be increased by 20% for product A and 25% each for products B and C. The sales manager confirmed that the increased quantities could be acheived at the prices originally budgeted. The production manager stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

Required:

(i) Present a statement of budgeted profitability.

(ii) Set optimal product mix and calculate the optimal profit. *(CA Inter May 1998)*

Solution

Statement of Budgeted Profitability

Products		*A*	*B*	*C*	*Total*
Budgeted Quantity (Units)	(1)	9750	7800	7800	
	(2)	Rs.	Rs.	Rs.	
Selling Price per unit		270	280	400	
Variable Cost per unit:					
Direct Materials		64	152	117	
Direct Labour		160	94	222	
Variable Overheads		16	9	21	
Total Variable Cost per unit	(3)	240	255	360	
Contribution per unit	(4) = ((2) – (3))	30	25	40	
Total Contribution	(1) × (4)	2,92,500	1,95,000	3,12,000	7,99,500
Less: Fixed Cost					4,00,000
Profit					3,99,500

(2) Statement of Optimal Product Mix and Profit

Products		*A*	*B*	*C*	*Total*
Contribution per unit	(1)	30	25	40	
Direct Labour hours in Department 2	(2)	5	4	7	
Contribution per direct labour hour (1)/(2)	(Rs.)	6	6.25	5.71	
Ranking		II	I	III	

(*Contd.*)

Products	*A*	*B*	*C*	*Total*
Optimal Product Mix Units (3)	11,700 (58,500 hrs.)	9,750 (39,000 hrs.)	5,292 (37,044 hrs.)	
Total Contribution (Rs.) (1) × (3)	3,51,000	2,43,750	2,11,680	8,06,430
Less: Fixed Cost (Rs.)				4,00,000
Optimal Profit				4,06,430

Working Notmes:

1. Total hours available in Department 2

Products (a)	*Units (b)*	*Hrs per unit (c)*	*Total Hrs. (d) = (b) × (c)*
A	9,750	5	48,750
B	7,800	4	31,200
C	7,800	7	54,600
Total			1,34,550

2. Maximum Sales Quantities of Products (under improved market conditions)

Products	*Units*	*Increase in percentage*	*Total number of units*
A	9,750	20	11,700
B	7,800	25	9,750
C	7,800	25	9,750

Example 17.15 (Product Mix Decision)

M/s. Mars Ltd. are manufacturing three products. The cost details are as follows:

Particulars	*Products*					
	A		*B*		*C*	
	Units	*Rs.*	*Units*	*Rs.*	*Units*	*Rs.*
Direct Materials	4	12	5	15	6	18
Direct Labour		5		6		6
Direct Expenses		8		9		11
		25		30		35
Selling Price		35		40		50
		10		10		15
No. of Units sold	20,000		40,000		20,000	
Contribution		2,00,000		4,00,000		3,00,000
Total Contribution				Rs. 9,00,000		
Less: Fixed Costs				Rs. 7,50,000		
				Rs. 2,50,000		

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The direct materials were all imported. Due to foreign exchange restrictions, henceforth, the company can import only 300,000 units of raw materials. The company can produce in all 100,000 units maximum (all products). However, they can market only 20000 units of product A & C each. There is a local substitute material which is available at a price of Rs. 3.75 per unit. Besides, the company has to spend Rs. 50,000 on intermediaries and consumables, if local substitute material is used in the production process. There was also a third party who was willing to take a part of the plant on lease upto 50000 units capacity of B and willing to pay lease charges of Rs. 2,75,000.

You are required to advise the management:

(i) What should be the quantum of production/sales mix of products with existing import restrictions?

(ii) Whether the company can optimise production of 100,000 units with local substitute materials?

(iii) Whether the company can enhance profits by leasing out a part of the plant to the thrid party and restricting its own production? *(CA Inter May 1999)*

Solution:

(i) Statement of Quantum of Productions/Sales Mix of Products
(*with existing import restrictions*)

Products	*A*	*B*	*C*	*Total*
Selling price per unit (Rs.)	35	40	50	
Less: Variable Cost per unit	25	30	35	
Contribution per unit of product (Rs.) (1)	10	10	15	
Units of Materials (2)	4	5	6	
Contribution per unit of material (Rs.) (3) = (1)/(2)	2.50	2	2.50	
Ranking	I	II	I	
Units made (4)	20,000	20,000	20,000	
(Materials consumed)	(80000 units)	100,000 units)	120,000 units)	
Total Contribution (Rs.) (5) = (1) × (4)	2,00,000	2,00,000	3,00,000	Rs. 7,00,000
Less: Fixed Costs (Rs.)				Rs. 7,50,000
Profit (Loss)				Rs. (50,000)

(ii) *Use of Local substitute of Material* (Output 100,000 units)

	Rs.	Rs.
Contribution per unit of product B on using local substitute material (Rs. 10 – Rs. 3.75)	6.25	
Total Contribution on 40,000 units of product B (40000 units × Rs. 6.25)		2,50,000
Less: Intermediaries Expenses		50,000
Net additional Contribution		2,00,000
Loss on Present Output of 60000 units (as per (1))		50,000
Net Profit		1,50,000

Thus, the company can have optimum production of 100,000 units by using local substitute of material.

(iii) *Evaluation of Leasing Out a part of the Plant*

	Total contribution on sale of 20000 units of Products A and C and 10000 units of Product B by using imported material (20,000 units × Rs. 10 + 10000 units × Rs. 10 + 20000 units × Rs. 15)	6,00,000
Less:	Fixed Assets	7,50,000
	Profit (Loss)	(1,50,000)
Add:	Lease Rent received	2,75,000
	Net Profit	1,25,000

Conclusion: The net profit is Rs. 1,50,000 in case the company uses local substitute of material and the plant capacity fully for producing 1,00,000 units, whereas by leasing out the plant capacity upto 50,000 units of Product B for a rent of Rs. 2,75,000, the company makes a profit of Rs. 1,25,000. A comparative study of the two alternatives suggests that it will be better for the company to have optimum production of 100,000 units by using local substitute of material.

Example 17.16 (Export order, Outsourcing)

Novina Industries Ltd. has received an export order for its only product that would require the use of half of the factory's present capacity of 400,000 units per annum. The factory is currently operating at 60% level to meet the demand of its domestic market.

As against current price of Rs. 6.00 per unit, the export order offers @ Rs. 4.50 per unit, which is less than the cost of production, the details of which are given below:

Direct Materials	Rs. 2.50 per unit
Direct Labour	Rs. 1.00 per unit
Direct Expenses	Re. 0.50 per unit
Fixed Overheads	Re. 1.00 per unit

The condition of the export is that it has either to be accepted in full or totally rejected.

The company is considering the following alternatives:

(a) Accept the order and keep domestic sales unfulfilled to the excess demand for the same

(b) Increase factory capacity by installing a few balancing machinery and equipments and also by working extra time to meet the balance of the required capacity. This will increase fixed overheads by Rs. 20,000 annually and the additional cost of overtime will work out to Rs. 40,000 per annum.

(c) Out source the production of additional requirements by supplying direct materials and paying conversion charges of Rs. 1.75 per unit to a small converter, and engaging one supervisor at a cost of Rs. 3,000 per month to look after quality, packing and despatch.

(d) Reject export order and continue with domestic market.

As a Management Accountant, you are required to make comparative analysis of various proposals and suggest which of the alternative proposals is the most attractive to Novina Industries Ltd.

(ICWA, Inter, Stage 1, June 2006)

Solution:

Novina Industries Ltd
Analysis of four alternative proposals

			Rs.
Proposal-A: (Accept Export order and domestic sale of 20000 units)			
Export Sales – 200,000 units @ Rs. 4.50 per unit.			9,00,000
Domestic Sales – 200,000 units @ Rs. 6.00 per unit.			12,00,000
Total	400,000 units		21,00,000
Less: Direct cost of sales (variable) @ Rs. 4			16,00,000
Contribution			5,00,000
Less: Fixed costs (60% level that is 240,000 units × 1)			2,40,000
Profit			2,60,000

Proposal-B

			Rs.
Export Sales	200,000 units @ Rs. 4.50 per unit		9,00,000
Domestic Sales	240,000 units @ Rs. 6.00 per unit.		14,40,000
440,000 units		Total	23,40,000
Variable cost of sales @ Rs. 4	= Rs. 17,60,000		Rs.
Additional cost of overtime	Rs. 40,000		18,00,000
Contribution			5,40,000
Less: Fixed overheads (240,000 + Additional 20,000)			2,60,000
Profit			2,80,000

Proposal-C

			Rs.
Export Sales	200,000 units @ Rs. 4.50 per unit.		9,00,000
Domestic Sales	240,000 units @ Rs. 6.00 per unit		14,40,000
440,000 units		Total	23,40,000
Less: Direct cost of Sales (Variable) 4,00,000 × 4	= Rs. 16,00,000		
Direct Material cost of 40000 units × 2.50	= Rs. 1,00,000		
Conversion charges of 40000 units × 1.75	= Rs. 70,000		
Supervision charges @ 3000 × 12	= Rs. 36,000		
Total	18,06,000		18,06,000
Contribution			5,36,000
Less: Fixed overheads			2,40,000
Profit			2,94,000

Proposal-D: (Rejecting export order and remaining with domestic market)

	Rs.
Domestic Sales 240,000 units @ Rs. 6.00 per unit.	14,40,000
Less: Direct cost of Sales (240,000 × 4)	9,60,000
Contribution	4,80,000
Less: Fixed overheads	2,40,000
Profit	2,40,000

Decision: On making comparative analysis of four alternative proposals (A, B, C and D), it is revealed that for accepting export order proposal-C is most profitable and should be accepted by Novina Industries Ltd.

Example 17.17 (Shut Down Decision)

The annual flexible budget of TBA Ltd. is as follows:

Production Capacity	40%	60%	80%	100%
Costs:	Rs.	Rs.	Rs.	Rs.
Direct wages	20,000	30,000	40,000	50,000
Direct material	16,000	24,000	32,000	40,000
Production overheads (Fixed and variable)	11,400	12,600	13,800	15,000
Administrative overheads (Fixed and variable)	5,800	6,200	6,600	7,000
Selling and distribution overheads (Fixed and variable)	6,200	6,800	7,400	8,000
Total:	59,400	79,600	99,800	1,20,000

The company is presently passing through a period of very lean market demand and operating at 50% capacity and have also selling its product at a discounted price generating a sales revenue of Rs. 60,000 at that level.

It is expected that the market scenario will improve in the next year and, on a conservative rate, the company is likely to operate at 70% capacity level with increased sales revenue of Rs. 20,000.

As an option, the management is considering to close down the operation for one year and start operation after one year when the market conditions are likely to improve. If closed down for one year it is estimated that

(i) the present fixed costs will reduce by 60%;
(ii) there will be a cost of Rs. 10,000 towards closing down operations;
(iii) to maintain a skeleton maintenance service for which Rs. 24,000 to be incurred;
(iv) an initial cost of re-opening of Rs. 20,000 to be incurred.

The other option is to keep the factory operational for one year and wait for better time next year. You are required to work out the profitability under the two options and give your comment.

(ICWA, Inter Stage 1, June 2005)

Solution:

TBA Ltd.

Cost Structure

	Total Cost at 100%	*Variable Cost at 100%*	*Fixed Cost*
	(Rs.)	(Rs.)	(Rs.)
Direct Wages	50,000	50,000	Nil
Direct Material	40,000	40,000	Nil
Production over head	15,000	6,000	9,000
Admn. over head	7,000	2,000	5,000
Selling and Distribution. over head	8,000	3,000	5,000
	1,20,000	1,01,000	19,000

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Comparative Profitability of two Options

	Current Operation 50% Level (Rs.)	*Closure for one year (Rs.)*	*Operation after one year 70% Level (Rs.)*
Revenue	60,000	Nil	1,20,000
Variable Costs:			
Direct Materials	20,000		28,000
Direct Wages	25,000		35,000
Production over head	3,000		4,200
Admn. over head	1,000		1,400
Selling and Distribution over head	1,500		2,100
	50,500	Nil	70,700
Fixed Costs	19,000	7,600 (40%)	19,000
Closing down costs	–	10,000	–
Maintenance cost	–	24,000	–
Re-opening cost	–	20,000	–
Total cost	69,500	61,600	89,700
Profit/ Loss	(9,500)	(61,600)	30,300

Comment: In the light of assessment of comparative profitability, it is better to continue with operation in current year and wait for the next year.

Example 17.18 (Mode of Conveyance Decision)

ACME Company is considering three proposals for conveyance facilities for its sales staff, who normally travels on an average 20000 kilometres per annum locally. The proposals are as follows:

I. Purchase and maintain own fleet of cars. Average cost of a car is Rs. 2.50 lakhs. Petrol consumption is @ 12 km/litre. Each has a resale value of Rs. 50,000 at the end of five years.
II. Allow the executive to use their own car and reimburse expenses @ Rs. 5 per km and insurance premia.
III. Hire cars from outside agency for Rs. 30,000 per year per car, the company shall also bear the cost of petrol (Rs. 3.75 per km), taxes and tyres etc.

Following cost data are available for consideration

(i) Petrol– Rs. 45 per litre
(ii) Repairs and maintenance– @ 50 paise per km
(iii) Insurance – Rs 4,800 per year per car
(iv) Taxes – Rs. 2,400 per year per car
(v) Tyres – @ 40 paise km
(vi) Driver's wages and Bonus Rs. 30,000 per annum per car

Which of the proposals is acceptable? *(ICWA Inter, Stage 1, June 2005)*

Solution:

Acme Company
Statement Showing Comparative cost of Operation per car Per Annum and Per KM. (20000 Kilometres p.a)

Particulars of Expenses	*Company's Purchased and own car (I)* (Rs.)	*Executive Car (II)* (Rs.)	*Hire Car (III)* (Rs.)
Petrol @ Rs. 45 per litre/12 km per litre	75,000.00	–	75,000.00
Repairs and Maintenance @ 50 p/km	10,000.00	–	–
Tyre @ 40 paise/ km	8,000.00	–	8,000.00
Insurance Rs. 4,800 per year/car	4,800.00	4,800.00	–
Taxes @ Rs. 2,400 p.a. per car	2,400.00	–	2,400.00
Depreciation			
Rs. (2,50,000 – 50,000)/5	40,000.00	–	–
Re-imbursement of Expenses			
@ Rs. 5 per km	–	1,00,000.00	–
Driver's Wages and Bonus @ Rs. 30000 p.a	30,000.00	–	–
Hire charges	–	–	30,000.00
Total cost: (A)	1,70,200.00*	1,04,800.00	1,15,400.00
Cost per kilometer (A/20000 km)	8.51	5.24	5.77

*This cost will go up, because company would have earned interest, if it invested Rs. 2.50 lakhs elsewhere.

Comment: In consideration of the comparative analysis as stated in the tabulated statement, second proposal (allow executives to use their own cars) is most economic and recommended to accept.

Example 17.19 (Sell or Process Further)

Modern Mills Ltd. manufactures certain grades of products known as M, B_1 and B_2. In course of manufacture of product M (main product), by products B_1 and B_2 emerge. The joint expenses of manufacture amount to Rs. 2,37,600.

All the three products are processed further after separation and sold as per details given below:

	Product M	*(By products)*	
		Product B_1	*Product B_2*
Sales	Rs. 2,00,000	1,20,000	80,000
Cost incurred after separation	Rs. 20,000	15,000	10,000
Profit as percentage on sales	25	20	15

Total fixed selling expenses are 10% of total cost of sales which are apportioned to the three products in the ratio of 20 : 40 : 40.

Required:

(i) Prepare a statement showing the apportionment of joint costs to the products (M, B_1 and B_2).

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(ii) If the Product B_1 (by product) is not subject to further processing and is sold at the point of separation, for which there is a market at Rs. 1,00,440 without incurring any selling expenses. Would you advise its disposal at this stage? Show the workings. *(ICWA, Inter, Stage 1, June 2005)*

Solution:

Modern Mills Ltd.

Statement of Apportionment of Joint Cost

(Fig. in Rs.)

	Total	*Product M*	*(By-products)*	
			Product B_1	*Product B_2*
Sales	4,00,000	2,00,000	1,20,000	80,000
Less: Profit	86,000	50,000	24,000	12,000
Cost of Sales	3,14,000	1,50,000	96,000	68,000
Less: Selling and distribution expenses (10 % of Rs. 3,14,000) apportioned in the ratio of 20 : 40 : 40	31,400	6,280	12,560	12,560
Cost of production	2,82,600	1,43,720	83,440	55,440
Less: After Split-off cost (Separation Cost)	45,000	20,000	15,000	10,000
Joint Cost Apportioned	2,37,600	1,23,720	68,440	45,440

(iii) If product B_1 (By-product) is sold after further processing, a profit of Rs. 24,000 is earned on this product as shown in the statement above. However if it is sold at the point of separation, its profit will be as follows:

Sales of product B_1	Rs. 1,00,440
Less: Share in joint cost	Rs. 68,440
Profit	32,000

Recommendation:

It reveals from the comparative assessment of profitability as stated above that when Product B_1 is sold at the point of separation, profit to the tune of Rs. 32,000 is earned resulting in enhancement of profit by Rs. 8,000 (that is, Rs. 32,000 – Rs. 24,000). Hence, it is advisable to sell the product B_1 at the point of separation instead of selling after further processing.

Example 17.20 (Limiting Factor Decision)

A company has plans to manufacture five different types of product using a common raw materials which is locally available according to requirement at Rs. 16 per kg. However skilled labour required for manufacture is in short supply and current availability is only 30000 hours per month @ Rs. 20 per hour.

Variable production overheads amounts to Rs. 10 per labour hour and variable selling and distribution cost is 10% of sales value.

Total fixed costs of selling, distribution and administration is estimated to be Rs. 3,00,000 per month. Further details relating to the products are given below:

Product	*Current demand (units)*	*Selling price per unit (Rs.)*	*Raw material required (kg/unit)*	*Direct labour required (hrs/unit)*
A	8,000	100	2	1
B	6,000	120	2.5	1.2
C	5,000	160	3	2
D	3,000	220	4	3
E	2,000	300	5	4

Required:

(a) Contribution Analysis statement showing the relative profitability of the products under:

(i) Normal conditions without any constrains on resources.

(ii) When skilled labour hours are in short supply.

(b) Production plan for optimum profit when available labour hours is only 30000. What is the expected profit?

(c) If the company decides to produce and sell even relatively less profitable products to meet at least 10% of the current demand, what revised plan will you suggest? What is the anticipated profit?

(ICWA, Inter, Stage 1, Dec. 2005)

Solution:

(a) Contribution Analysis Statement

(i) Under Normal Condition and (ii) Under – When skilled Labour hours is in short supply

	Products				
	A	*B*	*C*	*D*	*E*
Raw material required (kg/unit)	2	2.5	3	4	5
Direct labour required (hrs.unit)	1	1.2	2	3	4
Variable cost per unit (Rs.):					
Raw materials @ Rs. 16 per kg.	32	40	48	64	80
Direct Labour @ Rs. 20 per hr.	20	24	40	60	80
Production overhead @ Rs. 10 per hr.	10	12	20	30	40
Selling and Distribution Cost	10	12	16	22	30
Total (A)	72	88	124	176	230
Selling price per unit Rs. (B)	100	120	160	220	300
Contribution per unit (Rs.) (B–A):	28	32	36	44	70
P/V Ratio (Contribution/sales)	28%	26.7%	22.5%	20%	23.3%
(i) Profitability Ranking	I	II	IV	V	III
Contribution per labour hour (Rs.) (Contribution/Labour hour per unit)	28.00	26.67	18.00	14.67	17.50
(ii) Ranking	I	II	III	V	IV

(*Contd.*)

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(b) Expected Profit (Under Production Plan for Optimum Profit)

	Products					*Total*
	A	*B*	*C*	*D*	*E*	
Total labour hours available						30000
Contribution per labour hr. (Rs.)	28	26.67	18.00	14.67	17.50	
Ranking	I	II	III	V	IV	
Allocation of labour hours	8000	7200	10000		4800	
No. of units to be produced (Maximum)	8000	6000	5000		1200	
Total contribution (Rs.)	2,24,000	1,92,000	1,80,000		84,000	6,80,000
Less: Fixed cost (Rs.)						3,00,000
Expected Profit (Rs.)						3,80,000

(c) Profitability Statement

(When at least 10% of current demand of product D is to be maintained)

Total labour hours available: 30000 hrs.

Products	*Rank of contribution per hr.*	*No. of units to be produced*	*Labour hrs required*	*Contribution per unit (Rs.)*	*Total contribution (Rs.)*
A	I	8000 (max)	8000	28	2,24,000
B	II	6000 (max)	7200	32	1,92,000
C	III	5000 (max)	10000	36	1,80,000
D	V	300 (10%)	900	44	13,200
E	IV	975	3900	70	68,250
Total			30000		6,77,450
Less:	Fixed cost				3,00,000
Anticipated	Profit				3,77,450

Comments: Since total profit is declined by Rs. 2,550, this revised plan can not be recommended.

Example 17.21 (Sell or Process Further Decision)

A certain raw material on undergoing a chemical process yield three product A, B and C and a by-product X. The relevant particulars of the process for a month are given below:

Joint processing cost:

Raw materials input	: 20,000 kg @ Rs. 15
Other materials	: Rs. 30,600
Direct labour	: 4000 hours @ Rs. 20
Production overheads	: Rs. 1,00,000

Output, selling price and other particulars:

Solution: Basic Calculations

Statement of Priority of Production Taking Labour Time as Key Factor

(Rs.)

Product	*Selling*	*Total Variable Cost*				*Contribution*		
	Price per unit	*Direct materials*	*Direct labour*	*Variable overheads*	*Total*	*Per unit*	*Per Labour hour*	*Production priority*
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
A	70	20	10	5	35	35	52.50	IV
B	92	24	12	6	42	50	62.50	II
C	95	32	12	6	50	45	56.25	III
D	110	40	16	8	64	46	43.13	V
E	180	60	20	10	90	90	67.50	I

Contribution per labour hour has been derived as follows:

$$\frac{\text{Product per unit contribution} \times \text{Rs. 15 average labour rate}}{\text{Product direct labour cost}}$$

Product

$$A = \frac{\text{Rs } 35 \times 15}{10} = 52.5$$

$$B = \frac{50 \times 15}{12} = 62.5$$

$$C = \frac{45 \times 15}{12} = 56.25$$

$$D = \frac{46 \times 15}{16} = 43.13$$

$$E = \frac{90 \times 15}{20} = 67.50$$

(a) Statement of Estimated Profit for 1996-97
(*As per Company's Production Plan*)

Product	*Vol. of Sales (units)*	*Contribution per unit (Rs.)*	*Total Contribution (Rs.)*	*Total Fixed cost (Rs.)*	*Profit (Rs.)*
A	3,000	35	1,05,000	45,000	60,000
B	4,000	50	2,00,000	72,000	1,28,000
C	4,000	45	1,80,000	72,000	1,08,000
D	3,000	46	1,38,000	72,000	66,000
E	2,400	90	2,16,000	72,000	1,44,000
			8,39,000	3,33,000	5,06,000

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(b) Production Plan for Maximum Profits

Product	*Volume of Sales (units)*	*Hours required*	*Contribution per unit (Rs.)*	*Total Contribution (Rs.)*	*Priority*
E	4,000 (Max.)	5,334	90	3,60,000	I
B	6,000 (Max.)	4,800	50	3,00,000	II
C	3,331 (Balance)	2,665 (Bal. hrs.)	45	1,49,895	III
A	1,000 (Minimum)	667	35	35,000	IV
D	500 (Minimum)	534	46	23,000	V
		14,000		8,67,895	

(c) The maximum profit under plan (b) suggested would amount to Rs. 8,67,895 – Rs. 3,33,000
= Rs. 5,34,895.

Example 17.27 (Buy Decision)

Stirling Industries Ltd. manufactures a product Z by making and assembling three components A, B and C. The components are made in a machine shop using three identical machines each of which can make any of the three components. However, the total capacity of the three machines is only 12,000 machine-hours per month and is just sufficient to meet the current demand. Labour for assembling is available according to requirements. Further details are given below:

Components	*Machine-hours required per unit*	*Variable cost per unit*	*Market price at which the component can be purchased if required*
A	4	Rs. 48	Rs. 64
B	5	60	75
C	6	80	110
Assembling	15	30	–
(per unit of Z)		218	

Fixed costs per month amount to Rs. 50,000. Product Z is sold at Rs. 300 per unit. From next month onwards the company expects the demand for Z to rise by 25%. As the machine capacity is limited, the company wants to meet the increase in demand by buying such numbers of A, B or C which is most profitable.

You are asked to find out the following:

(a) Current demand and profit made by the company.
(b) Which component and how many units of the same should be bought from the market to meet the increase in demand?
(c) Profit made by the company if suggestion in (b) is accepted. *(ICWA Inter Dec. 1998)*

Solution:

(a) Total Machine Hours required per unit of Z = 15 hrs.
Hence, with 12,000 hours available 800 units of Z can be produced.

Statement of Current Profit
(*Output and Sales 800 Units*)

Particulars	*Rs.*
Selling Price per unit	300
Less: Variable Cost including assembling	218
Contribution per unit	82
Total Contribution from 800 units @ Rs. 82	65,600
Less: Fixed Costs	50,000
Current Net Profit	15,600

(b) Statement of Additional Cost per Hour if Components are Purchased from the Market

	A	B	C
Market Price per unit	Rs. 64	Rs. 75	Rs. 110
Less: Variable Cost of making per unit	Rs. 48	Rs. 60	Rs. 80
(i) Additional Cost of purchasing per unit	Rs. 16	Rs. 15	Rs. 30
(ii) Hours saved by purchasing	4	5	6
Additional Cost per hour-saved (i) ÷ (ii)	Rs. 4	Rs. 3	Rs. 5

Thus, to save machine hours it is best to purchase B which has the least additional cost per hour. In the next month demand will be 25% more that is, (800 units + 25%) or 1,000 units. This can be met as follows:

	Hrs required	
Make 1,000 units of C	6,000	
Make 1,000 units of A	4,000	
Make 400 units of B	2,000	(Balance)
	12,000	hours

The balance of 600 units (1,000 – 400) of B can be purchased from the market.

(c) Statement of Profit
as per plan given in (b)

			Rs.	Rs.
Sale Value of 1,000 units of Z	@	Rs. 300		3,00,000
Cost of making 1,000 units of C	@	Rs. 80	Rs 80,000	
Cost of making 1,000 units of A	@	Rs. 48	Rs 48,000	
Cost of making 400 units of B	@	Rs. 60	Rs 24,000	
Cost of buying 600 units of B	@	Rs. 75	Rs 45,000	
Assembling 1,000 units Z	@	Rs. 30	Rs 30,000	2,27,000
Contribution				73,000
Fixed Costs				50,000
Net Profit				23,000

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Example 17.28 (Diversification Decision)

A company produces 30,000 units of product A and 20,000 units of product B per annum. The sales value and costs of the two products are as follows:

	Rs.
Sales value	7,60,000
Direct Material	1,40,000
Direct Labour	1,90,000
Factory Overheads	1,90,000
Administrative and Selling Overheads	1,20,000

50% of factory overheads are variable and 50% of administrative and selling overheads are fixed. The selling price of A is Rs. 12 per unit and B is Rs. 20 per unit.

The direct material and labour ratio for product A is 2 : 3 and for B is 4 : 5. For both the products the selling price is 400% of direct labour. The factory overheads are charged in the ratio of direct labour and administrative and selling overheads are recovered at a flat of Rs. 2 per unit of A and Rs. 3 per unit of B.

Due to fall in demand of the above products the company has a plan to diversify and make product C using 40% capacity. It has been estimated that for C direct material and direct labour will be Rs. 2.50 and Rs. 3 per unit respectively. Other variable costs will be same as applicable to product A. The selling price of product C is Rs. 14 per unit and production will be 30,000 units.

Assuming 60% capacity is used for manufacture of A and B calculate

(a) present cost and profit,
(b) cost and profit after diversification, and
(c) give your recommendation as to whether to diversify or not.

(ICWA Inter June 1999)

Solution:

Computation of Unit Variable Cost of Products A and B

	Particulars	*A*	*B*	*Total*
		Rs.	Rs.	Rs.
(i)	Selling Price per unit	12.00	20.00	32.00
(ii)	Variable Cost per unit:			
	Direct Material	2.00	4.00	6.00
	Direct Labour (1/4th of Selling Price)	3.00	5.00	8.00
	Factory Overhead (50%)	1.50	2.50	4.00
	Administrative and Selling Overhead (50%)	1.00	1.50	2.50
	Total Variable Cost	7.50	13.00	20.50
(iii)	Contribution (i) – (ii)	4.50	7.00	11.50

(a) Computation of Cost and Profit before Diversification

	Particulars		*A*	*B*	*Total*
1.	Production and Sales (in units)		30,000	20,000	50,000
			Rs.	Rs.	Rs.
2.	Sales Value (Rs.)		3,60,000	4,00,000	7,60,000
3.	Variable Costs:				
	Direct Material		60,000	80,000	1,40,000
	Direct Labour		90,000	1,00,000	1,90,000
	Factory Overheads		45,000	50,000	95,000
	Administrative & Selling Overhead		30,000	30,000	60,000
	Total Variable Costs		2,25,000	2,60,000	4,85,000
4.	Contribution (2) – (3)		1,35,000	1,40,000	2,75,000
5.	Fixed Costs:				
	Factory Overhead	95,000			
	Administrative & Selling Overhead	60,000			1,55,000
6.	Net Profit				1,20,000

(b) Cost and Profit after Diversification

Particulars	*Capacity Levels*		
	60%		*40%*
Products	A	B	C
1. Production and Sales (in units)	18,000	12,000	30,000
	Rs.	Rs.	Rs.
2. Sales Value (Rs.)	2,16,000	2,40,000	4,20,000
3. Variable Costs:	Rs.	Rs.	Rs.
Direct Material	36,000	48,000	75,000
Direct Labour	54,000	60,000	90,000
Factory Overhead	27,000	30,000	45,000
Administrative & Selling Overheads	18,000	18,000	30,000
Total Variable Costs	1,35,000	1,56,000	2,40,000
4. Contribution (2) – (3) (Rs.)	81,000	84,000	1,80,000
5. Total Contribution (Rs.)		(Rs.)	
Product A		81,000	
B		84,000	
C		1,80,000	
			3,45,000
6. Fixed Overheads:			
Factory Overheads		95,000	
Administrative & Selling Overheads		60,000	
			1,55,000
7. Net Profit			1,90,000

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Recommendation: The company should immediately implement the proposed diversification. This is because this has increased the net profit from Rs. 1,20,000 to Rs. 1,90,000 and improve the overall P/V Ratio from 36.18% to 39.38%.

Example 17.29 (Production Plan Decision)

XY Ltd. is manufacturing three household products A, B and C and selling them in a competitive market. Details of current demand, selling price and cost structure are given below:

Particulars	*A*	*B*	*C*
Expected Demand (units)	10,000	12,000	20,000
Selling Price per unit (Rs.)	20	16	10
Variable Cost per unit (Rs.):			
Direct Materials (Rs. 10/kg)	6	4	2
Direct Labour (Rs. 15/hr.)	3	3	1.50
Variable Overheads	2	1	1
Fixed Overhead per unit (Rs.)	5	4	2

The company is frequently affected by acute scarcity of raw material and high labour turnover.
During the next period, it is expected to have one of the following situations:

(a) Raw materials available will be only 12,100 kg.
(b) Direct labour hours available will be only 5,000 hrs.
(c) It may be possible to increase sales of any one product by 25% without any additional fixed costs but by spending Rs. 20,000 on advertisement. There will be no shortage of materials or labour.

Suggest the best production plan in each case and the resultant profit that the company would earn according to your suggestion.

(ICWA Inter June 1998)

Solution:

Statement of Cost and Profit

Particulars	*Products*		
	A	*B*	*C*
Selling Price/unit (Rs.)	Rs. 20	Rs. 16	Rs. 10
Variable Cost/unit (Rs.):			
Direct Material	6	4	2.00
Direct Labour	3	3	1.50
Variable Overheads	2	1	1.00
Total Variable Cost/Unit	11	8	4.50
Contribution/Unit	9	8	5.50
P/V Ratio or Contribution/Sales	45%	50%	55%

Ranking

(i) As per profitability
With no limiting factor
(On the basis of profitability) III II I

(ii) With raw material as limiting factor
Raw Material required per unit

$\left(\frac{\text{Raw Material Cost}}{\text{Price per kg}}\right)$	0.6 kg	0.4 kg	0.2 kg
Contribution per kg. of Raw Material	Rs. 15	Rs. 20	Rs.27.50
Ranking	III	II	I

(iii) With labour as limiting factor:
Labour hours required per unit

$\left(\frac{\text{Labour Cost}}{\text{Wages per kg}}\right)$	1/5 hr.	1/5 hr.	1/10 hr.
Contribution per labour hour	Rs. 45	Rs. 40	Rs. 55
Ranking	II	III	I

Evaluation of Alternatives

(a) Raw material available is 12,100 kg. In such a case, the Production Plan will be as follows:

Product	*No. of Units*	*Raw Material required*	*Contribution per unit*	*Total Contribution*
C	20,000	4,000 kg	Rs. 5.50	Rs. 1,10,000
B	12,000	4,800 kg	Rs. 8.00	Rs. 96,000
A	5,500	3,300 kg	Rs. 9.00	Rs. 49,500
Total:		12,100 kg		Rs. 2,55,500
Less: Total Fixed Costs				Rs. 1,38,000*
Net Profit				Rs. 1,17,500

*Total Fixed Cost

A: 10,000 × Rs. 5 =	Rs. 50,000
B: 12,000 × Rs. 4 =	Rs. 48,000
C: 20,000 × Rs. 2 =	Rs. 40,000
	Rs. 1,38,000

(b) When Labour Hours available are 5,000 hours. In such a case the Production Plan will be as follows:

Product	*No. of Units*	*Labour Hours required*	*Contribution per unit*	*Total Contribution*
C	20,000	2,000	Rs. 5.50	Rs. 1,10,000
A	10,000	2,000	Rs. 9,00	Rs. 90,000
B	5,000	1,000	Rs. 8.00	Rs. 40,000
Total:	5,000			Rs. 2,40,000
Less: Fixed Cost				Rs. 1,38,000
Net Profit				Rs. 1,02,000

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(c) No shortage of Material and Labour: The most profitable product is C and hence its 25% more production will be raised by 25% that is 5,000 units. The total production of C will be 25,000 units i.e. 25% of 20,000 or 5,000 units.

The extra production of 5,000 units of C will fetch an additional contribution of Rs. (5,000 × Rs. 5.50) or Rs. 27,500. The solution will now be as under than additional expenditure on advertisement of Rs 20,000.

Product	*No. of units*	*Contribution per unit*	*Total Contribution*
A	10,000	Rs. 9.00	Rs. 90,000
B	12,000	Rs. 8.00	Rs. 96,000
C	25,000	Rs. 5.50	Rs. 1,37,500
			Rs. 3,23,500
Less: Fixed Costs		1,38,000	
Advertisement Expenses		20,000	Rs. 1,58,000
Net Profit:			Rs. 1,65,500

Example 17.30 (Replacement of a Product)

A multi product company has the following costs and output data for the last year.

	Product		
	X	Y	Z
Sales mix	40%	35%	25%
	Rs.	Rs.	Rs.
Selling price	20	25	30
Variable cost per unit	10	15	18
Total fixed cost			1,50,000
Total sales			5,00,000

The company proposes to replace product Z by product S. Estimated cost and output data are:

Sales mix	50%	30%	20%
Selling price	20	25	28
Variable cost per unit	10	15	14
Total fixed costs			1,50,000
Total sales			5,00,000

Analyse the proposed change and suggest what decision the company should take.

(ICWA, Inter)

Solution:

(I) Computation of Present Profit and BEP

Particulars	*Products*		
	X	Y	Z
	Rs.	Rs.	Rs.
Selling price	20	25	30
Variable cost	10	15	18
Contribution	10	10	12

P/V ratio	50%	40%	40%	
Sales mix	40%	35%	25%	100%
Contribution per rupee of sales: (P/V ratio × Sales mix)	20%	14%	10%	44%
Sales				Rs. 5,00,000
Total contribution Rs. (5,00,000 × 44/100)				2,20,000
Fixed costs				1,50,000
Profit				Rs. 70,000
Break-even point (Rs. 1,50,000 × 100/44)				Rs. 3,40,909

(2) Computation of Proposed Profit and BEP

Particulars	*Products*			*Total*
	X	Y	Z	
	Rs.	Rs.	Rs.	
Selling price	20	25	28	
Variable cost	10	15	14	
Contribution	10	10	14	
P/V Ratio	50%	40%	50%	
Sales mix	50%	30%	20%	100%
Contribution per rupee of sales (P/V ratio × Sales mix)	25%	12%	10%	47%
Sales				Rs. 5,00,000
Total contribution 5,00,000 × 47/100				2,35,000
Fixed cost				1,50,000
Profit				Rs. 85,000
Break-even point (1,50,000 × 100/47)				3,19,149

A comparison of the present situation and the proposed situation shows that if product Z is replaced by product S, profit would increase by Rs. 15,000 (Rs. 85,000 – 70,000) and break-even point will reduce by Rs. 21,760 (Rs. 3,40,909 – 3,19,149). The change is beneficial and, therefore, product Z may be dropped, provided all other relevant factors remain constant.

Example 17.31 (Alternative Proposals Decision)

AB Ltd. manufactures three products X, Y and Z. Standard selling prices and costs have been established for 2003 as follows:

	X	*Y*	*Z*
Selling price per unit	Rs. 28	Rs. 60	Rs. 125
Direct materials per unit	8	15	20
Direct wages per unit	10	20	50
Variable overheads per unit	5	10	25

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Direct wages are paid at the rate of Rs. 2 per hour in each case. Fixed overheads are budgeted at Rs. 25,000 for the coming year. In the short run, the company cannot increase its direct labour strength and as a result, only 35,000 direct labour hours will be available in the coming year. The company has commitments to produce 500 units of each product. It has been suggested that after meeting the minimum requirements for X, Y and Z, the balance of available direct labour hours should be used to produce product Z.

You are required:

(a) To prepare an income statement showing the expected results if the proposal is adopted.
(b) Comment on the statement you have produced in (a) and prepare an income statement for any alternative policy, which you consider would be more profitable.
(c) Basing your calculations on your suggestion in (b), show the company's break-even point in terms of units and sales value.
(d) Show the sale value which is required to produce an after tax return of 10% on capital employed of Rs. 1,00,000 assuming tax rate of 50%.

(ICWA, Final year)

Solution:

(a) Income Statement Showing Results if the Proposal is Adopted Rs. '000)

	Product X	*Product Y*	*Product Z*	*Total*
1. Sales value	14.00	30.00	137.50	181.50
2. Variable costs:				
Direct materials	4.00	7.50	22.00	33.50
Direct wages	5.00	10.00	55.00	70.00
Variable overheads	2.50	5.00	27.50	35.00
Total	11.50	22.50	104.50	138.50
3. Contribution fund (1 – 2)	2.50	7.50	33.00	43.00
4. Fixed overheads				25.00
5. Opening profit (3 – 4)				18.00

Thus, the operating profit will be Rs. 18,000.

Notes: (i) Total available direct labour hours 35000

Labour hours to be utilised to meet commitments:

$(500 \times 5 + 500 \times 10 + 500 \times 25)$ 20000

Balance hours available 15000

(ii) Additional units of Z to be produced 15,000/25, that is 600 units

Thus, total production of Z will be (500 + 600), that is 1100 units

(iii) Required direct labour hours for each unit of production of

X: 10/12, that is 5 hours, Y: 20/2, that is 10 hours and Z: 50/2, that is 25 hours.

(b) Profitability Statement

	Product X	*Product Y*	*Product Z*
1. Selling price	Rs. 28	Rs. 60	Rs. 125
2. Variable costs per unit:			
Direct materials	8	15	20

(*Contd.*)

	Direct wages	10	20	50
	Variable overheads	5	10	25
	Total	Rs. 23	Rs. 45	Rs. 95
3.	Contribution per unit (1 – 2)	Rs. 5	Rs. 15	Rs. 30
4.	Required labour hours per unit	5	10	25
5.	Contribution per labour hour (3/4)	Re. 1.00	Rs. 1.50	Rs. 1.20
6.	Ranking	III	I	II

Availability of labour hours being limited, AB Ltd. should produce as many unit of T as possible. There being no restriction on the units of Y that can be sold, available labour hours, after meeting the commitments for products X and Z should be allocated to Y. Thus, optimal product mix is:

Product	*Units to be produced*	*Allocated labour hours*	
X	500	2,500	
Y	2,500	20,000	(Balancing figure)
Z	500	12,500	
		35,000	

Income Statement with the above Alternative

	Products			*Total*
	X	*Y*	*Z*	*(Rs. '000)*
Contribution	2.5	30.00	15.00	47.50
Fixed costs				25.00
Operating profit (1 – 2)				22.50

(c) Break-even point in terms of units and sales

Contribution from committed production and sales:

Production X:	500 × Rs. 5.00	Rs. 2,500
Production Y:	500 × Rs. 15.00	7,500
Production Z:	500 × Rs. 30	15,000
		Rs. 25,000

Fixed cost being Rs. 25,000, break-even sales of AB Ltd. is sales of 500 units of each of the three products X, Y and Z. Break-even sales in terms of value is (500 × 28 + 500 × 60 + 500 × 125), i.e. Rs. 1,06,500.

(d) Sales value to earn a post-tax return of 10% on capital employed

Required return 10% of Rs. 1,00,000 i.e. Rs. 10,000

Required operating profit =

$$\frac{\text{Required return}}{(1-\text{tax rate})} = \frac{\text{Rs. } 10{,}000}{(1-0.50)} = \frac{\text{Rs. } 10{,}000}{0.50} = \text{Rs. } 20{,}000$$

Committed sales will earn contribution enough to meet fixed costs. Therefore, to earn an operating profit of Rs. 20,000 additional units of Y is to be sold to earn a contribution of Rs. 20,000. Thus, the total number of units of Y to be sold is (500 + Rs. 20,000/15) that is 1,833.33 or 1,834 units.

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Thus, total sale value is	X:	500 × Rs. 28	= Rs. 14,000
	Y:	1,834 × Rs. 60	= Rs. 1,10,040
	Z:	500 × Rs. 125	= Rs. 62,500
		Total	= Rs. 1,86,540

THEORY QUESTIONS

1. What is meant by the term "differential costing"? Does differential cost mean the same thing as variable cost?
2. What is incremental cost? Does incremental cost mean the same thing as variable cost?
3. Give examples of how incremental costs are used in decision-making.
4. A departmental store is thinking of eliminating one of its departments because the accountant using the total cost basis to profitability analysis, says the department is operating at a loss. What should be investigated before the final decision is made?
5. Explain the meaning and features of relevant costs. Give suitable examples to support your explanation. *(B. Com (Hons) Delhi 1997)*
6. Ventilators Ltd. wants to stabilise its production through the year. The approaches recommended are:
   (a) Maintan production at an even pace throughout the year, and get the off-season production stored on the premises.
   (b) Maintain production at an even pace but offer dealers a special discount for off-season purchases.
   (c) Extend special terms to dealers, but maintain prices at a level that will enable regular movement of goods throughout the year.

   Discuss the relative merits and disadvantages of the above proposals. *(CA Inter)*
7. What do you mean by 'make or buy' decision. State the quantitative as well as qualitative considerations in inflnencing a make or buy decision. *(B. Com (Hons), Delhi, 2002)*
8. Cost-benefit analysis is needed for resolving many managerial problems. List the various items of cost and benefits that you will quantify in respect of managerial decisions:
   (a) Add or drop a product
   (b) retain or replace
   (c) shutdaun or continue
9. Explain the basic characteristics of costs involved in decision-making. *(B Com (Hons), Delhi)*
10. State the costing data required for (i) determining the priority of products, and (ii) make or buy decisions. *(B Com (Hons), Delhi)*
11. How would you go about determining the point at which a manufacturing company that is facing a period of operating losses should shut assuming that profitability of operations is the only point to be considered?
12. Why is the contribution that a product makes towards the recovery of non-escapable costs a bettr measure of its profitability than the profit or loss reported on its sale after it has been charged with its fair share of all costs?

SELF EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions:

(i) The type of costs presented to management for a non-routine decision should be limited to
   (a) Relevant costs
   (b) Standard costs

(c) Controllable costs

(d) Conversion costs

(ii) Other things remaining the same, ideal product mix is determined in terms of

(a) Sales

(b) Variable costs

(c) Total costs

(d) Contribution margin

(iii) In a make or buy decision

(a) Only variable costs are relevant

(b) Fixed costs that can be avoided in the future are relevant

(c) Fixed costs that will continue regardless of the decision are relevant

(d) (a) and (b)

(iv) Relevant costs are

(a) Future costs

(b) Standard costs

(c) Controllable costs

(d) Historical costs

(v) The decision maker should consider in case of limiting factor(s) to maximise the profit

(a) Sales

(b) Contribution margin

(c) Variable costs

(d) Fixed costs

(vi) The measurable value of an alternative use of resources is referred to as a (an)

(a) Opportunity cost

(b) Imputed cost

(c) Differential cost

(d) Sunk cost

(vii) A manager of a company reported the total additional cost required for the proposed increased production level. The increase in total cost is known as

(a) Controllable cost

(b) Incremental cost

(c) Opportunity cost

(d) Out-of-pocket cost

(viii) Which of the following is usually an incremental cost.

(a) Conversion cost

(b) Period cost

(c) Manufacturing overhead cost

(d) Direct product cost

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(ix) A cost incurred in the past and hence irrelevant for current decision making is a

(a) Fixed cost

(b) Discretionary cost

(c) Sunk cost

(d) Direct cost

(x) A cost that cannot be changed by any decision made now or in the future is a (an)

(a) Indirect cost

(b) Uncontrollable cost

(c) Opportunity cost

(d) Sunk cost

PROBLEMS

1. (Dropping a product)

The costs per unit of three products X, Y and Z are given below:

Products	X	Y	Z
Direct Material (Rs.)	20	16	18
Direct Labour (Rs.)	12	14	12
Variable Overheads (Rs.)	8	10	6
Fixed Expenses (Rs.)	6	6	4
	Rs. 46	46	40
Profit	18	14	12
Selling Price (Rs.)	64	60	52
No. of units produced	10,000	5,000	8,000

Production arrangements are such that if one product is given up the production of the others can be raised by 50%. The directors propose that product Z should be given up because the contribution from the product is the lowest. Present suitable analysis of the data indicating whether the proposal should be accepted.

(B. Com (Hons) Delhi 1998)

Ans: The profit under proposed situation will increase by Rs. 42,000. Hence the proposal for discontinuance of product Z should be accepted.

2. (Revised selling price)

Merry-make Cassets Co., is expecting a profit of Rs. 2,50,000 for the current year. The following further information is available from records.

Selling price per unit	Rs. 20
Variable cost per unit	Rs.10
Fixed cost for the year	Rs. 1,00,000

The company's production capacity is not fully utilised and market research suggests following alternative strategies for the forthcoming year.

Strategy 1: Reduction in selling price by 5%. Expected increase in sales volume 10%.

Strategy 2: Reduction in selling price by 7%. Expected increase in sales volume 20%.

Strategy 3: Reduction in selling price by 10%. Expected increase in sales volume 25%.

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Required:

(a) Evaluate the alternative strategies and state which is the most profitable. Assume the same cost structure as in the current year.

(b) Suggest other factors, which must be considered by management before taking a decision.

Ans: Strategy 2 is most profitable.

3. (Profitability of two orders)

X limited has been offered an order from A Ltd. for 10000 units of output @ Rs. 100 each which has a variable cost of Rs. 60 and will involve an outlay of Rs. 60,000 to set-up jigs and dies. At the same time, there is another offer of B Ltd., for 8000 units of output at Rs. 110 each. Variable costs are estimated at Rs. 68 each and involves an outlay of Rs. 50,000 to set-up jigs and dies. Which offer should the company accept?

Ans: A Ltd. offer should be accepted.

4. (Decision to Increase Sales)

Quality Product Limited has drawn up the following budget for the year 1998–99:

	Rs.
Raw Materials	20,00,000
Labour, stores, power and other variable costs	6,00,000
Fixed Manufacturing Overheads	7,00,000
Packing and variable distribution cost	4,00,000
Fixed general overheads including selling	3,00,000
	40,00,000
Sales Revenue @ Rs. 50 per unit	50,00,000
Budgeted Profit	Rs. 10,00,000

The General Manager suggests to reduce selling prices by 5% and expects to achieve an additional volume of 5%. The more intensive manufacturing programme will involve additional costs of Rs. 15,000 for production planning. It will also be necessary to open an additional sales office at the cost of Rs. 1,00,000 per annum.

The Sales Manager, on the other hand, suggests to increase selling price by 10% which it is estimated will reduce sales volume by 10%. At the same time a saving in manufacturing overheads and general overheads of Rs. 50,000 and Rs. 1,00,000 per annum respectively is expected on this reduced volume.

Which of these two proposals would you accept and why? Show complete working.

(B. Com. (Hons) Delhi 1998)

Ans: The proposal of sales manager should be accepted.

5. (Minimum Price Decision)

An umbrella manufacturer makes an average profit of Rs. 2.50 per unit on a selling price of Rs. 14.30 by producing and selling 60,000 units at 60 per cent of potential capacity.

His cost of sales per unit is as follows:

Direct Materials	Rs. 3.50
Direct Wages	Rs. 1.25
Factory Overhead	Rs. 6.25 (50% fixed)
Sales Overhead	Re. 0.80 (25% variable)

During the current year, he intends to produce the same number but estimates that his fixed costs would go up by 10 per cent while the rates of direct wages and direct materials will increase by 8% and 6% respectively. However, the selling price cannot be changed.

Under this situation, he obtains an offer for a future 20% of his potential capacity.

What minimum price would you recommend for acceptance of the offer to ensure the manufacturer an overall profit of Rs. 1,67,300? *(B. Com. (Huns), Delhi,1996)*

Ans: Rs. 11.30

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6. (Deciding Mode of Conveyance)

A company is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable travelling, approximately 20000 kilometres every year.

The proposals are as follows:

(i) Purchase and maintain its own fleet of cars. The average cost of car is Rs. 1,00,000.

(ii) Allow the Executive use his own car and reimburse expenses at the rate of Rs. 1.60 paise per kilometre and also bear insurance costs.

(iii) Hire cars from an agency at Rs. 20,000 per year per car. The company will have to bear costs of petrol , taxes and tyres.

The following further details are available:

Petrol Re. 0.60 per kilometre

Repairs and maintenance Re. 0.20 per kilometre

Tyre Re. 0.12 per kilometre

Insurance Rs. 1,200 per car per annum

Taxes Rs. 800 per car per annum

Life of the car : 5 years with annual milage of 20,000 kilometres.

Resale value : Rs. 20,000 at the end of the fifth year.

You are required to work out the relative costs of the three proposals and rank them.

(B. Com. (Hons.) Delhi, 2001)

Ans: The proposal should be accepted in order of (ii) (iii) and (i)

7. (Dropping a Product)

A company manufactures three products A, B and C. There are no common processes and the sale of one product does not affect price or volume of sales of any other.

The company's budgeted profit/loss for 2002 has been abstracted as follows:

	Total	*A*	*B*	*C*
Sales	Rs. 3,00,000	Rs. 45,000	Rs. 2,25,000	Rs. 30,000
Production cost: Variable	1,80,000	24,000	1,44,000	12,000
Fixed	60,000	3,000	48,000	9,000
Factory cost	2,40,000	27,000	1,92,000	21,000
Selling and administration costs: Variable	24,000	8,100	8,100	7,800
Fixed	6,000	2,100	1,800	2,100
Total cost	2,70,000	37,200	2,01,900	30,900
Profit	30,000	7,800	23,100	(–) 900

On the basis of the above, the Board had almost decided to eliminate product C, on which a loss was budgeted. Meanwhile, they have sought your opinion. As the company's Cost Accountant what would you advice? Give reasons for your answer.

(ICWA Inter)

Ans: P/V ratio, A 28.7%, B 32.4%, C 34%

It is found that product C, though has the highest P/V Ratio, seems to be non-profitable because it has to bear a higher percentage of fixed cost as compared to its total cost. The percentage comes to about 36

$\left(\text{that is, } \frac{11,100}{30,900} \times 100\right)$ which in case of other products is too less. Since the surplus capacity generated by one

product canot be used for other products, there seems to be no justification for discontinuing product C till some new product is developed which will have a higher P/V ratio than product C. In the present circumstances, since C has a higher P/V ratio, and if the sales continue to rise, C may start giving profit too.

8. (Foreign Market Sales Decision)

A factory produces 24000 units. The cost sheet gives the following information:

Direct material	Rs. 1,20,000
Direct wages	84,000
Variable overheads	48,000
Semi-variable overheads	28,000
Fixed overheads	80,000
Total Cost	3,60,000

The product is sold at Rs. 20 per unit. The management proposed to increase the production by 3000 units for sales in the foreign market. It is estimated that semi-variable overheads will increase by Rs. 1,000. But the product will be sold at Rs. 14 per unit in the foreign market. However, no additional capital expenditure will be incurred. The management seeks your advice as cost accountant. What will you advise them?

(B. Com (Hons) Delhi 1997)

Ans: Sales of additional units 3000 in the foreign market will give a profit of Rs. 9,500. Hence the proposal should be accepted

9. (Export Order)

A machine tool manufacturing company sells its lathes at Rs. 36,500 each made up as follows:

Direct materials	Rs. 16,000	
Direct labour	2,000	
Variable factory overheads	5,000	
Fixed factory overheads	3,000	
Variable selling overheads	500	
Royalty	1,000	
Profit	5,000	32,500
Central excise duty		1,000
Sales tax		3,000
		36,500

There is enough idle capacity.

(a) A firm in Arabia has offered to buy 10 company's lathes at Rs. 28,500 each. Should the company be interested in the business?

(b) It has been decided to sell 5 such lathes to an engineering company under the same management at bare cost. What price should you charge?

Ans:

(a)	Contribution	Rs. 4,000
	Less: Sales tax	2,340
	Savings	Rs. 1,660

Company may accept the export order.

(b) The company may charge Rs. 31,000 (Rs. 36,000 – Rs. 5,500) (profit and selling overheads)

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10. (Changing Product Mix Decision)

The budgeted results for X Co. include the following:

	Rs. in lakhs	*Variable cost as % of sales value*
Sales: Product A	60	50%
Product B	50	60%
Product C	80	65%
Product D	40	80%
Product E	30	70%
	260	

Fixed overheads for the period Rs. 100.00 lakhs.

You are required to (a) Prepare a statement showing the amount of loss expected, (b) assuming that the sale of only one product can be increased at a time, you are asked to recommend a change in the sales volume of each product which will eliminate the expected loss. *(C.A. Inter)*

Ans: (a) Total loss Rs 5,00,000.

(b) Additional sales required to break-even, assuming sales of only one product is increased at a time, to give the additional contribution of Rs. 5,00,000, is calculated as follows:

$$\text{Sales required} = \frac{\text{Under-recovery of fixed overheads}}{\text{P/V ratio of the product}}$$

Product	Rs.	Rs.
A	5,00,000	10,00,000
	50%	
B	5,00,000	12,50,000
	40%	
C	5,00,000	14,28,571
	45%	
D	5,00,000	25,00,000
	20%	
E	5,00,000	16,66,667
	30%	

The company should utilise the spare capacity available for Product A to achieve maximum profitability as its P/V ratio is highest. Fixed costs remaining the same at every level of production, this combination will lead to maximum profitability.

11. (Alternative Proposals Decision)

Quality Products. Ltd. manufactures and markets a single product. The following data are available:

	Per unit	*Per unit*	
Materials	Rs. 16	Dealer's margin	Rs. 4
Conversion costs (Variable)	12	Selling price	40

Fixed cost: Rs. 5 lakhs
Present sales: 90000 units
Capacity utilisation: 60 per cent

There is acute competition. Extra efforts are necessary to sell. Suggestions have been made for increasing sales:

(a) By reducing sales price by 5 per cent.

(b) By increasing dealer's margin by 25 per cent over the existing rate.

Which of these two suggestions you would recommend, if the company desires to maintain the present profit? (Give reasons)

Ans: Present profit Rs. 2.20,000

(a) Units required to maintain the same profit 1,16,111 units

(b) Units required to maintain the same profit 1,02,857 units. Second proposal is recommended.

(C.A. Inter)

12. (Product Profitability)

The following particulars are taken from the records of a company engaged in manufacturing two products, A and B, from a certain material:

Particulars	*Product A (per unit) Rs.*	*Product B (per unit) Rs.*
Sales	2,500	5,000
Material cost (Rs. 50 per kg)	500	1,250
Direct labour (Rs. 30 per hour)	750	1,500
Variable overhead	250	500
Total fixed overheads: Rs. 10,00,000		

Comment on the profitability of each product when:

(i) Total sales in value is limited.

(ii) Raw materials is in short supply.

(iii) Production capacity is the limiting factor.

(iv) Total availability of raw materials is 20000 kg and maximum sales potential of each product is 1000 units, find the product mix to yield maximum profits.

(CA Inter Nov 1998)

Ans.(i) Prodct A is more Profitable. (ii) Prodct A is more Profitable. (iii) Prodct A is more Profitable. (iv) Prodct A 1000 unit,B 400 units.

13. (Decision about New Market)

A company annually manufactures 10000 units of a product at a cost of 4 per unit and there is home market for consuming the entire volume of production at the sale price of 4.25 per unit. In the year 2002, there is a fall in the demand for home market which can consume 10000 units only at a sale price of Rs. 3.72 per unit. The analysis of cost per 10000 units is:

Materials	Rs. 15,000
Wages	11,000
Fixed overheads	8,000
Variable overheads	6,000

The foreign market is explored and it is found that this market can consume 20000 units of the product if offered at sale price of 3.55 per unit. It is also discovered that for additional 10000 units of the product (over initial 10000 units) the fixed overheads will increase by 10 per cent. Is it worthwhile to try to capture the foreign market?

Ans: It is advisable to sell goods in the foreign market.

14. (Export Offer)

Due to industrial depression, a plant is running, at present, at 50% of its capacity. The following details are available.

	Cost of production per unit
Direct material	Rs. 200
Direct labour	100

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	Rs.
Variable overhead	300
Fixed overhead	200
	800
Production per month	20000 units
Total cost of production	Rs. 1,60,00,000
Sale price	1,40,00,000
Loss	Rs. 20,00,000

An exporter offers to buy 5000 units per month at the rate of Rs. 650 per unit and the company hesitates to accept the offer for fear of increasing its already large operating losses.

Advise whether the company should accept or decline this offer.

Ans: The company should accept the offer

15. (Decision about Mechanisation)

Management of a manufacturing unit is considering extensive modernisation of the factory through progressive mechanisation which would result in improved productivity and reduced strength. Through negotiations with the union, it was agreed that for every 1% increase in productivity, workers would be paid 0.5% incentive wages. It was also agreed that through voluntary retirement the staff strength would be reduced to 300 from the present level of 400. The following further comparative data are available before and after the proposed mechanisation:

	Before mechanisation	*After mechanisation*
No. of articles produced per month	50,000	48,000
Fringe benefits	50% of wages	
Wages paid per month	Rs. 4,00,000	
Sales per month (value)	Rs. 24,00,000	
P/V ratio	25%	

Based on the above data, you are required to work out the annual financial implication of the proposal.

(ICWA Inter)

Ans: There will be increase in annual contribution due to mechanisation.

16. (Special Order)

Nubo Manufacturing Company is presently operating at 50% of practical capacity producing about 50,000 units annually of a patented electronic component. Nubo recently received an offer from an overseas market to sell 30,000 components at Rs 6.00 per unit FOB Nubo's Plant. Nubo has not previously sold components in the market. Budgeted production costs for 50000 and 80000 units of output are as follows:

Units	50000	80000
Costs:	Rs.	Rs.
Direct material	75,000	1,20,000
Direct labour	75,000	1,20,000
Factory overheads	2,00,000	2,60,000
	3,50,000	5,00,000
Cost per unit	Rs. 7.00	Rs. 6.25

The sales manager thinks the order should be accepted, even if it results in a loss of Re 1.00 per unit, because he feels the sales may build up future markets. The production manager does not wish to have the order accepted primarily because the order would show a loss of Re 0.25 per unit when computed on the new average unit cost. The cost accountant has made a quick computation indicating that accepting the order will actually increase profit. You are required to:

(a) Explain what apparently caused the drop in cost from Rs. 7.00 per unit to Rs. 6.25 per unit when budgeted production increased from 50000 to 80000 units. Show supporting computations.

(b) Should the order be accepted?

(ICWA Inter)

Ans: The order of overseas market be accepted.

17. (Profitable Product Mix)

A manufacturing company produces and sells three products P, Q and R. It has an available machine hour capacity of one lakh hours, interchangeable among the three products. Presently, the company produces and sells 20000 units of P and 15000 units each of Q and R. The unit selling price of the three products are Rs. 25, Rs 32 and Rs. 42 for P, Q and R respectively. With this price structure and the aforesaid sales-mix the company is incurring loss. The total expenditure, exclusive of fixed charges (presently Rs. 5 per unit), is Rs. 13.75 Lakhs. The unit cost ratio among the products P, Q and R is 4 : 6 : 7. Since the company desires to improve its profitablity without changing its cost and price structures, it has been considering the following three mixes so as to be within its total available capacity.

Products	*Mix I (in units)*	*Mix II (in units)*	*Mix III (in units)*
P	25000	20000	30000
Q	15000	12000	5000
R	10000	18000	15000

You are required to compute the quantum of loss now incurred and advise the most profitable mix which could be considered by the company. *(I.C.W.A. Inter Dec. 1995)*

Ans: Loss Rs.15,000.Mix III gives the highest contribution and is therefore, recommended.

18. (Export Proposals)

Vinak Ltd. operating at 75% level of activity produces and sells two products A and B. The cost sheets of the two products are as under:

	Product A	*Product B*
Units produced and sold	600	400
Direct materials	Rs. 2.00	Rs. 4.00
Direct labour	4.00	4.00
Factory overheads (40% fixed)	5.00	3.00
Selling and administration overheads (60% fixed)	8.00	5.00
Total cost per unit	19.00	16.00
Selling price per unit	23.00	19.00

Factory overheads are absorbed on the basis of machine hour which is the limiting (key) factor. The machine hour rate is Rs. 2 per hour.

The company receives an offer from Canada for the purchase of product A at a price of Rs. 17.50 per unit. Alternatively, the company has another offer from the Middle East for the purchase of product B at a price of Rs. 15.50 per unit.

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In both the cases, a special packing charge of 50 p. per unit has to be borne by the company.
The company can accept either of the two export orders and in either case the company can supply such quantities as may be possible to be produced by utilising the balance of 25% of its capacity.
You are required to prepare:

(i) A statement showing the economics of the two export proposals giving your recommendations as to which proposal should be accepted.

(ii) A statement showing the overall profitability of the company after incorporating the export proposal recommended by you. *(CA Inter)*

Ans: (i) Order from the middle East should be accepted
(ii) Over all profitablity Rs.5094.

19. (Product Profitability Decision)

Zenith Enterprises Ltd. is engaged in manufacturing and selling two products A and B. The following information are available from the records of the company:

Budgeted Data (Monthly):				
Products		A		B
Capacity		40%		30%
Production in units		4000		6,00
Cost per unit:	Rs.	Rs.	Rs.	Rs.
Direct Material	150		80	
Conversion Cost:				
Variable	360		300	
Fixed	90	600	120	500
Selling Price per unit		750		425
Profit/Loss per unit		150		(75)

(i) In the subsequent period, the following changes are envisaged:

(a) Direct Material Cost of Products A and B to increase by 20%;
(b) Selling Price of Product A to increase by 10%;
(c) Selling Price of Product B to increase by 30%.

(ii) The management is contemplating to utilise 30% capacity presently lying idle and for this the following alternative proposals are to be considered:

(a) Further sale of Product A is possible, but the additional out put can be sold at Rs 600 per unit. Efficiency for this additional production, will decrease by 10%;
(b) Product B is expected to have a ready market at a price of Rs 510 per unit. The additional output is possible at the same efficiency level as budgeted;
(c) A new product C may be introduced for which the following data are available:

Direct Material Cost per unit	Rs. 480
Selling Price per unit	Rs. 1,200

Conversion Cost of Product C is same as that of Product B. However, an additional amount of Rs. 50,000 is to be incurred for advertisement. Production rate of C is also same as that of Product B.

(iii) The following additional information also needs to be considered:

(a) Present allocation of capacity of 40% to Product A and 30% to Product B cannot be altered. However, the idle capacity of 30% can be utilised for any of the Products A, B and C.
(b) Fixed expenses are not to increase on account of utilisation of additional 30% capacity (except for the advertisement expenses as statedm above).

You are required to prepare a comparative statement for providing information to the management giving your comments on the profitability of the three proposals as stated above. *(ICWA Inter Dec. 1997)*

Ans: Proposal C is the most profitable proposal.

20. (Production Subcontracting Decision)

New Bharat Industries is manufacturing several consumer durables which have good demand in the market. The firm has been established only very recently and currently it is in the final stage of production. It has ambitious plans to expand production after earning income in the market. However, the company is having problems to get adequate power supply. Moreover, most of its labourers are casual workers and labour-absenteeism is also affecting production. In view of these unstable conditions the firm has adopted the practice of preparing quarterly flexible budgets.

For the quarter ending 31st December, 1996 flexible budgets for three possible levels of production were prepared as follows. The company wanted to achieve 90% capacity utilisation as its products had good demand.

Particulars	*Flexible Budgets*		
	60%	*80%*	*90%*
	(in lakhs of rupees)		
Budgeted Sales	50.00	66.00	75.00
Budgeted Costs:			
Direct Materials	12.00	16.00	18.00
Direct Labour	15.00	20.00	22.50
Production Overheads	11.80	14.00	15.10
Administration Overheads	2.00	2.00	2.00
Selling Overheads	7.80	9.80	10.20

Soon after the decision to attain 90% capacity utilisation, available power was reduced by the State Electricity Board and the reduced supply was sufficient to meet 50% capacity production.

The position has been immediately reviewed and the firm is considering the following possible options to meet the situation.

(a) Stop production for the quarter. As regular employees are only very few, lay-off compensation payable will be only Rs. 1.20 lakhs. Further, overheads can be reduced by as much as 60%.

(b) Continue production at 50% level. Estimated sales income at this level will be Rs. 40 lakhs.

(c) A private agency in the area has offered surplus captive power available with it. With this additional supply production can be maintained at 90% level. However, the overall variable production overhead will increase by 40%.

(d) Sub-contract the balance 40% which cannot be made by the firm to two small industrial units in the area, which have the necessary facilities, equally at a cost of Rs. 15 lakhs each.

Evaluate each of the above options and recommend the best plan. Indicate the other important points, if any, to be considered.

(ICWA Inter Dec. 1996)

Ans: The form should accept option (C).

21. (Buy Decision)

Household Equipments Ltd. is producing a kitchen equipment from five components three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment is as follows:

Components	*A*	*B*	*C*	*D*	*E*	*Total*
Machines Hours reqd. per unit	10	14	12	—	—	36
Labour Hours reqd. per unit	—	—	—	2	1	3
Variable Cost per unit (in Rs.)	32	54	58	12	4	160
Fixed Cost per unit (apportioned)	48	102	116	24	36	316
Total Component Cost	80	156	174	36	30	476
Assembly Cost per unit (all variable)						Rs. 40
Selling Price per unit						Rs. 600

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The marketing department of the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture A, B and C is already working to the maximum capacity of 4752 hours and there is no possibility of increasing this capacity during the next period. But labour is available for making components D and E and also for assembly according to demand. The management is considering the purchase of one of the components A, B or C from the market to meet the increase in demand. These components are available in the market at the following prices:

Component A	:	Rs.	80
Component B	:	Rs.	160
Component C	:	Rs.	125

Required:

(a) Profit made by the company from current operations.
(b) If the company buys any one of the components A, B or C, what is the extent of additional capacity that can be created?
(c) Assuming 50% increase in demand during the next period, which component should the company buy from the market.
(d) The increase in profit, if any, if the component suggested in (c) is purchased from the market.

(ICWA Inter Dec 1995)

Ans: (a) Rs. 11088 (b) Additional capacity created by component A 38.5%, Buy component B 63.6%, Buy component C 50% (c) The cheaper between the components B and C should be purchased (d) Increase in profit Rs. 24,222.

22. (Product Mix Decision)

Vinak Ltd. which produces three product furnishes you the following data for 2005–06.

	Products		
	A	*B*	*C*
Selling Price per unit (Rs.)	100	75	50
Profit/Volume Ratio (%)	10	20	40
Maximum Sales potential (Units)	40000	25000	10000
Raw material content as percentage of variable costs (%)	50	50	50

The Fixed Expenses are estimated at Rs. 6,80,000. The company uses a single raw material in all the three products. Raw material is in short supply and the company has a quota for the supply of raw materials of the value of Rs. 18,00,000 for the year 2005–06 for the manufacture of its products to meet its sales demand.
You are required to

(i) Set a product mix which will give the maximum overall profit keeping the short supply of raw material in view.
(ii) Compute that maximum profit. *(CA, Inter)*

Ans: (i) A 20,000 units, B 25,000units C 10,000 units.(ii) Profit Rs. 95,000.

PRICING DECISIONS

18

Learning Objectives

After reading this chapter, you should be able to:

1. describe factors influencing pricing decisions;
2. discuss different methods of pricing;
3. understand circumstances when a business firm can sell a product below the variable cost, and
4. explain the concept of target pricing, prices indifference point.

The chapter on 'Alternative Choices Decisions' has discussed how cost and revenue analysis and relevant information help management in making various alternative choices decisions such as make or buy, add or drop product, product mix, sell or process further, operate or shutdown, replace or retain, buy or lease, special order, export proposals, etc. The present chapter discusses 'pricing decisions' which is one of the most crucial and difficult decisions which a business firm has to make, and determine how cost information can be useful to management in framing suitable pricing policy.

FACTORS INFLUENCING PRICING DECISIONS

Pricing of a product or service refers to the assignment of a selling price to a product or service provided by a firm. The pricing decisions are influenced by internal and external factors both. Some such factors (determinants) are as follows:

1. Cost data of the product which may be actual, replacement, standard or any other cost base.
2. Firm's profit and other objectives.
3. Demand for the product or service and its elasticity.
4. Nature of product and its life expectancy.
5. Pricing decision as a long-run decision or short term decision or a one-time spare capacity decision.
6. Type of competition for the product or service and availability of close substitutes.
7. Number of suppliers in the market.
8. Economic and political climate and trends and likely changes in them in future.
9. Type of industry to which the product belongs and future outlook of the industry.
10. Government guidelines, if any.

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DIFFERENT METHODS OF PRICING

The different methods of pricing are generally the following:

1. Total Cost-Plus or Full Cost-Plus Pricing

Total cost-plus or full cost-plus pricing involves all costs plus a profit margin. It includes not only the product's direct costs but also the indirect costs incurred by the overall company which have to be allocated to different products in case different products are manufactured. An example of price calculation using full cost-plus method is as follows:

	(Rs.)	(Rs.)
Direct material		10
Direct labour		20
Factory overheads:		
Fixed	15	
Variable	5	20
Total manufacturing cost		50
Non-manufacturing overheads:		
Fixed	10	
Variable	0	10
Total cost		60
Add: Profit margin (25% on total cost)		15
Selling price		75

Full cost-plus method has the following advantages:

1. It is simple to operate if cost structures of products are known.
2. The pricing decision under full cost approach becomes standardised and such decisions can easily be delegated to lower management.
3. It ensures recovery of total costs and also provides a reasonable rate of returns to the firm.
4. It helps a business firm to predict the selling prices of other competitive firms, specially of those firms who are having similar cost structures.
5. This pricing method is important in contracting industries where price of the contracts needs to be determined considering fixed costs also.
6. This brings stability in the pricing policy and selling price can be justified to customers.
7. Full cost pricing is consistent with absorption costing system.

Full cost-plus method has the following disadvantages too:

1. It ignores demand and competition and may result into underpricing or overpricing of products.
2. Fixed costs are likely to be distributed on some arbitrary basis as there are different methods of apportionment and thus total costs of different products will be different depending on which apportionment method is used.
3. In full cost pricing, the choices of volume or capacity base is very important. Different unit products costs will emerge under different concepts of capacity.
4. This method does not distinguish between relevant costs (for example, variable costs and incremental fixed costs) and irrelevant costs (fixed costs).
5. This method cannot always shield the firm from a loss. If sales demand falls below the volume level used to calculate the fixed cost per unit, the total sales revenue will be inadequate to cover the total costs.

Within full cost-plus method, some other cost bases can used be for determining the selling price such as manufacturing cost plus or conversion cost plus.

Manufacturing cost (or product cost) plus pricing includes cost incurred specifically for manufacturing the product plus a profit margin. The profit margin added to this cost must cover all operating expenses and generate a satisfactory level of profit. Using the information given in the earlier example, a cost of Rs. 50 will be used. To this cost a higher profit margin needs to be added to cover non-manufacturing overheads as well as to provide a satisfactory level of profit to the firm. For example, selling price calculation may be as follows:

	Total manufacturing costs	Rs. 50
Add:	Profit margin (50% on manufacturing cost)	Rs. 25
	Selling price	Rs. 75

Conversion cost plus pricing uses conversion cost for determining the selling price and to this cost a profit margin is added. This pricing method is generally followed when the customer provides the materials. This method depends on the assumption that greater profits can be realised if efforts are directed to products requiring less labour and overhead because more units can be produced and sold.

2. Marginal Cost-Plus Pricing

This method, also known as contribution approach, uses only variable costs as the basis for pricing. Fixed costs are not added to the product, service or contract. However, fixed costs should be taken into account in determining the profit margin to be added to variable costs to arrive at the selling price.

Marginal cost approach helps a business firm to enter into new markets easily, to increase its competitive position in the existing markets, to survive during trade depressions, to utilise spare available capacity, to dispose off surplus or obsolete stock.

Marginal cost-plus pricing brings some disadvantages to the firm as well. For instance, recovery of fixed costs may be doubted. There is likely to be undesirable competition for cutting prices to a lower level. In case management decides to increase lower marginal cost pricing, it may face dissatisfaction from the consumers.

Using the information given in the earlier example, marginal costs of Rs. 35 can be used to set the selling price. Obviously, it indicates the cost below which the price should not fall, otherwise the company would have losses. Also, a higher profit margin can be added to marginal cost which may work as a long term selling price even for normal sales. For instance, if the profit margin of 100% is added to marginal costs of Rs. 35, the selling price will be Rs. 70.

3. Differential Cost-Plus Pricing

This method involves adding a mark up on differential cost which is the increase in total cost resulting from the production of additional units. Differential cost pricing differs from variable cost pricing in which a mark up on variable cost is added, whereas both variable costs and fixed costs are included in the differential costs on which a mark up is determined. This method can be applied where some revenue above differential cost may be received rather than no revenue at all. Such additional revenue makes some contribution towards the recovery of fixed costs which are already incurred.

4. Standard Costs

Standard costs represent the costs that should be attained under efficient operating conditions at a normal capacity. The cost-based methods discussed above have some adverse implications and include costs due to inefficient manufacturing, wasteful operations, etc. That is, it is likely that unnecessary costs may be assigned to the product. On the other hand, standard costs use costs from efficient operations plus the agreed profit. Also, pricing can be done more quickly.

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FIXING SELLING PRICE BELOW VARIABLE COST

The situations where a business firm is justified to sell its products at a price below the variable cost are as follows:

(i) when a new product is introduced in the market or to popularise a new product.
(ii) When foreign market is to be explored.
(iii) When a weaker competitor is to be driven out of market.
(iv) When it is feared that future market will go out of hand.

TARGET PRICING

A target price is the estimated price for a product or service that potential customers will be willing to pay. This estimate is based on an understanding of customers' perceived value for a product and competitors' responses. The target price forms the basis for calculating target costs. A target cost is the estimated long-run cost of a product or service that when sold enables the company to achieve targeted profit. It is derived by subtracting the target profit from the target price. Developing target prices and target costs requires the following four steps:

Step 1 – Develop a product that satisfies the needs of potential customers.
Step 2 – Choose a target price based on customers' perceived value for the product and the prices competitors charge.
Step 3 – Derive a target cost by subtracting the desired profit margin from the target price.
Step 4 – Estimate the actual cost of the product.
Step 5 – If estimated actual cost exceeds the target cost, investigate ways of driving down the actual cost to the target cost.

PRICES INDIFFERENCE POINT

A price indifference point is the sales level at which a firm's net income is same between two pricing alternatives. The price indifference point indicates the volume of sales at which the new price gives a profit equal to the profit of old sales volume and price. In case, sales volume at new price is lower than sales volume at old price (when there is price indifference point), firm should reject the price increase since firm's profit will decrease. In contrary to this, if expected sales volume with price increase is greater than the price indifference point, profit will increase. Price indifference point's concept is very useful in short-term decision making situations.

Example 18.1 (Computing New Price)

Suman Ltd., manufactured and sold 1000 Electric Irons last year at a price of Rs. 800 each. The cost structure of Electric Irons is as follows:

Materials	200
Labour	100
Variable cost	50
Marginal cost	350
Factory Overhead (fixed)	200
Total Cost	550
Profit	250
Sale Price	800

Due to heavy competition, price has to be reduced to Rs. 750 for the coming year. Assuming no change in costs, state the number of Electric Irons that would have to be sold at the new price to ensure the same amount of total profits as that of the last year. *(B.Com.(Hons), Delhi 2004)*

Solution:

Profit on sale of 1000 electric irons = Rs. 250 × 1000 = Rs. 2,50,000

Reduced Sales Price		Rs. 750
Less: Material	Rs. 200	
Labour	Rs. 100	
Variable Cost	Rs. 50	
Contribution per unit		350
		400

No. of units to be sold to earn Rs. 2,50,000

$$= \frac{\text{Fixed Cost + Required Profit}}{\text{Contribution per unit}}$$

$$= \frac{\text{Rs. 2,00,000 + Rs. 2,50,000}}{400}$$

$$= \frac{\text{Rs. 4,50,000}}{400} = 1125 \text{ units to be sold}$$

Verification:

Sales – VC – Fixed Cost
(1125 × 750) – (350 × 1125) – 2,00,000
Rs. 8,43,750 – Rs. 3,93,750 – 2,00,000
Rs. 8,43,750 – Rs. 5,93,750 = Rs. 2,50,000

Example 18.2 (Using Price Elasticity of Demand in Selling Price)

A company decides to manufacture 100,000 units of its product. The variable cost per unit is Rs. 10 and fixed costs amount to Rs. 600,000. In Board meeting the finance manager suggests that the full-cost method should be used in fixing selling price for the company's product. He has also suggested a profit margin of 25% on total costs. The marketing manager while disagreeing with the finance manager's proposal presents the following information regarding possible demand of product at different prices:

Price per unit (Rs.)	*Demand (units)*
18	84000
20	76000
22	70000
24	64000
26	54000

Which proposal (Finance Manager's or Marketing Manager's) will be useful for the company?

Solution:

(A) Finance manager's proposal	(Rs.)
Variable cost	10
Fixed cost	6

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Total cost	16
Profit margin (25%)	4
Selling price	20

No. of units to be sold at a price of Rs. 20 per unit (as given in the question)

= 76000 units

Total contribution = 76000 units × Rs. 10 =	Rs. 7,60,000
Less: Fixed Costs	6,00,000
Net Profit	Rs. 1,60,000

(B) Before evaluating marketing manager's proposal, a profitability statement at different selling price needs to be prepared.

Profitability Statement

Selling price per unit (Rs.)	*Units demanded*	*Contribution per unit (Rs.)*	*Total contribution (Rs.)*	*Fixed cost (Rs.)*	*Net profit (Rs.)*
18	84000	8	6,72,000	(6,00,000)	72,000
20	76000	10	7,60,000	(6,00,000)	1,60,000
22	70000	12	8,40,000	(6,00,000)	2,40,000
24	64000	14	8,96,000	(6,00,000)	2,96,000
26	54000	16	8,64,000	(6,00,000)	2,64,000

It can be found that at a selling price of Rs. 20 (Finance manager's proposal), the net profit is Rs. 1,60,000. But if the company fixes a selling price of Rs. 24 per unit, the maximum profit of Rs. 2,96,000 will be earned. Therefore the finance manager's proposal is rejected and marketing manager's proposal is recommended. In fact while making the proposal the finance manager has not considered the price elasticity of demand of company product which can be an important factor in fixing the selling price.

Example 18.3 (Considering Opportunity Costs in Selling Price)

V Ltd. Manufactures small chairs for children. The following information is provided:

	Per unit (Rs.)
Material (3 kg @ Rs. 2 per kg)	6
Labour	5
Variable overheads	4
Allocated fixed overheads	2

Material is currently used to make desks which provide contribution of Rs. 5 per unit, 2 kg of material are required for each desk. What is the minimum price per chair if

(i) material is plentiful
(ii) material is scarce

Solution:

The minimum price of product is determined in different manners depending on different situations as listed below:

(i) When the product has been made—The minimum price will be whatever is recoverable subject to recovering any disposal costs. All costs incurred in manufacturing the product are sunk costs and therefore not relevant in pricing decisions.

(ii) When the product is to be made and there are no scarce resources—In this case, the minimum price will be equal to incremental costs of making the product.

(iii) When the product is to be made and there are scarces resources—In this case, the minimum price is calculated as follows:

Minimum price = Incremental costs of making product (external opportunity costs) + Opportunity costs of scarce resources (internal opportunity cost)

Using the above guidelines, the minimum price per chair will be as follows:

(i) *Material is plentiful*

Minimum price = Incremental cost of making chairs
= 6 + 5 + 4 = Rs. 15 per chair.

(iii) *Material is scarce*

Minimum price = Incremental costs + Internal opportunity costs of scarces resources

$$=15 + \left(\frac{\text{Contribution}}{\text{kg of material}} = \frac{\text{Rs. } 5}{2 \text{ kg}} \times 3 \text{ kg} \right)$$

= 15 + 7.50
= Rs. 22.50 per chair

Example 18.4 (Minimum Price)

ACE Ltd. has an inventory of 5000 units of a product left over from last year's production. This model is no longer in demand. It is possible to sell these at reduced prices through the normal distribution channels. The other alternative is to ask someone to take them on "as is where is" basis. The latter alternative will cost the company Rs. 5,000.

The company produced 240,000 units of the product, last year, when the unit costs were as under:

Manufacturing Costs	Rs.	Rs.
Variable	6.00	
Fixed	1.00	7.00
Selling and Distribution Cost:		
Variable	3.00	
Fixed	1.50	4.50
Total Cost		11.50
Selling Price per Unit		14.00

Required:

Should the company scrap the items or sell them at a reduced price? If you suggest the latter, what minimum price would you recommend? *(CA, Final, May 1998)*

Solution:

Minimum recommended price per unit of 5000 units of a product (obsolete model) of ACE Ltd.

(i) Historical cost of Rs. 11.50 per unit of 5000 units of a product is irrelevant (as it is a sunk cost) for determining the recommended price per unit.

(ii) If at all this model is sold in the market through normal distribution channels it will entail a variable selling and distribution cost of Rs. 3 per unit.

(iii) If the stock is disposed off by asking someone to take them on "as is where is basis", the company would have to spend Rs. 5000 over 5,000 units that is Re. 1/- per unit.

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(iv) In view of (ii) and (iii), the option of selling 5000 obsolete units of model using regular channels will have a differential cost of Rs. 2 (Rs. 3 – Re. 1) per unit.

Recommendation:

Hence, if the company can get anything more than Rs. 2/- per unit, then it is worthwhile to sell the stock of 5,000 units and earn an additional contribution.

Example 18.5 (Export Order Price)

Somesh of Agra presently operates its plant at 80% of the normal capacity to manufacture a product only to meet the demand of Government of Tamil Nadu under a rate contract.

He supplies the product for Rs. 4,00,000 and earns a profit margin of 20% on sales relisations. Direct cost per unit is constant.

The indirect costs as per his budget projections are:

Indirect costs	20000 units (80% capacity) Rs.	22500 units (90% capacity) Rs.	25000 units (100% capacity) Rs.
Variable	80,000	90,000	1,00,000
Semi-variable	40,000	42,500	45,000
Fixed	80,000	80,000	80,000

He has received an export order for the product equal to 20% of its present operations. Additional packing charges on this order will be Rs. 1,000.

Arrive at the price to be quoted for the export order to give him a profit margin of 10% on the export price. *(CA Final, May 1996)*

Solution:

Working Notes:

1. Direct Cost per unit

	Rs.
Selling price per unit (Rs. 400,000/20000 units)	20
Less: Profit margin (20% × Rs. 20)	4
Total cost	16
Less: Indirect costs (Rs. 2,00,000 / 20000 units)	10
Direct cost per unit	6

2. Statement of differential cost for 4000 units (20% of 20000 units)

	Present production 20000 units	Proposed production 24,000 units	Differential for 4000 units
Direct cost @ Rs. 6/- p.u.	Rs. 1,20,000	Rs. 1,44,000	Rs. 24,000
Indirect Cost:			
Variable @ Rs. 4 p.u.	80,000	96,000	16,000
Semi-variable	40,000	44,000	4,000
Fixed	80,000	81,000	1,000
Total	3,20,000	3,65,000	45,000

Computation of the price to be quoted for the export order of 4,000 units

	Rs.
Differential cost	45,000
(Refer to Working Note 2)	
Add: Profit	5,000
(10% of export price or 1/9th cost)	
Price to be quoted	50,000

Export price per unit Rs. 12.50
(Rs. 50000/4000 units)

THEORY QUESTIONS

1. "In the long run, selling price will tend to equal costs plus reasonable profits." Discuss. *(ICWA)*
2. List the factors taken into consideration in fixing the selling price by a business firm.
3. Discuss full cost-plus and marginal cost-plus methods of pricing. Which pricing method can be useful to a firm and under what situations.
4. Product pricing is an important area for management decision making. State briefly the broad objectives of pricing policy. Mention specifically situations where prices are fixed below the variable cost.

(ICWA Inter, Stage 1, Dec. 2004)

PROBLEMS

1. An Electronics Company has the following cost structure for an electronic product.

	Rs.
Direct material	50
Direct labour	75
Variable overheads	30
Fixed overheads	45
Total unit cost	200

Fixed selling and administrative costs Rs. 6,00,000.
Additional information:

(i) Budgeted production and sale for the next year is 20000 units.
(ii) The management feels that a minimum return of 20% is required on equity investments of Rs. 20,00,000. What price should it charge for one unit of its output.

Ans. Rs 250

2. MPC Ltd. of Mumbai presently sells as equipment for Rs. 42,000. Increase in prices of material and labour cost are anticipated to the extent of 10% and 20% respectively in the coming year. Material cost represents 40% of cost of sales and labour cost 30% of cost of sales. The remaining relate to overheads.
If the existing selling price is retained, despite the increase in labour and material prices, the company would face a 25% decrease in the existing amount of profit on the equipment.

Required:

(i) Calculate a selling price so as to give the same percentage of profit on increased cost of sales, as before.
(ii) Prepare a statement of profit/loss per unit showing the new selling price and cost per unit in support of your answer. *(ICWA, Inter, Stage 1, June 2005)*

Ans. (i) Rs. 46,200
(ii) Percentage of profit on sales, Existing 40%, New 40%.

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3. A company presently sells an equipment for Rs. 35,000. Increase in prices of labour and material costs are anticipated to the extent of 15% and 10% respectively in the coming year. At present material cost represents 40% of cost of sales and labour cost 30% of the cost of sales. The remaining relate to overheads. If the existing selling price is retained, despite the increase in labour and material prices, the company would face 20% decrease in the existing amount of profit on the equipment.

You are required to arrive at a selling price so as to give the same percentage of profit on increased cost of sales, as before. Prepare a statement of profit/loss per unit, showing the new selling price and cost per unit in support of your answer. *(ICWA, Stage 2, Dec. 2006)*

Ans: Revised selling price Rs. 37,975

Percentage of profit on cost of sales 42.5%.

STANDARD COSTING

19

Learning Objectives

After reading this chapter, you should be able to:

1. explain historical costing and its limitations;
2. define standard costs and its differences with estimated cost, standard costing and its advantages and limitations;
3. understand different types of standards and explain how tight should standards be;
4. describe developing or setting standards; revision of standards;
5. explain the procedure of computing material cost variances, labour cost variances, overhead cost variances and sales variances;
6. discuss disposition of variance, managerial uses of variances, and
7. understand different types of control ratios.

Control of cost is one of the most important objectives of cost accounting and cannot be achieved without some standard against which actual can be compared. This chapter introduces the concepts and basic procedures of standard costing and also explains the techniques used in standard cost variance analysis. However, before discussing standard costing it will be appropriate to evaluate briefly historical cost accounting and its limitations.

HISTORICAL COSTING AND ITS LIMITATIONS

Historical cost systems are principally associated with recording of historical, or as they are commonly called, actual cost. Historical costing is the ascertainment of costs after they have been incurred. Historical costs have the following limitations:

1. Historical costs are collected after they have been incurred and therefore are ineffective in cost control. The costs have been incurred, they cannot be undone and no steps can be taken to correct inefficiencies.
2. Historical costs are not helpful in cost reduction since they contain no standards or goals towards which employees can work.

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3. Historical costs do not provide reliable guides to management in the tasks of budgeting, planning, and decision-making because they reflect a situation in a previous period. But the enterprise, in fact, may be working under conditions different from those prevailing during that previous period.

DEFINITION OF STANDARD COST, STANDARD COSTING

A standard cost is a planned cost for a unit of product or service rendered. Standard costs represent excellent target costs that should be obtained. The Institute of Cost and Management Accountants (UK) defines standard cost as "a predetermined cost which is calculated from management's standards of efficient operation and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis." Standard cost expresses what costs should be under attainable good performance.

Standard costing is the setting of predetermined cost estimates in order to provide a basis for comparison with actual costs. The Institute of Cost and Management Accountants (UK) defines standard costing as "the preparation and use of standard costs, their comparison with actual costs, and the analysis of variances to their causes and points of incidence."

STANDARD COSTS AND ESTIMATED COSTS

The term "standard costs" should not be confused with "estimated costs". Standard cost and estimated costs differ in the following respects:

First, estimated costs are frequently less accurately determined. Estimated costs are developed from projections using averages of past data regarding performance. Standard costs are predetermined realistically and much more scientifically through the use of time and motion studies, engineering estimates and specifications, selected measures of plant capacity, cost behaviour patterns.

Second, estimated costs are not helpful to management in accomplishing managerial functions as they are not scientifically predetermined costs. But standard costs involve more sophistication, operation analysis and evaluation and comprehensive review of internal and external factors and provide reliable measures for product costing, product pricing, planning, coordination and cost control purposes.

Third, estimated cost emphasises on actual cost with which it is compared at the end of the accounting period. If the estimated costs are found higher or lower than actual costs they are revised for use in the next accounting period. In standard costing, the emphasis is on standard costs, that is, what costs of material, labour and overhead should be incurred if the factory is to be operated as a highly efficient unit with each manager, foreman, worker, plant and machine functioning as an efficient part of the production process. Under standard costing, actual costs are ascertained only to facilitate their comparison with standard costs.

ADVANTAGES OF STANDARD COSTING

Among the many advantages generally attributed to standard costing, the most important may be listed as follows:

1. *Managerial planning* Planning is a process of using all resources in such a manner that maximises business profits. Standard costs are more convenient than actual costs for budget preparation because the standard costs at different production levels and for different product-mixes are readily built up into total costs as called for by the budget. On the other hand, using actual costs requires a great deal of analysis and adjustment when extensive changes in product volume or product-mixes take place.

2. *Coordination* The establishment of standards coordinates all functions—manufacturing, marketing engineering, research, and accounting towards the achievement of a common goal. Setting standards involves defining and communicating targets so that they can work towards the attainment of the goal.
3. *Cost control* Cost control and cost reduction are probably the most important aims of any costing system; and standard costing gives due recognition to this fact. Cost control has the objective of production of the required quality at the lowest cost attainable under existing conditions. Standards enable management to make periodic comparison of actual costs with standard costs in order to measure performance and to take action to maintain control over costs.
4. *Economical means of costing and record-keeping* The use of standard costs can reduce clerical labour and expense by avoiding the detailed record-keeping which is necessary when actual costs alone are used.
5. *Formulating price and production policies* Standard costs as compared to actual costs can be used for estimating selling prices. When standard unit costs are available, expected costs and sales prices can be computed on the basis of standard costs. Standards already established can easily be modified to reflect current conditions and changes in material prices or labour rates and the price of the product can be determined on a realistic basis.

   Actual costs, on the other hand, may reflect excessive usage of material, abnormal labour times or an inequitable charge for overhead. Actual overhead cost per unit at any given time may be so influenced by temporary fluctuations in production levels as to make actual cost entirely unusable for pricing.
6. *Standards as incentives to employees* If standards are reasonable and attainable they act as incentives to employees to improve their performances and to maintain the quality of the product. Standards motivate workers, supervisors and foremen to work more efficiently in the accomplishment of their respective standards.

DIFFERENT TYPES OF STANDARDS

The two principal considerations affecting the classification of standards are: (i) attainability of standards, that is, the ease with which it is possible to achieve the standards, and (ii) frequency with which the standards are revised. On the basis of these two factors, it is possible to classify standards as ideal, normal, basic, current or expected actual standards.

Ideal, Perfect, Maximum Efficiency or Theoretic Standards

Ideal standards (costs) are the standards which can be attained under the most favourable conditions possible. The level of performance under ideal standards would be achieved through the best possible combination of factors—the most favourable prices for materials and labour, highest output with best equipment and layout, and maximum efficiency in the utilisation of the production resources—in other words, maximum output at minimum cost. Such standards reflect only goals or targets without any hope of performance being currently achieved. These standards are extremely tight and do not provide for waste and inefficiency in any form; no material is wasted; no units are spoiled; there are no idle hours; operators work at predetermined speed; the available capacity is fully utilised.

Normal Standards

Normal standards are the average standards which (it is anticipated) can be attained during a future period of time, preferably long enough to cover one business cycle. These standards are not revised until the cycle has

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run its full course. This generally results in an incorrect valuation of inventories and consequent errors in the profit disclosed, as the inventories are understated in periods of high prices, and over-stated when prices are low. Normal standards are mainly used as a device to solve the problem of absorbing fixed overhead rather than in connection with material cost and wages. Since these standards do not reflect the goals to be attained, they are not often used.

Basic Standards

The Institute of Cost and Management Accountants (UK) defines a basic standard as the standard which is established for use unaltered for an indefinite period which may be a long period of time. Basic standards are seldom revised or updated to reflect current operating costs and price level changes.

Currently Attainable or Expected Actual Standards

Current standards are standards which are established for use over a short period of time, and are related to current conditions. They represent current costs to be expected from efficient operations. Currently attainable standards are formulated after making allowance for the cost of normal spoilage, cost of idle time due to machine breakdowns, and the cost of other events which are unavoidable in normal efficient operations. They take the place of actual cost and are recorded in account books and financial statements. Any deviation from these standards reflect inefficiencies in the production activities, unless the variances have occurred due to uncontrollable factors. These standards are most accurate and very useful to management in product costing, inventory valuations; estimates, analyses, performance evaluation, planning, employee motivation, and for managerial decision making and external financial reporting.

HOW TIGHT SHOULD STANDARDS BE

It can be rightly said that a single standard may not be suitable for all purposes. For the purposes of cost control, tight standards need to be established. The attainable (good) performance standards are useful for purposes of inventory valuation, product costing and income determination.

High Standards

A high standard helps in cost reduction and motivating employees to try to reach the targets established. High standards represent the best possible performance and, if achieved, raise the levels of performance and efficiency as compared to poor or loose standards. High standards being unattainable in practice may not be good for the employees. Employees may not seriously accept them because they know that they are unattainable and impossible to achieve. High standards are also not realistic and therefore cannot be used in product costing, inventory valuation, financial statement, planning, and capital investment decisions.

Low (Loose) Standards

A standard which is low or loose can be attained by poor performance. However, it defeats the purpose of standard costing and fails to disclose inefficiencies. Such standards do not help management in cost control as they are not accurate measures to compare actual results.

In conclusion, it can be said that accountants generally seem to favour currently attainable standards which are most appropriate for performance appraisal, accounting purposes, cost control and decision-making. Such standards produce good performance, promote employee motivation and include unavoidable elements, such as spoilage, lost time, capacity not utilised in setting standards.

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DEVELOPING OR SETTING STANDARD

All factors related with standards-setting should be considered in the establishment of standards. Whatever method is used, standards must be established for a definite period of time so that they can be effective in performance evaluation, control and analysis of costs. Standards are usually set for a six- or twelve-month period. Sometimes a longer period is used but rarely a shorter period. Standards are developed for:

1. Materials.
2. Labour, and
3. Overhead.

Materials Standards

Two standards must be developed for materials:

1. Materials quantity (usage) standard
2. Materials price standard

Labour Standards

As in the case of direct materials, labour standards are also established for both cost and quantity (efficiency). For standard cost purposes, direct labour is treated separately from indirect labour, which is included in the factory overhead. Two standards are usually developed for labour costs;

1. Labour usage (or efficiency) standard
2. Labour cost (or rate) standard

Factory Overhead Cost Standards

Setting Overhead Standards

Setting standard overhead cost requires the determination of: (1) standard capacity and (2) standard overhead costs for this capacity. The standard overhead costs can be computed using normal capacity. The normal or expected actual capacity aims at a production level according to an existing set of conditions. This capacity does not require complete utilisation of all available facilities but is based on the efficient utilisation of resources and operations.

After standard capacity is determined, overhead—variable and fixed—to be incurred at that capacity is prepared. The standard overhead rate is found by dividing the standard or budgeted overhead at standard capacity by the volume selected to represent standard capacity. Volume may be measured in units of product, standard productive hour (labour or machine) or some standard cost, such as direct labour.

$$\text{Standard overhead rate} = \frac{\text{Standard overhead}}{\text{Standard production}}$$

REVISION OF STANDARDS

Standard costs require continuous review and, at times, frequent change. Changing prices, technological advances, new personnel, new machinery, changing quality of materials and new labour negotiations, all influence standards and make them obsolete resulting in unrealistic budgets, poor cost control, and unreasonable unit cost for inventory valuation and income determination.

A company should establish a programme to revise standards whenever required so that standards can be set at a currently attainable level. Labour rate standards should be revised for any change in labour rates; material quantity standards for any change in type, quality of material or method of production. If a new

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machine is purchased to replace an old machine, labour time standards and material quantity standards should be updated. In addition to these obvious revisions, in every business firm there should be a system for revising standards for adequacy and suitability at least once a year. A periodic review of standards is desirable to accomplish the objectives of standard costing.

VARIANCE ANALYSIS

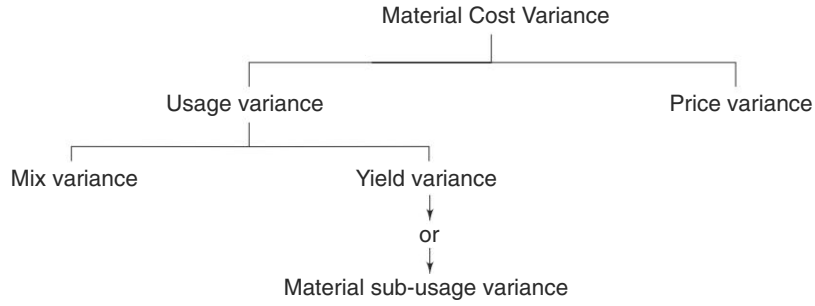
The function of standards in cost accounting is to indicate variances between standard costs which are allowed and actual costs which have been recorded. The Institute of Cost and Management Accountants (UK) defines variance as the difference between a standard cost and the comparable actual cost incurred during a period. Variance analysis can be defined as the process of computing the amount of, and isolating the cause of variances between actual costs and standard costs. Variance analysis involves two phases:

1. Computation of individual variances, and
2. Determination of the cause(s) of each variance

First, we concentrate on the computation of material, labour and factory overhead variances. Analysis of causes, reporting variances to managers, and accounting disposition of variances conclude the study of standard costing in this chapter.

MATERIALS VARIANCE

The following variances constitute materials variances:



Material Cost Variance

Material cost variance is the difference between the actual cost of direct materials used and standard cost of direct materials specified for the output achieved. This variance results from differences between quantities consumed and quantities of materials allowed for production and from differences between prices paid and prices predetermined. This can be computed by using the following formula.

Material cost variance= $(AQ \times AP) - (SQ \times SP)$

where AQ = Actual quantity

AP = Actual price

SQ = Standard quantity for the actual output

SP = Standard price

Materials Usage Variance

The material quantity or usage variance results when actual quantities of raw materials used in production differ from standard quantities that should have been used to produce the output achieved. It is that portion

of the direct materials cost variance which is due to the difference between the actual quantity used and standard quantity specified. As a formula this variance is shown as:

Materials quantity variance = (Actual quantity – Standard quantity) × Standard price

A material usage variance is favourable when the total actual quantity of direct materials used is less than the total standard quantity allowed for the actual output.

Example

Compute the materials usage variance from the following information:

Standard material cost per unit	Materials issued
Material A 2 pieces @ Re 1.00 = 2.00	Material A 2050 pieces
Material B 3 Pieces @ Rs 2,00 = 6.00	Material B 2980 pieces.
Rs 8.00	
Units completed 1000	

Solution:

Materials usage variance = (Actual quantity – Standard quantity) × Standard price

Material A = (2050 – 2000) × Re 1.00 = Rs. 50 (Adverse or Unfavourable)

Material B = (2980 – 3000) × Rs 2.00 = Rs 40 (Favourable)

Total = Rs 10 (Unfavourable)

It should be noted that the standard rather than the actual price is used in computing the usage variance. Use of actual price would have introduced a price factor into a quantity variance. Because different departments are responsible, these two factors must be kept separate.

As a general principle, actuals (cost, quantity, price, output, etc.) are compared with respective standard data to compute variances. Therefore, any formula to calculate, mathematically, any variance would be as follows:

(Actual–Standard)

However, one may use variance formula as Standard–Actual as it does not influence in any way the variance figure calculated by using the formula 'Actual–Standard'.

Materials Price Variance

A materials price variance occurs when raw materials are purchased at a price different from standard price. It is that portion of the direct materials which is due to the difference between actual price paid and standard price specified and cost variance multiplied by the actual quantity. Expressed as a formula,

Materials price variance (Actual price – Standard price) × Actual quantity

Materals price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated at the time of materials purchase rather than when materials are used. Purchase of matrials is an earlier event than the use of materials. Therefore, a variance based on quantity purchased is basically an earlier report than a variance based on quantity actually used. This is quite beneficial from the viewpoint of performance measurement and corrective action.

Example

Assuming in above example that material A was purchased at the rate of Re 1.00 and material B was purchased at the rate of Rs 2.10 the material price vriance will be as follows:

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Materials price variance = (Actual price – Standard price) × Actual quantity

Material A = (1.00 – 1.00) × 2,050 = Zero

Material B = (2.10 – 2.00) × 2,980 = Rs. 298 (Unfavourable)

The total of materials usage variance and price variance is equal to materials cost variance.

Materials Mix Variance

The materials usage or quantity variance can be separated into mix variance and yield variance.

A mix variance will result when materials are not actually placed into production in the same ratio as the standard formula. For instance, if a product is produced by adding 100 kg of raw material A and 200 kg of raw material B, the standard material mix ratio is 1 : 2. Actual raw materials used must be in this 1 : 2 ratio, otherwise a materials mix variance will be found.

Materials mix variance is that portion of the materials quantity variance which is due to the difference between the actual composition of a mixture and the standard mixture. It can be computed by using the following formula:

Materials mix variance = (Standard cost of actual quantity of the actual mixture – Standard cost of actual quantity of the standard mixture)

or

Materials mix variance = (Actual mix – Revised standard mix of actual input) × Standard price

Revised standard proportion is calculated as follows:

$$\frac{\text{Standard mix of a particular material}}{\text{Total standard quantity}} \times \text{Actual input}$$

Example

A product is made from two raw materials, material A and material B. One unit of finished product requires 10 kg of material. The following is standard mix:

Material A	20%–	2 kg @	Rs. 2.00	=	Rs 4.00
Material B	80%–	8 kg @	Rs. 1.00	=	Rs 8.00
	100%–	10 kg	Rs. 1.20		Rs 12.00

During a period one unit of product was produced at the following costs:

Material A	8 kg @	Rs 2.00	=	Rs. 16.00
Material B	4 kg @	Rs 1.25	=	Rs. 15.00
	12 kg	Rs 1.75		Rs. 21.00

Compute the materials mix variance.

Solution:

Materials mix variance = (Actual proportion – Revised standard proportion of actual input) × Standard price

Revised standard proportion:

$$\frac{\text{Standard proportion of a particular mix}}{\text{Total standard quantity}} \times \text{Actual input}$$

Revised standard proportion:

$$\text{Material A} = \frac{2}{10} \times 12 = 2.40 \text{ kg}$$

$$\text{Material B} = \frac{8}{10} \times 12 = 9.60 \text{ kg}$$

Materials mix variance:

Material A = (8 kg – 2.40 kg) × 2.00
= 5.60 × 2.00 = Rs. 11.20 (Unfavourable)
Material B = (4 kg – 9.60) × 1.00
= 5.60 × 1.00 = Rs. 5.60 (Favourable)
Total mix variance = Rs. 5.60 (Unfavourable)

Materials Yield Variance

Materials yield variance explains the remaining portion of the total materials quantity variance. It is that portion of materials usage variance which is due to the difference between the actual yield obtained and standard yield specified (in terms of actual inputs). In other words, yield variance occurs when the output of the final product does not correspond with the output that could have been obtained by using the actual inputs.

The total of materials mix variance and materials yield variance equals materials quantity or usage variance. When there is no materials mix variance, the materials yield variance equals the total materials quantity variance.

The formula for computing yield variance is as follows:

Yield variance = (Actual yield – Standard yield specified) × Standard cost per unit

or

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

Example

Standard input = 100 kg, standard yield = 90 kg, standard cost per kg of output = Rs. 20. Actual input 200 kg, actual yield 182 kg. Compute the yield variance.

Solution:

$$\text{Standard yield for the actual input} = \frac{90}{100} \times 200 = 180 \text{ kg}$$

Yield variance = (Actual yield – Standard yield for the actual input) × Standard cost per unit.
= (182 – 180) × Rs. 20
= 2 × 20 = 40 (Favourable)

The above yield variance can be computed by using another formula also, for example,

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit
= (18 kg – 20 kg) × Rs. 20
= Rs. 40 (Favourable)

In this example there is no mix variance and therefore, the materials usage variance will be equal to the materials yield variance.

The above formula uses output or loss as the basis of computing the yield variance. Yield variance can also be computed on the basis of input factors only. The fact is that loss in inputs equals loss in output. A lower yield simply means that a higher quantity of inputs have been used and the anticipated or standard output (based on actual inputs) has not been achieved. Yield, in such a case, is known as sub-usage variance

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(or Revised usage variance) which can be computed by using the following formula:

Sub-usage or revised usage variance = (Revised standard proportion of actual input—Standard quantity) × Standard cost per unit of input

Important Note

Variances, generally, can be computed by using two approaches namely by comparing the actuals with standards or comparing standard with actuals as displayed below.

Actual — Standard

or

Standard — Actual

A survey of relevant literature, books and publications on cost and management accounting in India and abroad reveals that both the above approaches have been recognised by the authors. In this text, both the methods have been followed in calculating variances to avoid any confusion among the students and readers. The use of only one of the above two approaches may create some doubt among the students.

Example 19.1

Finolex Co. uses a standard cost system and manufactures product Z. Standard cost per 1000 kg of output is as under:

Material	*Quantity (in kg)*	*Price (in Rs.)*
A	800	2.50
B	200	4.00
C	200	1.00

In March 2007, the company produced 2,00,000 kg of output. Actual consumption was:

Material:

A – 1,57,000 kg @ Rs. 2.40
B – 38,000 kg @ Rs. 4.20
C – 36,000 kg @ Rs. 1.10

Calculate material variances *(B.Com.(Hons), Delhi ,2007)*

Solution:

Standards Material Cost of 2,00,000 kg of output

			Standard Quantity (Kg)	*Standard Price (Rs.)*	*SQ X SP (Rs.)*
A	800 × 200	=	1,60,000	2.50	4,00,000
B	200 × 200	=	40,000	4.00	1,60,000
C	200 × 200	=	40,000	1.00	40,000
			2,40,000		6,00,000

Actual Material Cost of 2,00,000 kg of output

	AQ (kg)	*AP (Rs.)*	*AQ ′ AP (Rs.)*
A	1,57,000	2.40	3,76,800
B	38,000	4.20	1,59,600
C	36,000	1.10	39,600
	2,31,000		5,76,000

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(i) Material cost variance = (SQ × SP) – (AQ × AP) = 6,00,000 – 5,76,000 = Rs. 24,000 (F)

(ii) Material price variance = AQ(SP – AP)

A	=	1,57,000 (2.50 – 2.40)	=	15,700 (F)
B	=	38,000 (4.00 – 4.20)	=	7,600 (A)
C	=	36,000 (1.00 – 1.10)	=	3,600 (A)
MPV	=		Rs.	4,500 (F)

(iii) Material usage variance = SP(SQ – AQ)

A	=	2.50 (1,60,000 – 1,57,000)	=	7,500 (F)
B	=	4.00 (40,000 – 38,000)	=	8,000 (F)
C	=	1.00 (40,000 – 36,000)	=	4,000 (F)
MUV	=		Rs.	19,500 (F)

MCV = MPV + MUV = 4,500 (F) + 19,500 (F) = Rs. 24,000 (F)

(iv) Material mix variance

MMV = SP (AQ in std. prop – Aq)

A	=	2.50 (1,54,000 – 1,57,000)	=	7,500 (A)
B	=	4.00 (38,500 – 38,000)	=	2,000 (F)
C	=	1.00 (38,500 – 36,000)	=	2,500 (F)
			Rs.	3,000 (A)

(v) Material yield variance $= \frac{\text{SQ} \times \text{SQP}}{\text{Output}} \times$ (Expected output from AQ – Actual output)

$$= \frac{6,00,000}{2,00,000} \times \left(\frac{2,00,000}{2,40,000} \times 2,31,000 \right) - 2,00,000$$

$$= 3\ (1,92,500 - 2,00,000) = \text{Rs. } 22,500\ (\text{F})$$

MUV = MMV + MYV = 3,000 (A) + 22,500 (F) = Rs. 19,500 (F)

AQ in Std. Proportion = A = 2,31,000 × 16/24 = 1,54,000;

B = 2,31,000 × 4/24 = 38,500; C = 2,31,000 × 4/24 = 38500

Example 19.2

From the following data, calculate the following variances:

(i) Material cost variance;
(ii) Material price variance;
(iii) Material quantity variance;
(iv) Material mix variance;
(v) Material yield variance.

Material	*Standard*		*Actual*	
	Qty.	*Unit Price*	*Qty.*	*Unit Price*
A	60%	Rs. 20	88	Rs. 30
B	40%	Rs. 10	132	Rs. 10

Standard Loss: 10%

Actual output: 180 units

(B.Com.(Hons), Delhi 2003, 2005)

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Solution:

Comparative Statement of Costs

	Standard			*Actual*		
Article	*Qty.*	*Price Rs.*	*Cost Rs.*	*Qty. Rs.*	*Price Rs.*	*Cost.Rs.*
A	120	20	2,400	88	30	2,640
B	80	10	800	132	10	1,320
	200		3,200	220		3,960
Less: Std. Loss	20			40		–
	180		3,200	180		3,960

Material cost variance = Std. cost – Actual cost

= 3,200 – 3,960 = Rs. 760 (A)

Material quantity variance

= (SQ – AQ) SP

A = (120 – 88) 20 = 640 (F)

B = (80 – 132) 10 = 520 (A)

Rs. 120 (F)

Material price variance = (SP – AP) × AQ

A = (20 – 30) 88 = 880 (A)

B = (10 – 10) 132 = Nil

Rs. 880 A

Material mix variance

$$A = \left(\frac{120}{200} \times 220 - 88\right) 20 = 880 \text{ (F)}$$

$$B = \left(\frac{80}{200} \times 220 - 132\right) 10 = 440 \text{ A}$$

Rs. 440 (F)

Material yield variance

$$= \left(\frac{180}{200} \times 220 - 180\right) \frac{3200}{180}$$

$$= (198 - 180)\ \frac{3200}{180}$$

= Rs. 320 (A)

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Working Notes:

(i) *Standard quantity of materials A and B*

Standard quantity = 60 + 40 = 100

Less: Standard loss 10

Standard output 90

When standard output is 90, quantity of material A is 60

When output is 180, material A quantity will be $\frac{180 \times 60}{90} = 120$

Similarly quantity of material B will be $\frac{180 \times 40}{90} = 80$

(ii) *Standard output for the actual input*

Actual input = 88 + 132 = 220

When standard input is 100, standard output is 90

When actual input is 220, standard output will be $\frac{220 \times 90}{100} = 198$

(iii) *Revised standard quantity for actual input*

Material A = $\frac{120}{200} \times 220$

Material B = $\frac{80}{200} \times 220$

Example 19.3

Pragati Company manufactures a product P by mixing three raw materials. For every 100 kg of output 125 kg of raw material input are used. In April 1997, there was an output of 5600 kg. of product P. The standard and actual particulars of April, 1997 are as follows:

Raw Material	*Standard*		*Actual*	
	Mix	*Price per kg*	*Mix*	*Price per kg*
I	50%	Rs. 40	60%	Rs. 42
II	30%	Rs. 20	20%	Rs. 16
III	20%	Rs. 10	20%	Rs. 12

Calculate all material variances. The actual quantity of material used was 7000 kg.

(B. Com. (Hons.) Delhi 1997)

Solution:

Raw Material	*Standard for output of 5600 kg.*			*Actual for output of 5600 kg*		
	Qty kg.	*Rate Rs.*	*Amt. Rs.*	*Qty kg.*	*Rate Rs.*	*Amt. Rs.*
I	3500	40	1,40,000	4200	42	1,76,400
II	2100	20	42,000	1400	16	22,400
III	1400	10	14,000	1400	12	16,800
Total	7000*		1,96,000	7000		2,15,600

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$$\frac{*5,600}{100} \times 125$$

DMCV = Std. Cost for Actual Output – Actual Cost

= 1,96,000 – 2,15,600 = Rs. 19,600 (A)

DMPV = Actual Qty. × (SR – AR)

I = 4,200 × (40 – 42) = 8,400 (A)

II = 1,400 × (20 – 16) = 5,600 (F)

III = 1,400 × (10 – 12) = 2,800 (A)

5,600 (A)

DMUV = SR × (Std. qty. for actual output – Actual qty.)

I = 40 × (3,500 – 4,200) = 28,000 (A)

II = 20 × (2,100 – 1,400) = 14,000 (F)

III = 10 × (1,400 – 1,400) = Nil

14,000 (A)

DMMV= SR × (SRQ – AQ)

Since total Std. Mix and Actual Mix are the same, the RSQ will be the same as Std. qty.

I = 40 × (3,500 – 4,200)= 28,000 (A)

II = 20 × (2,100 – 1,400)= 14,000 (F)

III = 10 × (1,400 – 1,400)= 0

14,000 (A)

The Direct Material Yield Variance will be *Nil*.

Example 19.4

AB Ltd. has established the following standard mix for producing gallons of product A.

	Rs.
5 gallons of material X at Rs. 7 per gallon	= 35
3 gallons of material Y at Rs. 5 per gallon	= 15
2 gallons of material Z at Rs. 2 per gallon	= 4
	Rs. 54

A standard loss of 10% of output is expected to occur. Actual input was as under:

53000 gallons of material X at Rs. 7 per gallon.

28000 gallons of material Y at Rs. 5.30 per gallon

19000 gallons of material Z at Rs. 2.20 per gallon.

Actual output for a period was 92700 gallons of product A.

Compute:

(i) Material Mix Variance

(ii) Material Yield Variance *(B. Com. (Hons.) Delhi 1999)*

Solution:

Material	*Standard*			*Actual*		
	Quantity	*Rate Rs.*	*Amount Rs.*	*Quantity*	*Rate Rs.*	*Amount Rs.*
X	50000	7	3,50,000	53000	7.00	3,71,000
Y	30000	5	1,50,000	28000	5.30	1,48,400
Z	20000	2	40,000	19000	2.20	41,800
	100000		5,40,000	100000		5,61,200

(i) Material Mix Variance = SR × (Revised Std. Quantity* – Actual Quantity)

* Since Total Actual Mix and Total Std. Mix is the same, hence Standard Quantity is equal to Revised Standard Quantity

X = Rs. 7 × (50000 – 53,000) = 21,000 (A)
Y = Rs. 5 × (30000 – 28,000) = 10,000 (F)
Z = Rs. 2 × (20000 – 19,000) = 2,000 (F)
9,000 (A)

(ii) $$\text{Material yield Variance} = \text{Standard Cost Per unit} \times \left(\text{Standard Output for Actual Mix} - \text{Actual output}\right)$$

= 6 × (90,000 – 92,700)
= Rs. 16,200 (F)

Verification:

$$\text{Direct Material Usage Variance} = \text{Standard Rate} \times \left(\text{Std. Qty for actual output} - \text{Actual}\right)$$

X = 7 × (51500 – 53,000) = 10,500 (A)
Y = 5 × (30900 – 28,000) = 14,500 (F))
Z = 2 × (20600 – 19,000) = 3,200 (F)
7,200 (F)

Direct Material Usage Variance = Direct Material Mix Variance + Direct Material Yield Variance
= 9,000 (A) + 16,200 (F)
= 7,200 (F)

Example 19.5

Vinak Ltd. produces an article by blending two raw materials. It operates a standard costing system and the following standards have been set for raw materials:

Material	*Standard mix*	*Standard price per kg*
A	40%	Rs. 4.00
B	60%	Rs. 3.00

The standard loss in processing is 15%.

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During April 2001 the company produced 1700 kg of finished output. The position of stocks and purchases for the month of April 2001 is as under:

Material	*Stock on 1.4.01 (kg)*	*Stock on 30.4.01 (kg)*	*Purchasing during April 2001*	
			(kg)	*Cost (Rs.)*
A	35	5	800	3,400
B	40	50	1200	3,000

Calculate the following variances:

(i) Materials price variance
(ii) Materials usage variance
(iii) Materials yield variance
(iv) Materials mix variance
(v) Total materials cost variance. *(CA Inter, B. Com. (Hons), Delhi)*

Solution:

Standard cost of standard mix:

Type of material	*Standard quantity of material required Rs.*	*Standard price per kg Rs.*	*Standard quantity*
A	800	4	3200
B	1,200	3	3600
Total	2,000		6800

Note: 1. The loss being 15% to produce 85 kg of an article, the standard quantity of material required is 100 kg. Therefore, to produce 1700 kg of the article the standard quantity of material required is $\frac{100}{85} \times 1700$ kg or 2000 kg

2. Out of 2000 kg of material used, 40% is type A and 60% is type B, that is, 800 kg of A and 1,200 kg of B are the standard quantities.

Actual costs

Type of material	*Actual quantity of material used kg*	*Actual price per kg Rs*	*Actual quantity X actual price Rs*
A	830	4.25	3,518.75
B	1190	2.50	2,995.00
Total	2020		6,513.75

* Actual quantity of material A is 830 kg, out of this 35 kg is available at the standard price of Rs 4 per kg and remaining 795 kg at Rs 4.25 per kg.

Actual quantity of material B used is 1190 kg; out of this 40 kg is available at the standard price Rs. 3 per kg and the remaining 1150 kg at Rs. 2.50.

(i) Materials price variance = Actual quantity × (Actual price – Standard price)

A. Standard price of 830 units @ 4		3,320.00
Actual price of 35 units @ Rs. 4	140.00	
795 units @ Rs. 4.25	3,378.75	3,518.75
		198.75 (A)

B. Standard price of 1190 units @ Rs. 3		3,570.00
Actual price of 40 units @ Rs. 3	120,00	
1150 units @ Rs. 2.50	2,875.00	2,995.00
		575.00 (F)
	Total	376.75 (F)

(ii) Materials (total) usage variance = Standard price × (Actual quantity – Standard quantity)

	Rs.
A : 4 × (830 – 800)	120.00 (A)
B : 3 × (1,190 – 1,200)	30.00 (F)
	90.00 (A)

(iii) Materials yield variance = Standard rate × (Actual yield – Standard yield)

$$\text{Standard rate} = \frac{\text{Total standard cost}}{\text{Standard yield}} = \text{Rs.}\ \frac{6{,}700}{1{,}700} = \text{Rs 4 per kg}$$

Yield variance = 4 (1,700 – 1,717*) or Rs. 68 (A)

*By using 2000 kg of material, standard yield is 1700 kg. Therefore, the standard yield by using 2020 kg of material will be (1700/2000 × 2020 or 1717 kg)

(iv) Material mix variance = Actual quantity × (Per unit standard cost of standard mix – per unit standard cost of actual mix)

$$= 2020\left(\frac{6{,}800}{2000} - \frac{6{,}890}{2020}\right)$$

= 2020 (3.4 – 3.410) or Rs. 22 (A)

(v) Materials cost variance = (Actual cost – Standard cost)

= Rs. 6,513.75 – 6,800

= Rs. 286.25 (F)

Example 19.6

A company is manufacturing a chemical product making use of 4 different types of raw materials as follows:

Raw material	Share of total input (%)	Cost of raw materials (Rs./kg)
A	40	50
B	30	80
C	20	90
D	10	100

There is an inevitable normal loss of 10% during the processing.

For April 2007, the management furnished the following information:

Raw material consumed	Quantity Consumed (kg.)	Cost of material (Rs./kg)
A	42000	48
B	31000	80
C	18000	92
D	9000	110

Output obtained for the month was 92000 kg.

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Calculate:

(a) Material cost variance,
(b) Material price variance,
(c) Material mix variance,
(d) Material yield variance,
(e) Material usage variance. *(ICWA, Inter, Stage 1, June 2007)*

Solution:

Standard cost of the Finished product is worked out as follows:

Input	Quantity (kg)	Standard Price/kg (Rs.)	Standard Cost (Rs.)
A	40	50	2,000
B	30	80	2,400
C	20	90	1,800
D	10	100	1,000
	100	7,200	7,200
Processing loss	10	–	–
Output	90		7,200
Standard Cost per Unit (7200 ÷ 90)			Rs. 80

Computation of variances:

(a) *Material cost variance* = Standard Cost of actual Finished Output – Actual cost of Output

$$= 92000 \times 80 - \begin{bmatrix} A = 42000 \times 48 = 20,16,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 92 = 16,56,000 \\ D = 9000 \times 110 = 9,90,000 \end{bmatrix}$$

$$71,42,000$$

$$= 73,60,000 - 71,42,000 = \text{Rs. } 2,18,000 \text{ (F)}$$

(b) *Material price variance* = (Standard Price – Actual Price) Actual Quantity Consumed

A = (50 – 48) 42,000 = Rs. 84,000 (F)
B = (80 – 80) 31,000 = –
C = (90 – 92) 18,000 = Rs. 36,000 (A)
D = (100 – 110) 9,000 = Rs. 90,000 (A)
Rs. 42,000 (A)

(c) *Material mix variance* = (Actual input in standard proportion – Actual input) × Standard price

A = (40,000 – 42,000) Rs. 50 = Rs. 1,00,000 (A)
B = (30,000 – 31,000) Rs. 80 = Rs. 80,000 (A)
C = (20,000 – 18,000) Rs. 90 = Rs. 1,80,000 (F)
D = (10,000 – 9,000) Rs. 100 = Rs. 1,00,000 (F)
Rs. 1,00,000 (F)

(d) *Material yield variance* = (Standard yield of Actual input – Actual yield) × Standard Rate of Finished Product

= (1,00,000 × 90 – 92,000) × Rs. 80
= Rs. 1,60,000 (F)

(e) *Material usage variance* =Standard Cost of Actual Finished Output – Stand Cost (input) of Actual Input.

$$\text{Rs. } 73,60,000 - \left\{\begin{array}{l} A = 42000 \times 50 = 21,00,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 90 = 16,20,000 \\ D = 9000 \times 100 = \ 9,00,000 \end{array}\right\}$$

$$\underline{\quad\quad 71,00,000}$$

$$= 73,60,000 - 71,00,000$$

$$= \text{Rs. } 2,60,000 \text{ (F)}$$

(i) Check: Material usage variance = (Mix Variance + Yield Variance)
= (1,00,000 (F) + 1,60,000 (F)) = Rs. 2,60,000 (F)

(ii) Material cost variance = Material price variance + Material usage variance
2,18,000 (F) = 42,000 (A) + 2,60,000 (F)

Example 19.7

In a manufacturing process the following standards apply:
Standard prices : Raw material A Rs. 10 per kg., B Rs. 50 per kg.
Standard mix : 75% A and 25% B (by weight)
Standard output (weight of product as a percentage of weight of raw material) – 90%
In a particular period actual costs, usages and output were as follows:
4400 kg of A costing Rs. 46,500
1600 kg of B costing Rs. 78,500
Output 5670 kg of product.
The budgeted output for the period was 7200 kg.
Compute the material cost variances. *(ICWA, Stage 2, June 2005)*

Solution:

Standard yield from 6000 kg (4400 kg + 1600 kg) of input is

			Rs.
Material A (75%)	4500 kg @ Rs. 10	=	45,000
Material B (25%)	1500 kg @ Rs. 50	=	75,000
	6000 kg		1,20,000

Less:

Normal loss @ 10%	600 kg		
Std. Output	5400 kg		

Std. Cost of actual output of 5670 kg = $\frac{1,20,000}{5400} \times 5670$

= Rs. 1,26,000

Actual cost of actual output of 5670 kg

			Rs.
	4400 kg × Rs. 10.568	=	46,500
	1600 kg × Rs. 49.063	=	78,500
	6000 kg		1,25,000
Less actual loss	330 kg		
Actual output	5670 kg		

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(i) Material cost variance = 1,26,000 – 1,25,000 = Rs. 1000 (F)

(ii) Material price variance:

A (10 – 10.568) × 4400	= 2,499.20 (A)
B (50 – 49.063) × 1600	= 1,499.20 (F)
	1,000.0 (A)

(iii) Material usage variance:

		Rs.
A	$\left(\frac{4500}{5400}\times 5670-4400\right)\times 10$	= 3250 (F)
B	$\left(\frac{1500}{5400}\times 5670-1600\right)\times 50$	= 1250 (A) / 2000 (F)

(iv) Material Mix variance:

A (4500 – 4400) × 10	= 1000 (F)
B (1500 – 1600) × 50	= 5000 (A)
	4000 (A)

(v) Yield variance = (5400 – 5670) × $\frac{1200000}{5400}$ = 6000 (F)

Example 19.8

A factory manufactures a chemical product with three ingredient chemicals A, B and C as per standard data given below:

Chemical	*Percentage of total input*	*Standard Cost per kg. (Rs.)*
A	50%	40
B	30%	60
C	20%	95

There is a process loss of 5% during the course of manufacure.

The Management gives the following details for a certain week:

Chemical Consumed	Quantity purchased and issued	Actual Cost (Rs.)
A	5200 kg.	2,34,000
B	3600 kg.	2,19,600
C	1700 kg.	1,58,100

Output of finished product: 10200 kg.

Calculate all the relevant variances. *(ICWA, Inter, Stage 1, Dec. 2005)*

Solution:

Standard Cost of a Chemical Product

Chemical	*Percentage of Input*	*Quantity (kg)*	*Standard cost per kg (Rs.)*	*Total cost Rs.*
A	50%	0.50	40	20
B	30%	0.30	60	18
C	20%	0.20	95	19

(*Contd.*)

Total input	1.00	57
Less: Loss on processing (5%)	0.05	57
Output	0.95	

Standard Cost of a chemical product = $\frac{\text{Rs. } 57}{0.95}$ = Rs. 60

Computation of variances:

(1) *Total Material Cost Variances:*
Standard cost of actual production (output) – Actual material cost for production
= 10200 × Rs. 60 – Rs. (234000 + 219600 + 158100)
= Rs. 612000 – Rs. 611700 = Rs. 300 (FAV).

(2) *Material Price Variance:*
(Std. Price – Actual Price) × Actual qty. consumed.

A: [40 – (234000 / 5200)] × 5200	Rs. 26,000 (A)
B: [60 – (219600 / 3600)] × 3600	Rs. 3,600 (A)
C: [95 – (158100 / 1700)] × 1700	Rs. 3,400 (F)
	Rs. 26,200 (A)

(3) *Material Mix Variance:*
= (Actual input in std. proportion – Actual input) × Std. Cost of input/kg.

A: (0.50 × 10500 – 5200) × Rs. 40	Rs. 2,000 (F)
B: (0.30 × 10500 – 3600) × Rs. 60	Rs. 27,000 (A)
C: (0.20 × 10500 – 1700) × Rs. 95	Rs. 38,000 (F)
	Rs. 13,000 (F)

(4) *Yield Variance*
(Std. yield from actual input – Actual Output) × Std. cost of finished product
= (10,500 × 0.95 – 10,200) × Rs. 60 = Rs. 13,500 (F)

(5) *Usage Variance:*
Std. cost (output) of Actual output – Std cost of Actual Qty Consumed.
= 10,200 × Rs. 60 – $\begin{bmatrix} 5{,}200 \times \text{Rs. } 40 \\ 3{,}600 \times \text{Rs. } 60 \\ 1{,}700 \times \text{Rs. } 95 \end{bmatrix}$ = Rs.6,12,000 – Rs. 5,85,500
= Rs. 26,500 (F)
Usage Variance: Mix Variance + Yield Variance
= Rs. 13,000 (FAV) + Rs. 13,500 (FAV) = Rs. 26,500 (F)
Total Material Cost Variance:
Material Price Variance + Material Usage Variance
= Rs. 26,200 (ADV) + Rs. 26,500 (F)
= Rs. 300 (F)

Example 19.9

A product is manufactured by mixing and processing three raw materials X, Y and Z as per standard data given below:

Raw material	*Percentage of input*	*Cost per (kg)*
X	40%	Rs. 40
Y	40%	Rs. 60
Z	20%	Rs. 85

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Loss during processing is 5% of input and this has no realisable value. During a certain period 580,000 kg of finished product was obtained from inputs as per details given below:

Raw material	*Quantity consumed*	*Cost/kg*
X	240000 kg	Rs. 38
Y	250000 kg	Rs. 59
Z	110000 kg	Rs. 88

Calculate the total material cost variance with details of sub-variances relating to Price, Mix Yield and Usage. *(ICWA, Inter, Stage 1, Dec. 2004)*

Solution:

Standard Cost of the Finished Product

Raw material	*Percentage of Input*	*Quantity (kg)*	*Cost per kg. (Rs.)*	*Total (Rs.)*
X	40%	40	40	1,600
Y	40%	40	60	2,400
Z	20%	20	85	1,700
	Total input	100		5,700
	Less: Loss in processing	5		
	Output	95		5,700

$$\text{Standard cost per kg } \frac{5,700}{95} = \text{Rs. } 60$$

Computation of Variances

(i) *Total material cost variance:*

= standard cost of actual product – Actual material cost for production

$$= 5,80,000 \times \text{Rs. } 60 - \begin{bmatrix} 2,40,000 \times \text{Rs. } 38 \\ 2,50,000 \times \text{Rs. } 59 \\ 1,10,000 \times \text{Rs. } 88 \end{bmatrix}$$

= 3,48,00,000 – 3,35,50,000

= Rs. 12,50,000 (F)

(ii) *Material Price Variance:* (Std Price – Actual Price) × Actual Qty consumed

X: (40 – 38) × 24000 = 4,80,000 (F)

Y: (60 – 59) × 250000 = 2,50,000 (F)

Z: (85 – 88) × 110000 = 3,30,000 (A)

4,00,000 (F)

(iii) *Material Mix Variance:* (Input in Std proportion – Actual input) × Std Cost of input/kg

X (240000 – 240000) × Rs. 40 = Nil

Y (240000 – 250000) × Rs. 60 = Rs. 600000 (ADV)

Z (120000 – 110000) × Rs. 85 = Rs. 850000 (FAV)

600000 600000 Rs. 250000 (FAV)

(iv) *Yield variance:* = (Std yield from actual input – Actual input) × Std Cost of finished product

$$= \left(600000 \times \frac{95}{100} - 580000\right) \times \text{Rs. } 60$$

= 10000 × Rs. 60 = Rs. 6,00,000

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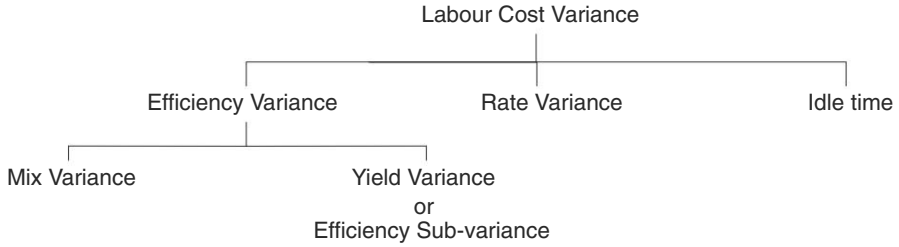
(v) Usage Variance: Standard cost (Output) of Actual production/(Output) – Standard Cost of Actual quantity Consumed

580000 × 60 – X : 2,40,000 × 40
Y : 2,50,000 × 60
Z : 1,10,000 × 85
= Rs. 3,48,00,000 – Rs. 3,39,50,000 = Rs. 8,50,000 (FAV)

Mix Variance + Yield Variance
Rs. 2,50,000 (FAV) + Rs. 6,00,000 (FAV)
= Rs. 8,50,000 (FAV)

LABOUR VARIANCES

Direct labour variances arise when actual labour costs are different from standard labour costs. Labour variances constitute the following:



Labour Cost Variance

Labour cost variance denotes the difference between the actual direct wages paid and the standard direct wages specified for the output achieved. This variance is calculated by using the following formula:

Labour cost variance = (AH × AR – SH × SR)

where AH = Actual hours

AR = Actual rate

SH = Standard hours

SR = Standard rate

Labour Efficiency Variance

The calculation of labour efficiency or usage variance follows the same pattern as the computation of materials usage variance. If actual direct labour hours required to complete a job differ from the number of standard hours specified, a labour efficiency variance results; it is the difference between actual hours expended and standard labour hours specified multiplied by the standard labour rate per hour. The formula is:

Labour efficiency variance = (Actual hours – Standard hours for the actual output) × Std. rate per hour.

It may be noted that the standard labour hour rate and not the actual rate is used in computing labour efficiency variance. If quantity variances are calculated, changes in prices/rates are excluded, and when price variances are calculated, standard quantities are ignored.

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Labour Rate Variance

Labour rate variance is computed in the same manner as materials price variance. When actual direct labour hour rates differ from standard rates, the result is a labour rate variance. It is that portion of the direct wages variance which is due to the difference between the actual rate paid and standard rate of pay specified. The formula for its calculation is:

Labour rate variance = (Actual rate – Standard rate) × Actual hours

Favourable rate variance arise whenever actual rates are less than standard rates; unfavourable variances occur when actual rates exceed standard rates.

Labour Mix Variance

Labour mix variance is computed in the same manner as materials mix variance. Manufacturing or completing a job requires different types or grades of workers and production will be completed if labour is mixed according to standard proportions. Standard labour mix may not be adhered to under some circumstances and substitution will have to be made. There may be changes in the wage rates of some workers; there may be a need to use more skilled or expensive types of labour, for example, employment of men instead of women; sometimes workers and operators maybe absent. These lead to the emergence of a labour mix variance which is calculated by using the following formula:

Labour mix variance = (Actual labour mix—Revised standard labour mix in terms of actual total hours) × Standard rate per hour

To take an example, suppose the following were the standard labour cost data per unit in a factory:

Class	*Proportion*			*Cost*
	%			*Rs.*
A	50	3 hours @	Rs. 4.00	12
B	50	3 hours @	Rs. 2.00	6
	100	6 hours	Rs 3.00	18

In a period, many class B workers were absent and it was necessary to substitute class B workers. Since the class A workers were less experienced with the job, more labour hours were used. The recorded costs of a unit were:

Class	*Proportions*		*Cost*	
	%		*Rs.*	
A	75	6 hours @	Rs. 4.00	24.00
B	25	2 hours @	Rs. 2.00	4.00
	100	8 hours	Rs 3.50	28.00

Labour mix variance will be calculated as follows:

Labour mix variance = (Actual proportion – Revised standard proportion of actual total hours) × Standard rate per hour

Revised standard proportion:

$$\text{Class A} = \frac{3}{6} \times 8 = 4 \text{ hours}$$

$$\text{Class B} = \frac{3}{6} \times 8 = 4 \text{ hours}$$

Applying the formula:

Class A = (6 – 4) × Rs. 4 = 8 (Unfavourable)

Class B = (2 – 4) × Rs. 2 = 4 (Favourable)

Total labour mix variance = Rs. 4 (Unfavourable)

Labour Yield Variance

The final product cost contains not only material cost but also labour cost. Therefore, higher or lower output than the standard output should take into account labour yield variance also. A lower output simply means that final output does not correspond with the production units that should have been produced from the hours expended on the inputs. It can be computed by applying the following formula:

Labour yield variance = (Actual output – Standard output based on actual hours) × Average standard labour rate per unit of output

or

Labour yield variance = (Actual loss – Standard loss on actual hours) × Average standard labour rate per unit of output

Labour yield variance is also known as labour efficiency sub-variance which is computed in terms of inputs, i.e. standard labour hours and revised labour hours mix (in terms of actual hours). Labour efficiency sub-variance is computed by using the following formula:

Labour efficiency sub-variance = (Revised standard mix – Standard mix) × Standard labour rate

Substitution Variance This type of variance arises in the case of labour, due to the substitution of labour, that is when one grade of labour is substituted by another. This variance in fact represents the difference between the actual hours at standard rate of standard worker and the actual hours at standard rate of actual worker.

The formula for computation is:

Substitution variance = (Standard hours × Standard rate for standard worker) – (Standard hours × Standard rate of actual worker)

Idle Time Variance

Idle time variance occurs when workers are not able to do the work due to some reason during the hours for which they are paid. Idle time can be divided according to causes responsible for creating idle time, for example, idle time due to breakdown, lack of materials or power failures. Idle time variance will be equivalent to the standard labour cost of the hours during which no work has been done, but for which workers have been paid for unproductive time. Suppose, in a factory 2000 workers were idle because of a power failure. As a result of this a loss of production of 4000 units of product A and 8000 units of product B occurred. Each employee was paid his normal wage (a rate of Rs. 20 per hour). A single standard hour is needed to manufacture four units of product A and eight units of product B. Idle time variance will be computed in the following manner:

Standard hours lost:

$$\text{Product A} = \frac{4000}{4} = 1000 \text{ hr}$$

$$\text{Product B} = \frac{8000}{8} = 1000 \text{ hr}$$

Total hours lost = 2000 hr

Idle time variance (power failure)

2000 hours @ Rs. 20 per hour = Rs. 40,000 (Adverse)

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Example 19.10

Calculate labour variances from the following information:

Actual hours	5,800
Actual direct wages	Rs. 1,800
Standard rate per hour	Re. 0.35
Standard hours	6,000

(B.Com. (Hons) Delhi, 2007)

Solution:

Actual Rate (AR)	=	Rs. 1,800 / 5800	=	Re. 0.3103448		
Total standard wage	=	6000 × 0.35	=	Rs. 2,100		
Labour cost variances	=	Std. Wage – Actual Wage	=	2100 – 1800	=	Rs. 300 (F)
Labour rate variance	=	AH (SR – AR)	=	5800 (0.35 – 0.3103448)	=	Rs. 230 (F)
Labour efficiency variance	=	SR (SH – AH)	=	0.35 (6000 – 5800)	=	Rs. 70 (F)
Labour cost variance	=	LRV + LEV	=	230(F) + 70(F)	=	Rs. 300 (F)

Example 19.11

Standard labour cost of producing 40 units of a product is 30 hours work by skilled workers at a standard rate of Rs. 60 per hour and 90 hours work by unskilled workers at the standard rate of Rs. 20 per hour. 40 units of the product were produced for which skilled workers were paid for 20 hours at Rs. 55 per hour and unskilled workers were paid for 130 hours at Rs. 24 per hour. Due to a machine break-down both skilled and unskilled workers lost 9 hours each. They were paid even for this time.

Calculate:

(i) Labour cost variance
(ii) Labour rate variance
(iii) Labour efficiency variance unadjusted
(iv) Labour mix variance
(v) Labour yield variance
(vi) Idle time variance

(B.Com. (Hons), Delhi, 2007)

Solution:

Standard Labour Cost of 40 Units of Product				*Actual labour Cost of 40 Units of Product*					
	SH	SR	SH × SR		AH Paid for	Idle Hours	AH Worked	AR Rs.	AH Paid × AR Rs.
Skilled	30	60	1,800	Skilled	20	9	11	55	1,100
Unskilled	90	20	1,800	Unskilled	130	9	121	24	3,120
	120		Rs. 3,600		150	18	132		4,220

(i) *Labour Cost Variance* = Standard Labour Cost – Actual Total Labour Cost
= (SH × SR) – (AH Paid × AR) = Rs. 3,600 – Rs. 4,220 = Rs. 620 (A)

Idle Time Variance	= Idle Hours × SR	
Skilled	= 9 × 60	= Rs. 540 (A)
Unskilled	= 9 × 20	= Rs. 180 (A)
Idle Time Variance		= Rs. 720 (A)

(ii) *Labour Rate Var (LRV)* = [(AH Paid (SR – AR)]

Skilled	= 20 (60 – 55)	= Rs. 100 (F)
Unskilled	= 130 (20 – 24)	= Rs. 520 (A)
Labour Rate Variance		= Rs. 420 (A)

Note: Labour Rate Variance is calculated with reference to actual time for which payment has been made including idle time paid for.

(iii) *Total Labour Efficiency Var.* (including impact of idle time) = [SR (SH – AH paid for)]

Skilled	= 60 (30 – 20)	= Rs. 600 (F)
Unskilled	= 20 (90 – 130)	= Rs. 800 (A)
Total LEV (including Idle Time)		= Rs. 200 (A)

For true measure of labour efficiency it is desirable that the impact of idle time (which is due to abnormal factors) is excluded and only Actual Hours worked are taken for calculating Labour Efficiency Variance.

Labour Efficiency Variance = [SR (SH – AH worked)]

Excluding idle time

Skilled	= 60 (30 – 11)	= Rs. 1,140 (F)
Unskilled	= 20 (90 – 121)	= Rs. 620 (A)
LEV (Excl. Idle Time)		= Rs. 520 (F)

Lab. Mix Var. (LMV) = SR AH worked in standard proportion – AH worked

AH Worked in standard proportion:

Skilled	= 132 × 30/120	= 33
Unskilled	= 132 × 90/120	= 99
LMV Skilled	= 60 (33 – 11)	= Rs. 1,320 (F)
Unskilled	= 20 (99 – 121)	= Rs. 440 (A)
Labour Mix Variance		= Rs. 880 (F)

$$\textit{Labour Yield Variance (LYV)} = \textit{Standard Labour Cost per unit of output} \left(\begin{matrix} \textit{Expected total output} \\ \textit{from total hrs worked} \end{matrix} - \textit{Actual output} \right)$$

$$= \frac{(\text{SH} \times \text{SR})}{\text{Output}} \text{ that is } \frac{\text{Rs. } 3{,}600}{40 \text{ units}} \left(\frac{40 \text{ units}}{120 \text{ hrs}} \times 132 \text{ hrs.} - 40 \text{ units} \right)$$

= Rs. 90 (44 units – 40 units) = Rs. 360 (A)

Example 19.12

The standard labour cost for producing 200 metres of cloth was predetermined as 20 skilled labour hours @ Rs. 15 per hour and 30 unskilled labour hours @ Rs. 10 per hour. 300 metres of cloth was produced with the help of 30 skilled labour hours paid @ Rs. 17 per hour and 30 unskilled labour hours paid @ Rs. 12 per hour. Calculate:

(i) Labour mix variance and

(ii) Labour yield variance. *(B.Com.(Hons), Delhi, 2005)*

Solution:

Labours Mix Variance:

$$A = \left(\frac{30}{75} \times 60 - 30 \right) 15 = 90 \text{ (A)}$$

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$$B = \left(\frac{45}{75} \times 60 - 30\right) 10 = 60 \text{ (F)}$$

Rs. 30 (A)

Labour yield variance

$$A = \left(\frac{300}{75} \times 60 - 300\right) \frac{900}{300} = \text{Rs. } 180 \text{ (F)}$$

Example 19.13

The standard cost on 'Material' and 'Labour' for the making of a unit of a certain product is estimated as under –

Material 80 kg at Rs. 1.50 per kg.
Labour 18 hrs. at Rs. 1.25 per hr.

On completion of the production of a unit, it was found that 75 kg of material costing Rs. 1.75 per kg has been consumed and that the time taken was 16 hours, the wage rate being Rs. 1.50 per hour.

You are required to analyse material and labour variances. *(B.Com.(Hons), Delhi, 2004)*

Solution:

Material Cost Variance:
St. Cost of Material – Actual Cost of Material
80 kg × Rs. 1.50 – 75 kg × Rs. 1.75
= Rs. 120 – Rs. 131.25 = Rs. 11.25 Adverse
Material cost variance is analyzed as follows:

(a) Material Price Variance:
Actual usage (St. Price – Actual Price)
75 kg (Rs. 1.50 – Rs. 1.75) = Rs. 18.75 Adverse

(b) Material Usage Variance:
St. Price (St. usage – Actual Usage)
Rs. 1.50 (80 kg – 75 kg) = Rs. 7.50 Favourable

Labour Cost Variance:
St. cost of labour – Actual cost of labour
18 hrs × Rs. 1.25 – 16 hrs × Rs. 1.50
= Rs. 22.50 – Rs. 24 = Rs. 1.50 (A)
Labour cost variance is analyzed as follows**:**

(a) Labour Rate Variance:
Actual Time (St. Rate – Actual Rate)
16 hrs (Rs. 1.25 – Rs. 1.50) = Rs. 4(A)

(b) Labour Efficiency Variance:
St. Rate (St. Time – Actual Time)
Rs. 1.25 (18 hrs – 16 hrs) = Rs. 2.50 (F)

Example 19.14

The following standard and actual data in respect of Chemical X is made available to you from the records of Naulakha Chemicals Ltd.

Standard Data:		*Total*
Materials:	*Rs.*	*Rs.*
450 kg of material A @ Rs. 20 per kg	9,000	
360 kg of material B @ Rs. 10 per kg	3,600	12,600
810		
Labour: @ per hour	Rs.	
2400 skilled hours Rs. 2		4,800
1200 unskilled hours Re. 1		1,200
90 kg Normal loss	–	–
720 kg		18,600
Actual Data:		Total
Materials:	Rs.	Rs.
450 kg of material A @ Rs. 19 per kg	8,550	
360 kg of material B @ Rs. 11 per kg	3,960	12,510
810		
Labour: @ per hour		
2,400 skilled hours Rs. 2.25		5,400
1,200 unskilled hours Rs. 1.25		1,500
50 kg Actual loss		19,410
760		

You are required to compute:

(a) Material cost variance;
(b) Material price variance;
(c) Material yield variance;
(d) Labour cost variance;
(e) Labour rate variance;
(f) Labour yield variance.

(B.Com.(Hons), Delhi 2002)

Solution

(a) Material Cost Variance:

$$(RSQ \times SP) - (AQ \times AP)$$

RSQ of Material A $= \frac{760}{720} \times 450 = 475$ kg

RSQ of Material B $= \frac{760}{720} \times 360 = 380$ kg

Material A $= (475 \times 20) - (450 \times 19)$

$= 9{,}500 - 8{,}550 = 950$ (F)

Materials B $= (380 \times 10) - (360 \times 11)$

$= 3{,}800 - 3{,}960 = \frac{160\ (A)}{790\ (F)}$

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(b) Material Price Variance:

(SP – AP) AQ		Rs.
Material A = (20 – 19) × 450 kg.		450 (F)
Material B = (10 – 11) × 360 kg.		360 (A)
	Total	90 (F)

(c) Material Yield Variance:

Std. Price (Std. loss – Actual loss)

$$\text{Rs. } \frac{12{,}600}{720} (90 \text{ kg} - 50 \text{ kg})$$

$$= \frac{12{,}600}{720} \times 40 = \text{Rs. } 700 \text{ (F)}$$

(d) Labour Cost Variance:

(SH × SR) – (AH × AR)

Skilled (2,400 × 2) – (2,400 × 2.25)		
4.800 – 5.400 =		Rs. 600 (A)
Unskilled = (1,200 × 1) – (1,200 × 1.25)		
1,200 – 1,500 =		Rs. 300 (A)
	Total	900 (A)

(e) Rate Variance:

(SR – AR) AH

Skilled (Rs. 2 – Rs. 2.25) × 2,400	= Rs. 600 (A)
Unskilled (Rs. 1 – Rs. 1.25) × 1,200	= Rs. 300 (A)
Total	900 (A)

(f) Labour Yield Variance – NIL

Example 19.15

The standard output of production 'EXE' is 25 units per hour in manufacturing department of a company employing 100 workers. The standard wage rate per labour hour is Rs. 6.

In a 42 hour week, the department produced 1040 units of 'EXE' despite 5% of the time paid was lost due to an abnormal reason. The hourly wage rate actually paid were Rs 6.20, Rs 6 and Rs 5.70 respectively to 10, 30 and 60 of the workers.

Compute relevant variances. *(CA Inter, May 1997)*

Solution:

Basic Calculations

1. *Standard man hours per unit:*
   25 units is the standard output when 100 workers work for 1 hour. Hence, standard man hours per unit are 100/25 = 4.

2. Standard Output: 1,040 units			*Actual Output: 1,040 units*				
Man hours for actual output	*Rate per hr.*	*Amount* Rs.	*Actual hours paid* for *Rs.*	*Idle time hrs.*	*Prod. hrs.*	*Rate per hour* Rs.	*Amount paid for production* Rs.
4,160	6	24,960	420	21	399	6.20	2,604
(1,040 units × 4 hrs.)			1,260	63	1,197	6.00	7,560
			2,520	126	2,394	5.70	14,364
		24,960	4,200	210	3,990		24,528

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Computations of Variances

Labour Cost Variance:

= Standard Labour Cost – Actual Labour Cost

= Rs. 24,960 – Rs. 24,528 = Rs. 432 (F)

Labour Rate Variance:

= Actual Time paid for × (Standard Rate – Actual Rate)

(i)	410 × (6 – 6.20)	=	84 (A)
(ii)	1,260 × (6 – 6)	=	—
(iii)	2,520 × (6 – 5.70)	=	756 (F)
			672 (F)

Labour Efficiency Variance (after segregating Idle Time Variance);

= Standard Rate × (Standard Time for actual output – Actual Time worked)

= Rs. 6 × (4,160 hrs. – 3,990 hrs.) = Rs. 1,020 (F)

Labour Idle Time Variance:

= Idle Time hrs. × Standard Rate

= 210 hrs. × Rs. 6 = Rs. 1,260 (A)

Example 19.16

From the following records of Apollo Bolt Nut Manufacturing Company, you are required to compute material and labour variances:

An input of 100 kg of material yields to standard output of 10000 units.
Standard price per kg of material = Rs. 20
Actual quantity of material issued and used by production department 10000 kg.
Actual price per kg of material = Rs. 21 per kg.
Actual output = 900,000 units
Number of employees = 200
Standard wage rate per employee per day = Rs. 40
Standard daily output per employee = 100 units
Total number of days worked = 50 days
(Idle time paid for and included in the above half day for each employee)
Actual wage rate per day = Rs. 45 *(B. Com. (Hons), Delhi 1998)*

Solution:

Direct Material Variances

DMCV = Standard Cost for Actual output – Actual Cost

= 9000 × 20 – 10000 × 21

= 1,80,000 – 2,10,000

= Rs. 30,000 (A)

Direct Material Cost Variance (DMCV) can be segregated into Direct Material Price Variance (DMPV) and Direct Material Usage Variance (DMUV) as shown below:

DMPV = Actual Quantity × (Standard Rate – Actual Rate)

= 10000 kg × (20 – 21)

= Rs. 10000 (A)

DMUV = Standard Rate × (Standard Quantity for Actual Output – Actual Quantity)

= 20 × (9000 – 10000)

= Rs. 20,000 (A)

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Direct Labour Variances

DLCV= Standard Labour Cost for Actual Output – Actual Labour Cost
= 900,000 × .40 – 50 × 200 × 45
= 3,60,000 – 4,50,000
= Rs. 90,000 (A)

Direct Labour Cost Variance (DLCV) may be segregated into Direct Labour Rate Variance (DLRV), Direct Labour Idle Time Variance (DLITV) and Direct Labour Revised Efficiency Variance (DLREV).

DLRV = Actual Time paid for × (SR – AR)
= 50 × 200 × (40 – 45)
= Rs. 50,000 (A)

DLITV = Idle Hours × Std. Rate
= 25 × 200 × 40
= Rs. 2,00,000 (A)

DLREV = Standard Rate × (Std. Time for Actual Output – Actual Time Worked)
= 40 × (9,000 – 5,000)
= 40 × 4,000 = Rs. 1,60,000 (F)

Verification:

DLCV = DLRV + ITV + DLREV
Rs. 90,000 (A) = Rs. 50,000 (A) + Rs. 2,00,000 (A) + Rs. 1,60,000 (F)

Example 19.17

A building can be constructed by engaging a gang of workers as per details given below, for 100 working days of eight hours each.

Standard data:

	Skilled	Semi-skilled	Unskilled
No. of workers in the gang	6	8	6
Standard rate of wages/hr	Rs. 25	Rs. 20	Rs. 16

Actual completion of the work however took 104 days of eight hours each. This includes 16 hours of stoppages due to heavy rains. The actual number of workers engaged and the actual rates paid are given below:

	Skilled	Semi-skilled	Unskilled
Number engaged	8	6	6
Actual rate/hr.	Rs. 30	Rs. 24	Rs. 16

Calculate the following variances:

(a) Labour cost variances
(b) Labour rate variance
(c) Labour efficiency variance
(d) Labour mix variance
(e) Idle time variance *(ICWA, Inter, Stage 1, Dec. 2006)*

(i) Standard labour cost:

			Days hrs.		
Skilled workers	=	6 Nos. @ Rs. 25 for	100 × 8	=	Rs. 1,20,000
Semi skilled workers	=	8 Nos. @ Rs. 20 for	100 × 8	=	Rs. 1,28,000
Unskilled workers	=	6 Nos. @ Rs. 16 for	100 × 8	=	Rs. 76,800
					Rs. 3,24,800

Standard gang time = 800 hours.
Standard gang rate/hr. = Rs. 3,24,800 ÷ 800 = Rs. 406/hr.

(ii) Actual labour cost:

		No.		Days		hr.day		Rate	=	Rs.
Skilled workers	=	8	×	104	×	8	×	Rs. 30	=	Rs. 1,99,680
Semi skilled workers	=	6	×	104	×	8	×	Rs. 24	=	Rs. 1,19,808
Unskilled workers	=	6	×	104	×	8	×	Rs. 16	=	Rs. 79,872
										Rs. 3,99,360

(iii) Standard labour cost for actual hours of actual gang:

			Days hrs.		
Skilled workers	=	8 Nos. @ Rs. 25 for	104 × 8	=	Rs. 1,66,400
Semi skilled workers	=	6 Nos. @ Rs. 20 for	104 × 8	=	Rs. 99,840
Unskilled workers	=	6 Nos. @ Rs. 16 for	104 × 8	=	Rs. 79,872
					Rs. 3,46,112

(iv) Standard labour cost for actual hours of standard gang:

			Days hrs.		
Skilled workers	=	6 Nos. @ Rs. 25 for	104 × 8	=	Rs. 1,24,800
Semi skilled workers	=	8 Nos. @ Rs. 20 for	104 × 8	=	Rs. 1,33,120
Unskilled workers	=	6 Nos. @ Rs. 16 for	104 × 8	=	Rs. 79,872
					Rs. 3,37,792

(v) Standard labour cost for actual hours utilised for completion of the work.

$(104 \times 8 - 16) \times$ Rs. 406 = Rs. 3,31,296

Calculation of Variances:

(a) *Labour Cost Variance:*
(Actual labour cost – Std. Cost of Actual hours utilised for completion of the Work):
(3,99,360 – 3,31,296) = Rs. 68,064 (Adv.)

(b) *Labour Rate Variance:*
(Actual labour cost – Std. L. Cost for Actual hours of Actual gang):
(3,99,360 – 3,46,112) = Rs. 53,248 (Adv.)

(c) *Labour Efficiency Variance:* (Std L. Cost of Actual hrs – Std Labour Cost of Actual hrs. utilised for Completion of the Work):
= (3,46,112 – 3,31,269) = Rs. 14,816 (Adv.)

(d) *Labour Mix Variance:* (Std L Cost of Actual hours – Std Lab. Cost of Actual hrs in Std Mix)
= (3,46,112 – 3,37,792) = Rs. 8,320 (Adv.)

(e) *Idle time Variance* = Idle time × Std Rate = 16 × 406 = Rs. 6,496 (Adv)
Alternatively: Labour Cost variance: (Labour rate variance + Labour efficiency variance)
= [53,248 (A) + 14,816 (A)]
= Rs. 68,064 (Adv.)
Labour Efficiency Variance = (L. Mix V + Idle time V.)
= [8,320 (A) + 6,496 (A)]
= Rs. 14,816 (Adv.)

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Example 19.18

The following cost data are available for the year 2005:

	Budgeted		*Actual*
Fixed overhead	96,000	(yearly)	8,500 (monthly)
Working days	300	(yearly)	–
Production (units)	24,000	(yearly)	2,100 (monthly)
Working hours in a day	8		–
Idle time (hrs.)	–		4

Find out idle time variance *(ICWA, Stage 2, Dec. 2006)*

Solution:

Let FO_2 stand for Budgeted fixed overhead for one month = Rs. 96,000/12 = Rs. 8,000
Let FO_3 stand for Standard fixed overhead for hours available during the period at standard rate.

$$= \frac{\text{Fixed overhead for one month}}{\text{Budgeted hours} \times \text{Hours available in a month}}$$

$$= \frac{\text{Rs. 8,000}}{\dfrac{\text{Budgeted hours available in a year}}{12}} \times \text{Hours available in a year}$$

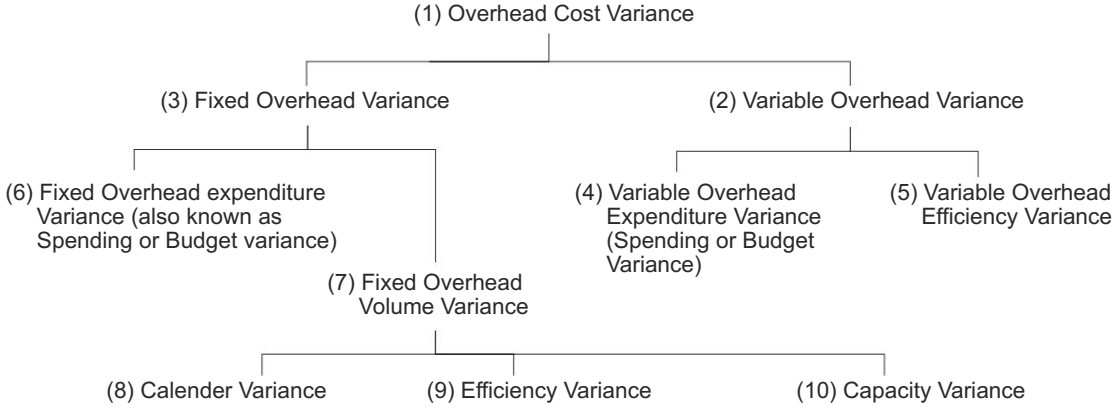
$$= \frac{\text{Rs. 8,000}}{\dfrac{\text{300 days} \times \text{8 hours}}{12}} \text{ (Budgeted hrs. for a month – Idle hrs)}$$

$$= \frac{\text{Rs. 8,000}}{\text{200 hrs}} \text{ (200 hrs – 4)} = \frac{\text{Rs. 8,000}}{200} \text{ 196 or Rs. 7,840}$$

Idle Time Variance = $FO_2 - FO_3$
= Rs. 8,000 – Rs. 7,840 = Rs. 160 (A)

OVERHEAD VARIANCES

The analysis of factory overhead variances is more complex than variance analysis for direct materials and direct labour. Generally, overhead variances constitute the following variances:



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1. Total Overhead Cost Variance

This overall overhead variance is the difference between the actual overhead cost incurred and the standard cost of overhead for the output achieved. This can be computed by applying the following formula:

(Actual overhead incurred – Standard hours for the actual output × Standard overhead rate per hour)

or

Actual overhead incurred – (Actual output × Standard overhead rate per unit)

To illustrate the overall overhead variance, assume that the actual overhead for a department amounts to Rs. 10,00,000 for the month of January, 2002 and standard (or allowed) hours for work performed total 4500 hours, while actual hours used are 5000. If overhead rate is Rs 200 per hour, the overall overhead variance will be the following:

Actual department overhead	Rs. 10,00,000
Overhead charged to production (4500 hr × Rs. 200)	Rs. 9,00,000
Overall or net overhead variance (Unfavourable)	Rs. 1,00,000

2. Variable Overhead Variance

It is the difference between actual variable overhead cost and standard variable overhead allowed for the actual output achieved. The formula for computing this variance is as follows:

Actual overhead cost – (Actual output × Variable overhead rate per unit)

or

Actual overhead cost – (Standard hours for actual output × Standard variable overhead rate per hour)

3. Fixed Overhead Variance

This variance indicates the difference between the actual fixed overhead cost and standard fixed overhead cost allowed for the actual output. This variance is found by using the following formula.

Fixed overhead variance = Actual overhead cost – Fixed overhead absorbed

or

Actual overhead cost – (Standard hours for actual output × Standard fixed overhead rate per hour).

4. Variable Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual variable overhead and budgeted variable overhead based on actual hours worked. This variance is found by using the following formula:

(Actual variable overhead – Budgeted variable overhead)

5. Variable Overhead Efficiency Variance

This variance is like labour efficiency variance and arises when actual hours worked differ from standard hours required for good units produced. The actual quantity produced and standard quantity fixed might be different because of higher or lower efficiency of workers employed in the manufacturing of goods. This variance is found by using the following formula:

(Actual hours – Standard hours for actual output) × Standard variable overhead rate per hour

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6. Fixed Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual fixed overhead and budgeted fixed overhead. The formula for computing this variance is as follows:

(Actual fixed overhead – Budgeted fixed overhead)

If actual fixed overhead costs are greater than budgeted fixed costs, an unfavourable variance results because actual costs exceed the budget. Actual overhead costs seldom equal budgeted costs because property tax rates may change, insurance premiums may increase or equipment charges may affect depreciation rates. As an illustration, assume that a company completed 36000 units (equal to 18000 standard productive hours) in 18500 hours at the recorded fixed cost of Rs 75,100. The standard fixed cost rate per hour is Rs 4. Therefore,

Expenditure variance = (Actual overhead costs – Budgeted overhead costs)
That is = (75,100 – 18,500 × 4)
= (75,100 – 74,000)
= Rs 1,100 (unfavourable)

The expenditure or budget variance provides management with information which helps in controlling costs. The budget variance is usually prepared on a departmental basis and the factors that cause the budget variance are, therefore, controllable by departmental managers.

7. Fixed Overhead Volume Variance

Volume variance relates to only fixed overhead. This variance arises due to the difference between the standard fixed overhead cost allowed (absorbed) for the actual output and the budgeted fixed overhead based on standard hours allowed for actual output achieved during the period. The variance shows the over- or under-absorption of fixed overheads during a particular period. If the actual output is more than the standard output, there is over-absorption and variance is favourable. If actual output is less than the standard output, the volume variance is unfavourable. The formula for computing this variance is as follows:

(Budgeted overhead applied to actual output – Budgeted fixed overhead based on standard hours allowed for actual output)

or

(Actual production – Budgeted production) × Standard fixed overhead rate per unit

Volume variance is further sub-divided into three variances.

8. Fixed Overhead Calendar Variance

It is that portion of volume variance which is due to the difference between the number of actual working days in the period to which the budget is applicable and budgeted number of days in the budget period.

If actual working days is more than the budgeted working days, the variance is favourable as work has been done on days more than budgeted or allowed and vice-versa. The formula is as follows:

(No. of actual working days – No. of budgeted working days) × Standard fixed overhead rate per day

Calendar variance can be computed based on hours or output. Then the formulae are:

Hours Basis:

Calendar variance = (Revised budget capacity hours – Budgeted hours) × Standard fixed overhead rate per hour

If revised budgeted capacity hours are more than the budgeted hours, the variance will be favourable. In the reverse situation, the variance will be unfavourable.

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Output Basis

Calendar variance = (Revised budgeted quantity in terms of actual number of days worked – Budgeted quantity) × Standard fixed overhead rate per unit

If revised budgeted quantity is more than the budgeted quantity the variance is favourable; if revised budgeted quantity is less, the variance will be unfavourable.

9. Fixed Overhead Efficiency Variance

It is that portion of volume variance which arises when actual hours of production used for actual output differ from the standard hours specified for that output. If actual hours worked are less than the standard hours, the variance is favourable and when actual hours are more than the standard hours, the variance is unfavourable. The formula is:

Fixed overhead efficiency variance = (Actual hours – Standard hours for actual production) × Standard fixed overhead rate per hour

or

Fixed overhead efficiency variance = (Actual production – Standard production as per actual time available) × Standard fixed overhead rate per unit)

10. Fixed Overhead Capacity Variance

It is that part of fixed overhead volume variance which is due to the difference between the actual capacity (in hours) worked during a given period and the budgeted capacity (expressed in hours). The formula is:

Capacity variance = (Actual capacity hours – Budgeted capacity hours) × Standard fixed overhead rate per hour

This variance represents idle time also. If actual capacity hours are more than the budgeted capacity hours, the variance is favourable and if actual capacity hours are less than the budgeted capacity hours, the variance will be unfavourable.

In case actual number of days and budgeted number of days are also given, then budgeted capacity hours will be calculated in terms of actual number of days and it will be known as revised budgeted capacity hours, that is, budgeted hours for actual days worked. In this situation, the formula for calculating capacity variance will be as follows:

Capacity variance = (Actual capacity hours – Revised budgeted capacity hours) × Standard fixed overhead rate per hour

In the above formula, the variance will be favourable if actual capacity hours are more than the revised budgeted hours. However, if actual capacity hours are lesser than the revised budgeted hours, the variance will be adverse as lesser hours means that lesser actual hours have been worked taking the actual days utilised into account.

Two-way, Three-way and Four-way Variance Analysis

The above overhead variances are also classified as Two-way, Three-way and Four-way variance. The different variances under these categories are listed below. The formulae for computing these variances are similar to as explained in the preceding section.

A. Two-way Variance Analysis

1. Controllable variance (Budget variance)
2. Volume variance (Uncontrollable variance)

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B. Three-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Capacity variance
3. Efficiency variance

C. Four-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Variable overhead efficiency variance
3. Fixed overhead efficiency variance
4. Capacity variance

Example 19.19

A company using standard costing system has the following information for the budget period:
Budgeted variable overheads = Rs. 8,00,000
Budgeted fixed overheads = Rs. 5,00,000
Overheads are recovered on the basis of standard machine hours. The company had budgeted for 100,000 machine hours for the year.
During the budge period the company used 1,10,000 machine hours while it should have used 95,000 machine hours for actual output.
Actual variable overheads Rs. 8,00,000
Actual fixed overheads Rs. 4,70,000
Calculate the following variances:

(i) Variable overhead cost variance;
(ii) Variable overhead spending variance;
(iii) Variable overhead efficiency variance;
(iv) Fixed overhead cost variance;
(v) Fixed overhead expenditure variance;
(vi) Fixed overhead volume variance;
(vii) Fixed overhead efficiency variance;
(viii) Fixed overhead capacity variance. *(B.Com.(Hons), Delhi, 2007)*

Solution:

$$\text{Budgeted fixed overheads per standard hour} = \frac{\text{Budgeted Fixed Overheads}}{\text{Budgeted Std. Hours}} = \frac{\text{Rs. 5,00,000}}{100{,}000} = \text{Rs. 5}$$

$$\text{Budgeted variable overheads per standard hour} = \frac{\text{Budgeted Variable Overheads}}{\text{Budgeted Std. Hours}} = \frac{\text{Rs. 8,00,000}}{1{,}00{,}000} = \text{Rs. 8}$$

(i) $$\text{Variable overhead cost variance} = \frac{\text{Budgeted variable overheads}}{\text{for actual output}} - \frac{\text{Actual variable overheads}}{\text{for actual output}}$$

= (Budgeted variable overheads per standard hour × Actual output in Std. hrs) – Actual variable over heads
= (8 × 95,000) – Rs. 8,00,000 = Rs. 7,60,000 – Rs. 8,00,000 = Rs. 40,000 (A)

(ii) Variable overhead spending variance = Budgeted variable overheads – Actual variable overheads
= Rs. 8,00,000 – Rs. 8,00,000 = Nil

(iii) $$\text{Variable overheads efficiency variance} = \text{Budgeted variable overheads per standard hour} \left(\text{Budgeted output in standard hours} - \text{Actual output in standard hours} \right)$$

$$= 8(1,00,000 - 95,000) = \text{Rs. } 40,000 \text{ (A)}$$

$$\text{Variable overhead cost variance} = \text{Rs. } 40,000 \text{ (A)} = \left(\text{Variable overheads spanding variance} - \text{Variable overhead efficiency variance} \right)$$

$$= \text{Nil} + \text{Rs. } 40,000 \text{ (A)} = \text{Rs. } 40,000 \text{ (A)}$$

(iv) $$\text{Fixed overheads cost variance} = \text{Budgeted fixed overheads for actual output} - \text{Actual fixed overheads for actual output}$$

= (Budgeted fixed overheads per standard hour × Actual output in standard hours) – Actual fixed overheads

= Rs. 5 × 95,000 – Rs. 4,70,000 = Rs. 4,75,000 – Rs. 4,70,000 = Rs. 5,000 (F)

(v) Fixed Overheads Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overhead

= Rs. 5,00,000 – Rs. 4,70,000 = Rs. 30,000 (F)

(vi) $$\text{Fixed overheads volume variance} = \text{Budgeted fixed overheads per standard hour} \left(\text{Budgeted output in standard hours} - \text{Actual output in standard hours} \right)$$

$$= 5(1,00,000 - 95,000) = \text{Rs. } 25,000 \text{ (A)}$$

Fixed overhead variance = Rs. 5,000 (F) = Fixed overheads expenditure var. + Fixed overheads volume variance

= Rs. 30,000 (F) + Rs. 25,000 (A) = Rs. 5,000 (F)

(vii) $$\text{Fixed overheads efficiency variance} = \text{Budgeted fixed overheads per standard hour} \left(\text{Budgeted hours for actual output} - \text{Actual hours worked for actual output} \right)$$

$$= \text{Rs. } 5\ (95,000 - 1,10,000) = \text{Rs. } 75,000 \text{ (A)}$$

(viii) $$\text{Fixed overheads capacity variance} = \text{Budgeted fixed overheads per standard hour} \text{ (Budgeted Hours – Actual hours woked)}$$

$$= \text{Rs. } 5\ (1,00,000 - 1,10,000) = \text{Rs. } 50,000 \text{ (F)}$$

Fixed overhead volume var. = Rs. 25,000 (A) = Fixed overhead efficiency variance + Fixed overhead capacity var.

= Rs. 75,000 (A) + Rs. 50,000 (F) = Rs. 25,000 (A).

Example 19.20

Details of fixed overheads, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	Rs. 10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	Rs. 94,000

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Calculate:

(i) Fixed overhead cost variance;
(ii) Fixed overhead expenditure variance; and
(iii) Fixed overhead volume variance. *(B.Com.(Hons), Delhi, 2005)*

Solution:

FOCV = Std. F/O for Actual output – Actual F/O for Actual output
= 1920 × 50 – 94000 = 2000 (F)

FO. Expenditure Variance = Budgeted Exp. – Actual Exp
= 1,00,000 – 94000 = 6000 (F)

$$\text{Fixed Overhead Volume Variance} = \left(\begin{matrix}\text{Budgeted}\\ \text{overhead}\end{matrix} - \begin{matrix}\text{Actual}\\ \text{overhead}\end{matrix}\right) \times \text{Budgeted Rate}$$

= (2000 – 1920) 50 = 4,000 (A)

Workings:

$$\text{Budgeted output} = \frac{\text{Budgeted Hours}}{\text{Budgeted Rate}} = \frac{10000}{5} = 2000 \text{ units}$$

Budgeted Expenditure = Budgeted Hours × Std. F/O per hour.
= 10000 × Rs. 10 = Rs. 1,00,000

Budgeted Rate per unit of output.

$$\text{Rs.} = \frac{1,00,000}{2000} = \text{Rs. 50 per unit}$$

Example 19.21

A company has a normal capacity of 120 machines working hours per day of 25 days in a month. The fixed overheads are budgeted Rs. 1,44,000 per month. The standard time required to manufacture one unit of production is 4 hours.

In April 1998, the company worked 24 days of 840 machine hours and produced 5305 units of output. The actual fixed overheads are Rs. 1,42,000.

Compute:

(i) Efficiency variance;
(ii) Capacity variance;
(iii) Calendar variance; *(B.Com.(Hons), Delhi 2005)*

Solution:

(i) *Calendar Variance:*

Budgeted output for Budgeted Hours of Budgeted days	—	Budgeted output for Budgeted Hours of Actual Days.

$$= \left(\frac{1}{4} \times 24,000 - \frac{1}{4} \times 23,040\right) 24$$

= (6,000 – 5,760) 24 = 5,760 (A)

Workings:

Budgeted Hours for Budgeted days = (8 × 120) × 25
= 24000 Hours.
Budgeted Hours for actual days = (8 × 120) × 24
= 23040 Hours

(ii) *Capacity Variance:*

Budgeted output for Budgeted Hours of actual days – Budgeted output for actual hours of actual days

$$= \left(23{,}040 \times \frac{1}{4} - 20160 \times \frac{1}{4}\right)24$$

= (5760 – 5040) 24 = 17,280 (A)

(iii) *Efficiency Variance:*

Budgeted output for actual Hours for actual days – Budgeted output for actual hours of actual days

= (5040 – 5305) 24 = 6360 (F)

Example 19.22

The following information is available from the cost records of a company for December, 2003:

	Rs.
Materials purchased 20000 pieces	88,000
Materials consumed 19000 pieces	
Actual wages paid for 4950 hours	24,750
Fixed factory overheads budgeted	40,000
Fixed factory overheads incurred	44,000

Units produced – 1800
Standard rates and prices are:
Direct material rate – Rs. 4 per piece.
Standard output – 10 pieces per unit
Direct labour rate – Rs. 4 per hour
Standard hours required to produce a unit – 2.5 hours
Overheads – Rs. 8 per labour hour

Compute the following variances:

(a) Material price and usage;
(b) Labour rate and efficiency;
(c) Fixed overheads expenditure variance;
(d) Fixed overheads volume variance. *(B.Com.(Hons), Delhi 2004)*

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Solution:

Ans. (a) Standard Cost Card (per unit)

Element of Cost	*Quantity of Hour Rs.*	*Rate Rs.*	*Standard Cost*
Direct material	10 Pieces	4	40
Direct labour	2.5 Hours	4	10
Overheads	2.5 Hours	8	20
Total Standard Cost			70

Calculation of Variance

(*a*) *Material Price Variance:*

= Actual Usage (St. Price – Actual Price)

= 19000 pieces (Rs. 4 – Rs. 4.40) = Rs. 7,600 Adverse

$$\text{(Actual Price} = \frac{\text{Rs. } 88{,}000}{20000} = \text{Rs. } 4.40\text{)}$$

Material Usage Variance

= St. Price (St. Usage – Actual Usage)

= Rs. 4 (18000 pieces – 19000 pieces) = Rs. 4,000 (Adverse)

(St. Usage = For 1800 units @ 10 pieces = 18000 pieces.

(*b*) *Labour Rate and Efficiency Variance:*

Labour Rate Variance = Actual Time (St. Rate – Actual Rate)

= 4950 hrs. (Rs. 4 – Rs. 5) = Rs. 4,950 (Adverse)

$$\text{Actual Rate} = \frac{\text{Actual Labour Cost}}{\text{Actual Time}} = \text{Rs. } 5$$

Labour Efficiency Variance:

St. Rate (St. Time – Actual Time)

= Rs. 4 (4500 hours – 4950 hours) = Rs. 1800 (Adverse)

(*c*) *Fixed Overhead Expenditure Variance:*

Budgeted Overheads – Actual Overheads

Rs. 40,000 – Rs. 44,000 = Rs. 4,000 (Adverse)

(*d*) *Fixed Overhead Volume Variance:*

= St. fixed Overhead Rate per unit

(Actual output – Budgeted output)

= 2.5 hrs. × Rs. 8 (1800 units – 2000 units)

= Rs. 4,000 (Adverse)

$$\text{Budgeted output} = \frac{\text{Budgeted overheads}}{\text{St. overhead per unit}}$$

$$= \frac{\text{Rs. } 40{,}000}{\text{Rs. } 20} = 2000 \text{ units.}$$

Example 19.23

From the following data, calculate:

(1) Fixed overhead expenditure variance;
(2) Fixed overhead volume variance;
(3) Fixed overhead cost variance.

	Budgeted	*Actual*
Fixed overheads for July	Rs. 10,000	Rs. 10,200
Units of production in July	5,000	5,200
Standard time for one unit	4 hours	–
Actual hours worked		20,100 hrs

(B.Com.(Hons), Delhi, 2002)

Solution:

(1) *Fixed Overhead Expenditure Variance:*
Budgeted Overhead – Actual Overhead
Rs. 10,000 – Rs. 10,200 = Rs. 200 (A)

(2) *Fixed Overhead Volume Variance:*

(i) Where Std. rate per unit is given,
(Actual Production – Budgeted Production) × Std. Rate per Unit,

$$\text{Standard Fixed Overhead rate per unit} = \frac{10000}{5000} = \text{Rs. } 2$$

(5,200 – 5,000) × Rs. 2 = 400 (F)

(ii) When Std. rate per hour is given,
(Std. hours for Actual Production – Budgeted hours) × Std. Rate per hour

$$\text{Standard Fixed Overhead rate per hour} = \frac{\text{Rs. } 2}{4 \text{ Hours}} = \text{Rs. } 0.50$$

(5,200 × 4 – 5,000 × 4) × Rs. 0.50
(20,800 – 20,000) × Rs. 0.50
800 × Rs. 0.50 = 400 (F)

(3) *Fixed overhead cost variance:*
(St. overhead cost of actual output – Actual overhead costs)
(5,200 × Rs. 2) – 10,200
Rs. 10,400 – 10,200 = Rs. 200 (F)

Example 19.24

Kolkata Furniture manufactures modular tables, chairs and office desks. The standard labour times required per unit of table, chair and desk are 4 hours, 2 hours and 8 hours respectively. The budgeted production per week is 140 standard hours and budgeted fixed overheads per week is Rs. 70,000.
During a particular week the firm achieved the following output:

Tables	8 Nos.
Chairs	8 Nos.
Desks	9 Nos.

The actual fixed production overhead amounted to Rs. 75,000. *(ICWA, Inter, Stage 1, Dec. 2003)*

Calculate:

(i) Fixed overhead variance
(ii) Expenditure variance
(iii) Volume variance

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Solution:

Standard FOH Rate per hour = Rs. 70,000 ÷ 140 hrs. = Rs. 500
Standard hours of Actual Production: 120 hours

Table	$= 8 \times 4$	=	32 hours
Chairs	$= 8 \times 2$	=	16 hours
Desks	$= 9 \times 8$	=	72 hours

Actual Fixed Production overhead: Rs. 75,000

(i) Fixed Production OH: Total variance:
(Standard FOH of Actual production – Actual FOH)
= Rs. (120 × 500) – Rs. 75,000 = Rs. 60,000 – Rs. 75,000 = Rs. 15,000 (Adv.)

(ii) Fixed Production OH: Expenditure variance:
(Budgeted FOH – Actual FOH) = Rs. 70,000 – Rs. 75,000 = Rs. 5,000 (Adv.)

(iii) Fixed Production OH: Volume variance:
(Budgeted FOH – Std. FOH of Actual Production)
= Rs. 70,000 – Rs. 120 × 500 = Rs. 70,000 – Rs. 60,000 = Rs. 10,000 (Adv.)

	Rs.	Rs.
Reconciliation		
Standard FOH of Actual Production: (120 × 500)		60,000
Add: Adverse variances –		
Expenditure variance	5,000	
Volume variance	10,000	15,000
Actual fixed overhead		75,000

Example 19.25

The following information was obtained from the records of a manufacturing unit using Standard Costing System:

	Standard	*Actual*
Production	4000 units	3800 units
Working days	20	21
Fixed overhead (Rs.)	40,000	39,000
Variable overhead (Rs.)	12,000	12,000

You are required to calculate the following overhead variances:

(a) Variable overhead variance
(b) Fixed overhead variance
  (i) Expenditure variance
  (ii) Volume variance
  (iii) Efficiency variance
  (iv) Calendar variance
(c) Also prepare a Reconciliation Statement for the standard fixed expenses worked out at Standard fixed overhead rate and the Actual fixed overhead. *(CA Inter, ICWA Inter)*

Solution:

Basic calculations	*Budgeted data*	*Actual data*
Variable overhead (Rs.)	12,000	12,000
Fixed overhead (Rs.)	40,000	39,000

Production (units)	4,000	3,800
Working (days)	21	20

$$\text{Standard variable overhead rate per unit} = \frac{12{,}000}{4000 \text{ units}} = \text{Rs. } 3$$

$$\text{Standard production per day} = \frac{4000 \text{ units}}{20 \text{ days}} = 200 \text{ units}$$

Standard fixed overhead per day = 200 × Rs. 10 = Rs. 2,000

(a) Variable overhead cost variance = Actual variable overhead – Recovered variable overhead
= 12,000 – 3,800 × 3
= 12,000 – 11,400 = Rs. 600 (A)

(b) Fixed overhead variance = (Actual fixed overheads – Recovered fixed overheads)
= 39,000 – 3,800 × 10
= 39,000 – 38,000 = Rs 1,000 (A)

(i) Fixed overhead expenditure variance = Actual overheads – Budgeted overheads
= 39,000 – 40,000 = Rs. 1,000 (F)

(ii) Fixed overhead volume variance = Recovered overheads – Budgeted overheads
= 38,000 – 40,000 = Rs. 2,000 (A)

(iii) Fixed overhead efficiency variance = Standard fixed overhead rate per day × (Actual time – Standard time for actual output)
= 2,000 × (21 – 3,800/200)
= 2000 (21 – 19) = 4,000 (A)

(iv) Fixed overhead calendar variance = Standard fixed overhead rate per day × (Actual days – Budgeted days)
= 2,000 × (21 – 20)
= Rs. 2,000 (F)

or

Standard fixed overhead rate per day × Extra days/Deficit worked
= 2,000 × 1 = 2,000 (F)

(c) Reconciliation statement

Standard fixed overheads 3800 × 100		Rs. 38,000
Less: Fixed overhead expenditure variance	1,000 (F)	
Less: Fixed overhead calendar variance	2,000 (F)	3,000 (F)
		35,000
Add: Fixed overhead efficiency variance (A)		4,000
Actual Fixed Overheads		39,000

Example 19.26

A Company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads of a month are Rs 1,50,000. The Standard time required to manufacture one unit of product is 4 hours. In a particular month, the Company worked for 24 days of 750 machine hours per day and produced 4,500 units of the product. The actual fixed overheads incurred were Rs. 1,45,000. Compute:

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(a) Efficiency variance
(b) Capacity variance
(c) Calendar variance
(d) Expenditure variance
(e) Volume variance and
(f) Total fixed overhead variance *(CA Inter, May 2001)*

Solution:

Standard/Budgeted Data		Actual Data	
Budgeted fixed Overhead (Rs.)	1,50,000	Actual fixed overhead (Rs.)	1,45,000
Budgeted output units	5000	Actual output units	4500
Budgeted hours	20000	Actual hours	18000
Budgeted days	25	Actual days	24
Standard labour hours per unit	4		
Standard hours worked per day	800		
Standard rate per unit (Rs.)	30		
Standard rate per hour (Rs.)	7.50		
Standard fixed overhead rate per day (Rs.)	6,000		

Computation of Variances:

(a) *Efficiency Variance:*

$$= \text{Standard fixed overhead rate per unit} \left\{ \begin{matrix} \text{Actual quantity} \\ \text{of output} \end{matrix} - \begin{matrix} \text{Standard quantity} \\ \text{of output} \end{matrix} \right\}$$

= Rs. 30 {4,500 units – 4,500 units} = Nil

(b) *Capacity Variance:*

= Standard fixed overhead rate per hour {Actual capacity hours – Budgeted capacity hours}
= Rs. 7.50 (18000 hours – 24 days × 800 hours)
= Rs. 7.50 (18000 hours – 19200 hours)
= Rs. 9,000 (Adverse)

(c) *Calendar variance:*

= Standard fixed overhead rate per day {Actual days – Budgeted days}
= Rs. 6,000 (24 days – 25 days)
= Rs. 6,000 (Adverse)

(d) *Expenditure Variance:*

= {Budgeted fixed overhead – Actual fixed overhead}
= {Rs. 1,50,000 – Rs. 1,45,000}
= Rs. 5,000 (Favourable)

(e) *Volume Variance:*

= Standard fixed overhead rate per unit {Actual output – Budgeted output}
= Rs. 30 (4,500 units – 5,000 units)
= Rs. 15,000 (Adverse)

(f) *Total Fixed Overhead Variance:*

= {Fixed overhead recovered on actual output – Actual fixed overhead incurred}

= {4,500 units × Rs. 30 – Rs. 145,000}

= Rs. 10,000 (Adverse)

Verification:

Total fixed overhead variance or Rs. 10,000 (Adverse)	= Expenditure variance + Volume variance = Rs. 5,000 (Favourable) + Rs. 15,000 (Adverse)
and	
Volume variance Rs. 15,000 (Adverse)	= Efficiency variance + Capacity variance + Calendar variance = Nil + Rs. 9,000 (Adverse) + Rs. 6,000 (Adverse)

Example 19.27

The following data is given:

	Budget	*Actuals*
Production (in units)	400	360
Man-hours to produce above	8000	7000
Variable overheads (Rs.)	10,000	9,150

The standard time to produce one unit of the product is 20 hours.

Calculate variable overhead variances and give necessary journal entries to record the transactions.

(CA Inter, Nov. 1997, B. Com. (Hons), Delhi 2000)

Solution:

Basic Calculations

1. Standard Variable Overhead per unit:
   Rs. 10,000/400 units = Rs. 25 per unit
2. Standard Variable Overhead per hour:
   Rs. 10,000/8,000 hrs. = Rs. 1.25 per hour
3. Recovered Variable Overhead:
   = Actual Output × Standard Variable Overhead per hour
   = 360 units × Rs. 25 = Rs. 9,000
4. Budgeted Variable Overhead (based on actual hours worked):
   = Actual hours Worked × Standard Variable Overhead per hour
   = 7,000 hrs. × Rs. 1.25 = Rs. 8,750
5. Standard Hours for actual output:
   = Actual Output × Standard Hours per unit
   = 360 units × 20 hours = 7,200 hours

Computation of Variances:

(i) *Variable Overhead Cost Variance:*

= Recovered Variable Overhead – Actual Variable Overheads

= Rs. 9,000 – Rs. 9,150 = Rs. 150 (A)

(ii) *Variable Overhead Budget or Expenditure Variance:*

= Budgeted Variable Overheads – Actual Variable Overheads

= Rs. 8,750 – Rs. 9,150 = Rs. 400 (A)

(iii) *Variable Overhead Efficiency Variance:*

= Standard Variable Overhead per hour (Standard Hours for Actual Output – Actual Hours)

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= Recovered Variable Overheads – Budgeted Variable Overheads
= Rs. 9,000 – Rs. 8,750
= Rs. 250 (F)

Verification

Variable Overhead Cost Variance	=	Variable Overhead Budgets Variance + Variable Overhead Efficiency Variance
Rs. 150 (A)	=	Rs. 400 (A) + Rs. 250 (F)

Journal Entries

			Dr. Rs.	*Cr.* Rs.
1.	Variable Overheads Control A/c	Dr.	8,750	
	Variable Overheads Expenditure Variance A/c	Dr.	400	
	To Bank/Creditors			9,150
2.	Work-in-progress Control A/c	Dr.	9,000	
	To Variable Overheads Control A/c			8,750
	To Variable Overheads Efficiency Variance A/c			250

Example 19.28

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of Budgeted Working Days	25
Budgeted Man-hours per day	6000
Output (budgeted) per man hour (in units)	1
Fixed Overhead cost as budgeted	Rs. 1,50,000
Actual Number of Working days	27
Actual man-hours per day	6300
Actual Output per man-hour (in units)	0.9
Actual Fixed Overhead Variances:	Rs. 1,56,000

Calculate Fixed Overhead Variances:

(a) Expenditure Variance;
(b) Calendar Variance;
(c) Capacity Variance;
(d) Efficiency Variance;
(e) Volume Variance;
(f) Fixed Cost Variance. *(ICWA Inter, Dec. 1995)*

Solution:

(a) FOEXV	=	Budgeted Fixed Overheads – Actual Fixed Overheads
	=	Rs. 1,50,000 – Rs. 1,56,000
	=	Rs. 6,000 (Adverse)
(B) FOCALV	=	No. of Excess Working Days × Fixed Overhead Rate per Day
	=	2 × 6,000 = Rs. 12,000 (Favourable)

	or	Possible Overheads – Budgeted Overheads
		= 27 × 6,000 – 25 × 6,000
		= Rs. 1,52,000 – 1,50,000 = Rs. 12,000 (Favourable)
(c)	FOCAPV (Revised)	= Standard Overheads – Possible Overheads
		= Re. 1 × 6,300 × 27 – 1,62,000
		= Rs. 1,70,100 – 1,62,000 = Rs. 8,100 (Favourable)
(d)	FOEFFV	= Recovered Overheads – Standard Overheads
		= 9 × 6,300 × 27 – 1,70,100
		= Rs. 1,53,090 – Rs. 1,70,100 = Rs 17,010 (Adverse)
(e)	FOCV	= FOEXPV + FOVV
		= FOEXPV + FOCALV + FORCAPV + FOEFFV
		= Rs. 6,000 (A) + Rs 12,000 (F) + 8,100 (F) + 17,010 (A)
		= Rs. 2,910 (Adverse)

Example 19.29

The details regarding a food product manufactured by ABC Co. for the last one week are as follows:

Standard Cost (For one unit)		Rs.
Direct Materials	10 units @ Rs. 1.50	15
Direct Wages	5 hours @ Rs. 8.00	40
Production Overheads	5 hours @ Rs. 10.00	50
		105

Actuals (For whole activity)	
Direct Materials	Rs. 6,435
Direct Wages	Rs. 16,324
Analysis of Variances	
Direct Materials	
Price	Rs. 585 (Adverse)
Usage	Rs. 375 (Favourable)
Direct Wages (Labour)	
Rate	Rs. 636 (Favourable)
Efficiency	Rs. 360 (Adverse)
Production Overheads	
Expenditure	Rs. 400 (Favourable)
Volume	Rs. 750 (Favourable)

You are required to calculate:

(i) actual output units;
(ii) actual price of material per unit;
(iii) actual wage rate per labour hour;
(iv) the amount of production overhead incurred and
(v) the production overhead efficiency variance *(CA Inter, May 1999)*

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Solution:

(i) *Computation of Actual Output in units*

DMCV = DMPV + DMUV
= Rs. 585 (A) + Rs. 375 (F)
= Rs. 210 (A)

or DMCV = Standard Cost for Actual Output – Actual Cost

Let units produced be taken as X

or 210 (A) = 15*x* – 6,435

or – 15X = – 6225

or X = 415 units.

(ii) *Actual Price of Material per unit*

DMUV = SR × (Standard Qty. for Actual Output – Actual Qty.)

or 375 (F) = 1.5 × (4,150 – X)

or 375 (F) = 6,225 – 1.5X

or 1.5X = 5,850

or X = 3,900 units

$$\text{Actual Price of Material per unit} = \frac{\text{Actul Cost}}{\text{Actual Quantity}}$$

$$= \frac{6,435}{3,900} = \text{Rs. } 1.65$$

(iii) *Actual Wage Rate per hour*

DLRV = Actual Hrs. × (SR – AR)

636 (F) = Standard Wages – Actual Wages

636 (F) = 8 × X* – 16,324

* Presuming as actual hours worked.

or 8X = Rs. 16,960

or X = 2,120 hours

$$\text{Actual Wage Rate per hour} = \frac{\text{Actul Wages}}{\text{Actual Hours}}$$

$$= \frac{16,324}{2,120} = \text{Rs. } 7.70 \text{ per hour}$$

(iv) *Amount of Production Overheads incurred*

Production Overhead Cost Variance = Expenditure Variance + Volume Variance
= Rs. 400 (F) + Rs. 750 (F)
= Rs. 1,150 (F)

Production Overhead Cost Variance = Recovered Overheads – Actual Overheads

Rs. 1,150 (F) = 415 × 50 – X*

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*taking overheads as X

or Rs. 1,150 (F) = 20,750 – X

or X = Rs. 19,600

$$\text{Production Overhead Efficiency} = \begin{pmatrix}\text{Std. Overhead}\\ \text{Rate per hour}\end{pmatrix} \times \begin{pmatrix}\text{Std. Hrs. for Actual Production} - \text{Actual Hours}\end{pmatrix}$$

Variance

= Rs. 10 × (415 × 5 – 2,120)

= Rs. 10 × (2,075 – 2,120)

= Rs. 10 × 45 = Rs. 450 Adverse

Example 19.30

SVL Ltd. uses a basic plan Standard Costing System in its factory. Unfavourable variances in a process have been about Rs. 3,000 a month. If the cause of variance can be found out and if that cause is correctible, it will take two months to correct it. The correction, if made, would be effective for two months. Investigation of variance will cost Rs. 980. Correcting the cause, if a cause is found, will cost Rs. 2,500. Management believes the probability of finding a correctible cause is 0.70.

Required:

(i) Would you recommend launching an investigation?

(ii) What is the minimum probability of finding a correctable cause that would justify an investigation?

(ICWA, Stage 2, Dec. 2003)

Solution:

(i) It is given that correction of cause of variance would be effective for two months. Thus the ensuing benefit will be:

	(Rs.)
Benefit: Rs. 3000 × 2	6000
Less: Cost of correcting the cause	2500
Benefit	3500
Probability	0.70
Expected value of benefit (3500 × 0.70)	Rs. 2450
Less: Cost of investigation	980
Net value of benefit	1470

Recommendation: Since, there is positive net value the investigation should be launched.

(ii) Minimum probability of finding correctable cause that would justify the investigation:

= Break even probability

Hence, Benefit × Probability – Cost = 0

Rs. 3,500 × P – Rs. 980 = 0

P = 980/3500 = 0.25

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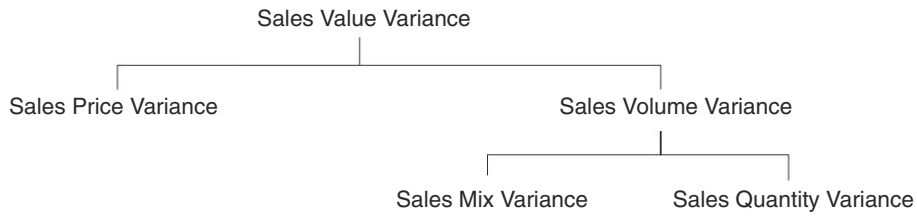
SALES VARIANCES

Sales variance is the difference between the actual value of sales achieved in a given period and budgeted value of sales. There are many reasons for the difference in actual sales and budgeted sales such as selling price, sales volume, sales mix. Sales variances can be calculated by using any one of the following two methods.

A. *Sales variance based on turnover*
B. *Sales variances based on margin (i.e. contribution margin or profit)*

The first approach, that is sales variance based on turnover, accounts for difference in actual sales and budgeted sales. The sales variances using margin approach accounts for differences in actual profit and budgeted profit. In the margin method it is assumed that cost of production is constant, that is no difference is assumed between actual cost of production and standard cost of production. The reason for this assumption is that cost variances are calculated separately to analyse the difference between actual cost and standard cost of production. Therefore, cost side of the sales variance is assumed constant under the margin method. Sales variances computed under these two methods show different amounts of variance.
The different sales variances under these two approaches and their formulae are given below:

(A) Sales Variances Based on Turnover



(i) *Sales Value Variance* Also known as sales variance, this variance shows the difference between actual sales value and budgeted sales value. The formula is

Sales value variance = (Actual value of sales – Budgeted value of sales)

Actual sales = Actual quantity sold × Actual selling price

Budgeted sales = Standard quantity × Standard selling price

or

Sales value variance = (Actual quantity × Actual selling price) – (Standard quantity × Standard selling price)

If actual sales are more than the budgeted sales, there is favourable variance and if actual sales less than the budgeted sales, unfavourable variance arises.

(ii) *Sales Price Variances* This variance is due to the difference between actual selling price and standard or budgeted selling price. The formula is:

Sales price variance = (Actual selling price – Budgeted selling price) × Actual quantity

If actual selling price is less than the budgeted selling price, variance is unfavourable and if actual selling price is more than the budgeted selling price, there will be favourable sales price variance.

(iii) *Sales Volume Variance* Sales volume variance arises when the actual quantity sold is different from the budgeted quantity. If actual sales quantity exceeds the budgeted sales quantity, there is a

favourable sales volume variance and if actual quantity sold is less than the budgeted quantity, the variance is unfavourable. The formula is:

Sales volume variance = (Actual quantity – Budgeted quantity) × Budgeted selling price

Sales volume variance is divided into two variances:
(a) Sales mix variance (b) Sales quantity variance.

(a) *Sales Mix Variance* Sales mix variance is one part of overall sales volume variance. This variance shows the difference between actual mix of goods sold and budgeted mix of goods sold. The formula is:

Sales Mix variance = (Actual mix of quantity sold – Actual quantity in standard proportion) × Standard selling price

Sales mix variance = (Budgeted Price per unit of actual mix – Budgeted price per unit of budgeted mix) × Total actual quantity

If actual mix of sales are more than the actual mix sales in standard or budgeted proportion, the variance is favourable and if actual mix sales are less than the standard mix (of actual sales), the variance is unfavourable. Similarly, if budgeted price per unit of actual mix is more than the budgeted price per unit of budgeted mix, favourable variance will arise. In the reverse situation, variance will be unfavourable.

(b) *Sales Quantity Variance* This variance is also a part of overall volume variance. This variance shows the difference between total actual sales quantity and total budgeted sales quantity. If total actual quantity is more than the total budgeted quantity, variance will be favourable and if total actual quantity less than the total budgeted quantity, there will be unfavourable sales quantity variance. The formula is

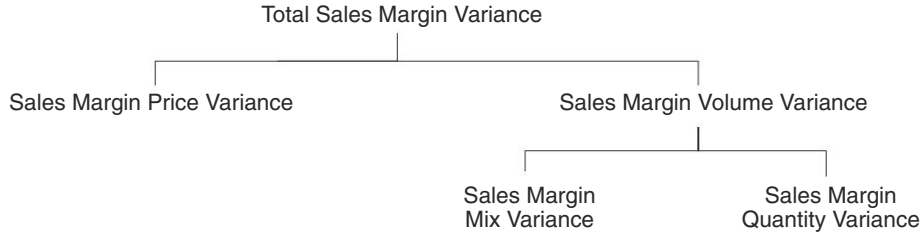
Sales quantity variance = (Total actual quantity – Total budgeted quantity) × Budgeted price per unit of budgeted mix

The total of sales mix variance and sales quantity variance will be equal to sales volume variance.

(B) Sales Variance based on Margin (that is Contribution Margin or Profit)

As stated earlier, the sales variances using margin approach show the difference in actual profit and budgeted profit only, whereas sales variances based on turnover show the difference between total actual sales and total budgeted sales.

The following sales variances are calculated if margin or profit is the basis of calculation:



(i) *Total Sales Margin Variance*—This variance indicates the aggregate or total variance under the margin method. This variance shows the difference between actual profit and budgeted profit. The formula is:

Total sales margin variance = Actual profit – Budgeted profit

If actual profit is more than the budgeted profit, variance will be favourable and if actual profit less than the budgeted profit, unfavourable variance will arise.

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(ii) *Sales Margin Price Variance*—This variance is one part of total sales margin variance and arises due to the difference between actual margin per unit and budgeted margin per unit. It is significant to note that, assuming cost of production being constant, the difference in the actual margin and budgeted margin will only be because of the difference between actual selling price and budgeted selling price. The formula for calculating sales margin price variance is:

Sales margin price variance = (Actual margin per unit – Budgeted margin per unit) × Actual quantity

If actual margin per unit is more than the budgeted margin per unit, favourable variance will be found and if actual margin less than the budgeted margin, variance will be unfavourable.

(iii) *Sales Margin Volume Variance*—This variance shows the difference between actual sales units and budgeted sales unit. The formula is:

Sales margin volume variance = (Actual quantity – Budgeted quantity) × Budgeted margin per unit

If actual sales units are more than budgeted sales units, variance will be favourable and if actual sales units less than the budgeted sales unit, unfavourable variance will arise.

Sales margin volume variance can be calculated using another formula which is:

Sales margin volume variance = (Standard profit on actual quantity of sales – Budgeted profit)

If standard profit exceeds budgeted profit, variance will be favourable and if standard profit is less than the budgeted profit, unfavourable variance will emerge.

Sales margin volume variance consists of (a) sales margin mix variance and (b) sales margin quantity variance.

(a) Sales Margin Mix Variance This variance shows the difference between actual mix of goods sold and budgeted (standard) mix of goods sold. The formula is

Sales margin mix variance = (Actual sales mix – Standard proportion of actual sales mix) × Budgeted margin per unit

If budgeted margin per unit on actual sales mix is more than the budgeted margin per unit on budgeted mix, variance will be favourable. In the reverse situation, unfavourable variance will arise.

(b) Sales Margin Quantity Variance This variance will be found when the total actual sales quantity in standard proportion is different from the total budgeted sales quantity. The formula is:

Sales margin quantity variance = (Actual sales in standard proportion – Budgeted sales) × Budgeted margin per unit on budgeted mix

If actual sales (in standard proportion) are more than the budgeted sales, variance will be favourable and if actual sales are less than the budgeted sales, unfavourable variance will arise.

Example 19.31

Greenfield Co. provides the following data for the month of March 2007:

Budget:

Product	*Budgeted sales (in units)*	*Budgeted selling price per unmit (Rs.)*
A	2160	12
B	1440	5

Actual:

Product	*Budgeted sales (in units)*	*Budgeted selling price per unmit (Rs.)*
A	2240	11
B	960	6

You are required to compute:

(i) Sales value variance
(ii) Sales volume variance
(iii) Sales price variance
(iv) Mix variance

(B.Com. (Hons), Delhi, 2007)

Solution:

	Budgeted Sales				*Actual Sales*		
	BQ (units)	*BP (Rs.)*	*BQ × BP*		*AQ (units)*	*AP (Rs.)*	*AQ × AP*
A	2160	12	25,920	A	2240	11	24,640
B	1440	5	7,200	B	960	6	5,760
	3600		Rs. 33,120		3200		Rs. 30,400

Sales Value Variance = (BQ × BP) – (AQ × AP) = 33,120 – 30,400 = Rs. 2,720 (A)

Sales Volume Variance = BP(BQ – AQ)

A = 12 (2,160 – 2,240) = 960 (F)

B = 5 (1440 – 960) = 2,400 (A)

Sales Volume Variance Rs. 1,440 (A)

Sales Price Variance = AQ (BP – AP)

A = 2240 (12 – 11) = 2,240 (A)

B = 960 (5 – 6) = 960 (F)

Sales Price Variance = Rs.1,280 (A)

Sales Value Variance = Volume Var + Price Var = 1,440 (A) + 1,280 (A) = Rs. 2,720 (A)

Sales Mix Variance = SP (AQ in Std. Proportion – AQS)

AQ in Std. Prop = A $3200 \times \frac{2160}{3600} = 1920$; B $3200 \times \frac{1440}{3600} = 1280$

Sales Mix Variance = BP (AQS in Std. Prop – AQ)

A = 12 (1920 – 2240) = 3840 (F)

B = 5 (1280 – 960) = 1600 (A)

Sales Mix Variance Rs. 2,240 (F)

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Example 19.32

The summarised budget and Actual working results of GEMCO LTD. for the year 2005-06 are given below:

Details	*Budget*			*Actual*		
	Products			*Products*		
	A Rs.	*B* Rs.	*C* Rs.	*A* Rs.	*B* Rs.	*C* Rs.
Selling Price per unit	12	16	25	13	16	27
Cost per unit	9	11	20	10	12	21
Sales (units)	40,000	32,000	24,000	42,000	40,000	22,000

Analyse the results and calculate the following:

(i) Budgeted profit, actual profit and variance in profit.

(ii) Analysis of the variance in profit in the following:

(1) Price variance
(2) Cost variance
(3) Sales margin volume variance
(4) Sales margin mix variance
(5) Sales margin quantity variance

(ICWA, Inter, Stage 1, June 2006)

Solution:

GEMCO Ltd.

	Rs.
(i) *Budgeted Profit*	4,00,000
(40,000 × 3 + 32,000 × 5 + 24,000 × 5)	
Actual Profit	4,18,000
(42,000 × 3 + 40,000 × 4 + 22,000 × 6)	
Variance in Profit:	18,000 (FAV)

(ii) *Analysis of Variance in Profit:*

(a) Cost Variance = (Standard Cost – Actual Cost) × Actual No. of Units

	Rs.	
A: (9 – 10) × 42,000	= 42,000 (Adv)	
B: (11 – 12) × 40,000	= 40,000 (Adv)	
C: (20 – 21) × 22,000	= 22,000 (Adv)	Rs. 1,04,000 (Adv)

(b) Price Variance = (Std price – Actual price) × Actual No. of Units

	Rs.	
A: (12 – 13) × 42,000	= 42,000 (Fav)	
B: (16 – 16) × 40,000	= 0	
C: (25 – 27) × 22,000	= 44,000 (Fav)	Rs. 86,000 (Fav)

(c) Sales Margin Volume Variance:

= (Budgeted vol. – Actual vol) × Standard Profit

A: (40,000 – 42,000) × 3	= 6,000 (Fav)	
B: (32,000 – 40,000) × 5	= 40,000 (Fav)	
C: (24,000 – 22,000) × 5	= 10,000 (Adv)	Rs. 36,000 (Fav)

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Reconciliation:

Variance in profit = Cost variance + Price variance + Volume variance
= 1,04,000 (Adv) + 86,000 (Fav) + 36,000 (Fav)
= Rs. 18,000 (Fav)

(d) Sales Margin mix variance:

(Revised standard Qty – Actual Qty.) × Standard Profit

		Rs.	
A:	(40/96 × 1,04,000 – 42,000) × 3	= 4,000 (Adv)	
B:	(32/96 × 1,04,000 – 40,000) × 5	= 26,667 (Fav)	
C:	(24/96 × 1,04,000 – 22,000) × 5	= 20,000 (Adv)	Rs. 2,667 (Fav)

(e) Sales Margin quantity variance

		Rs.	
A:	(40/96 × 1,04,000 – 40,000) × 3	= 10,000 (Fav)	
B:	(32/96 × 1,04,000 – 32,000) × 5	= 13,333 (Fav)	
C:	(24/96 × 1,04,000 – 24,000) × 5	= 10,000 (Fav)	Rs. 33,333 (Fav)

Reconciliation:

		Rs.
Sales margin mix variance	:	2,667 (Fav)
Sales margin Qty. variance	:	33,333 (Fav)
Sales margin volume variance	:	36,000 (Fav)

Example 19.33

The budgeted and the actual sales for a period in respect of three products are given below:

Budgeted Figures

Product	*Quantity*	*Price* Rs.	*Value* Rs.
A	1,000	5	5,000
B	750	10	7,500
C	500	15	7,500
	2,250		20,000

Actuals

Product	*Quantity*	*Price* Rs.	*Value* Rs.
A	1,200	6	7,200
B	700	9	6,300
C	600	14	8,400
	2,500		21,900

Calculate Sales Variances. *(CA Inter, Nov. 1998)*

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Solution:

Basic Calculations

	Budgeted			*Actual*			*Standard Sales*
Products	*Qty.*	*Price*	*Value*	*Qty.*	*Price*	*Value*	*(Actual Qty. × Budgeted Price)*
		Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*	
A	1,000	5	5,000	1,200	6	7,200	6,000
B	750	10	7,500	700	9	6,300	7,000
C	500	15	7,500	600	14	8,400	9,000
	2,250		20,000	2,500		21,900	22,000

Computation of Sales Variances

1. *Sales Value Variance* = Budgeted Sales – Actual Sales
   = Rs. 20,000 – 21,900
   = Rs. 1,900 (F)

2. *Sales Price Variance* = Actual Quantity × (Std. Price – Actual Price)

A	= 1,200 × (5 – 6)	= Rs. 1,200 (F)
B	= 700 × (10 – 9)	= Rs. 700 (A)
C	= 600 × (15 – 14)	= Rs. 600 (A)
		Rs. 100 (A)

3. *Sales Volume Variance* = Std. Selling Price × (Budgeted Qty. – Actual Qty.)

A	= 5 × (1,000 – 1,200)	= Rs. 1,000 (F)
B	= 10 × (750 – 700)	= Rs. 500 (A)
C	= 15 × (500 – 600)	= Rs. 1,500 (F)
		Rs.2,000 (F)

4. *Sales Mix Variance* = Std. Price × (Revised Std. Qty. – Actual Qty.)

A $= 5 \times \left(\frac{2,500}{2250} \times 1000 - 1,200\right)$

$= 5 \times \left(\frac{10}{9} \times 1,000 - 1,200\right)$ = Rs. 444 (F)

B $= 10 \times \left(\frac{2,500}{2250} \times 750 - 700\right)$

$= 10 \times \left(\frac{7,500}{9} - 700\right)$ = Rs. 1,333 (A)

C $= 15 \times \left(\frac{2,500}{2250}\right) \times 500 - 600$

$= 15 \times \left(\frac{5,000}{9} - 600\right)$ = Rs. 667 (F)

222 (A)

5. *Sales Qty. Variance* = Std. Rate × (Budgeted Qty. – Revised Std. Qty.)

A $= 5 \times \left(1{,}000 - \frac{10{,}000}{9}\right)$ = Rs. 556 (F)

B $= 10 \times \left(750 - \frac{7{,}500}{9}\right)$ = Rs. 833 (F)

C $= 15 \times \left(500 - \frac{5{,}000}{9}\right)$ = Rs. 833 (F)

Rs 2,222 (F)

Example 19.34

In a chemical manufacturing company production is carried on in batches. Details of standard input of materials, labour, overheads, etc. are as follows:

Standard input of materials per batch of 1,000 kg.

A	:	60% of input	@	Rs. 15/kg.
B	:	20% of input	@	Rs. 20/kg.
C	:	20% of input	@	Rs. 25/kg.
Labour	:	1,200 hrs. per batch @ Rs. 10 per hour.		
Variable Overhead	:	Rs. 2 per kg.		
Fixed Overhead	:	Rs. 50,000 per month.		
Selling Price	:	Rs. 50 per kg.		
Standard production per month	:	10 batches. There is no processing loss.		

Actual details for November 1996 were as follows:

Number of batches processed	:	8
Materials consumed	A	5,000 kg – Rs. 76,000
	B	1,500 kg – Rs. 30,000
	C	1,500 kg – Rs. 48,000
Labour engaged for 9,800 hrs. Wages paid		Rs. 95,000
Variable Overhead		Rs. 15,000
Fixed Overhead		Rs. 52,000

The output for the month was sold @ Rs. 54 per kg.

Required:

(i) Budgeted Profit for November, 1996 and Actual Profit made.
(ii) Analysis of the Variance in Profit. *(ICWA Inter, Dec. 1996)*

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Solution:

(i) Computation of Budgeted Profit

Cost per batch (1,000 kg.)					Rs.
Materials: Input1,000 kg	A	600 kg @ Rs 15	=	9,000	
	B	200 kg @ Rs 20	=	4,000	
	C	200 kg @ Rs 25	=	5,000	18,000
Labour: 1,200 hours @ Rs. 10					12,000
Variable Overhead @ Rs. 2 per kg					2,000
Fixed Overhead (Rs. 50,000 for 10 batches)					5,000
					37,000
Standard Cost per kg of output	= Rs. 37				
Selling Price	= 50				
Profit per kg as per standard	= 13				
Budgeted Profit per month	= 10 × 1,000 kg × Rs. 13 = Rs. 1,30,000				

Computation of Actual Profit for the Month

No. of batches processed	= 8	Rs.	Rs.	Rs.
Materials consumed:	A	5,000 kg	76,000	
	B	1,500 kg	30,000	
	C	1,500 kg	48,000	1,54,000
Direct Labour for (wages paid for 9800 hours)				95,000
Variation overhead				15,000
Fixed Overhead				52,000
	Total Cost			3,16,000
Total Sale Value of 8000 kg @ Rs. 54				4,32,000
	Actual Profit			1,16,000

Variance in Profit = Rs. 1,30,000 – 1,16,000 = Rs. 14,000 (A)

(ii) Variance Analysis

Material Price Variance = Actual Qty. × (SR – AR)

A $= \left(5{,}000 \times \text{Rs.}\,15 - \frac{76{,}000}{5{,}000}\right) = 1{,}000\ (A)$

B $= \left(1{,}5000 \times \text{Rs.}\ 20 - \frac{30{,}000}{1{,}500}\right) = \text{Nil}$

C $= \left(1{,}500 \times \text{Rs.}\ 25 - \frac{48{,}000}{1{,}500}\right) = 10{,}500\ (A)$

11,500 (Adverse)

Material Usage Variance = SR × (Std. Qty for Actual Output – Actual Qty)

A = Rs. 15 × (8 × 600 – 5,000 kg) = 3,000 (A)

B = Rs. 20 × (8 × 200 – 1,500 kg) = 2,000 (F)

C = Rs. 25 × (8 × 200 – 1,500 kg) = 2,500 (F)

1,500 (F)

Labour Rate Variance = Actual Time × (SR – AR)

$$= 9{,}800 \times \left(10 - \frac{95{,}000}{9{,}800}\right)$$

= Rs. 3,000 (F)

Labour Efficiency Variance = SR – (Std. Time for actual output – Actual Time)

= 10 × 0(1,200 × 8 – 9,800 hrs.)

= 10 × (9,600 hrs. – 9,800 hrs.)

= Rs. 2,000 (A)

Variable Overhead Variance = Recovered Overheads – Actual Overheads

= (8,000 kg × Rs. 2 – Rs. 15,000) = 1,000 (F)

Fixed Overhead Expenditure Variance = Budgeted Overheads – Actual Overheads

= Rs. 50,000 – Rs. 52,000 = 2,000 (A)

Fixed Overhead Volume Variance = (40,000 – 50,000) = 10,000 (A)

Sale Price Variance = 8,000 × (Rs. 50 – Rs 54) = 32,000 (F)

Sales Volume Variance (for profit) = Std. Rate × (Budgeted Qty – Actual Qty)

= 13 × (10,000 – 8,000) = 26,000 (A)

Summary of Variances

Adverse	*Rs.*	*Favourable*	*Rs.*
Material Price	11,500	Material Usage	1,500
Labour Efficiency	2,000	Labour Rate	3,000
Fixed Overhead Expenditure	2,000	Variable Overhead	1,000
Fixed Overhead Volume	10,000	Sales Price	32,000
Sales Volume (for Profit)	26,000		
	51,500		37,500

Net Profit Variance Rs. 14,000 (A). Thus, it has got reconciled.

Revision Variance

When a budget is revised, but where, as a matter of policy the change is not incorporated in the standard cost rate, a variance will arise termed as a Revision Variance. Revision variance is the difference between the basic standard cost and the revised standard cost.

DISPOSITION OF VARIANCE

Variance may be disposed off in either of the following ways:

1. Inventories and the cost of goods sold may be adjusted to reflect the actual costs.
2. Variances may be transferred to the profit and loss account.

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Under the first method, all variances are allocated between the inventory accounts and cost of goods sold account. This method, in fact, converts the accounts balances from standard costs to actual historical costs.

The following arguments are given in support of this method:

1. Only actual costs should be recorded in the cost of goods sold account and inventory accounts. The supporters of this method do not favour standard costs as true costs or costs suitable for use in the profit and loss account but as merely guides in factory management.
2. Variances from the standard are costs and not losses and therefore should be reflected in the inventory valuations and cost of goods sold.
3. If the variances are large, standard costs do not represent the actual costs and therefore are not good measures to determine the costs of goods sold and inventory.

Under the second method, the variances are considered as profit or loss items in the period in which they occurred. The work-in-process, finished goods inventory, and cost of goods sold are stated at standard costs. Unfavourable cost variances are deducted from the gross profit at standard costs. Favourable cost variances are added to the gross profit calculated at standard cost. The treatment of the cost variances under this method is shown on the income statement given below.

ABC Company
Income Statement for the Year Ending December 31, 2008

	Rs.	Rs.
Sales revenue		5,00,000
Cost of sales (standard)	3,00,000	
Selling and administrative expenses (standard)	1,50,000	4,50,000
Net Income (standard)		50,000
Deduct unfavourable variance from net income:		
Material price	200	
Material usage	800	
Labour efficiency	900	
Overhead:		
Volume	2,000	
Budget	1,100	5,000
Net income (actual)		45,000

The second method has the following arguments in its favour:

1. Standard costs help in the preparation of statements at the early date; actual cost delays the determination of inventory costs and cost of goods sold.
2. Standard costs avoid the inclusion of costs due to wastage, losses, inefficiencies, excessive overheads from low production volume. Standard cost represent normal costs and therefore inventory figures are conservative and acceptable for income determination and other purposes.
3. In a multi-product company, it may be difficult to determine accurately how much variance should be distributed to each product.
4. In taking corrective action managers may find it more useful when variance are depicted in the profit and loss account. Managerial attention is usually hampered when variances are combined with cost of goods manufactured.

It is difficult to suggest which method should be followed in accounting for variances. If the variances are large and significant, the first method, that is. distribution of variances to the respective accounts appears to

be appropriate for financial reporting, tax and job and contract pricing purposes. The second method may be preferable when the variances are insignificant. Thus, the treatment of variances depends on many factors such as (i) size of variance, (ii) accuracy of standard costs, (iii) cause of variances such as incorrect standard costs, (iv) timing of variances, for example, caused by seasonal fluctuation, (v) type of variance–material, labour, and overhead.

MANAGERIAL USES OF VARIANCES

Determination of variances is only the first step in the process of standard cost variance analysis. Mere computation of material, labour and overhead variances is useless for cost control and performance evaluation. The final objective of variance analysis is to determine the person(s) responsible for each variance and to pinpoint the cause(s) for incurrence of these variances. That is, before management can take effective action for improving control over costs, it needs to know not only the amount of variances, but also where the variances originated, who was responsible for them, and what caused them to arise.

Analysis of Variances by Responsibilities

Variances must be identified with the manager responsible for the costs incurred who should be held responsible for that cost. The cost factors which are directly controllable by operating supervision must be separated from those costs factors from which executive management is responsible.

Specific titles of individuals who are responsible for each type of variance differ among business enterprises. Generally speaking, the following personnel are held accountable for variances noted against them:

Responsibility for Cost Variances

	Variance	*Personnel Responsible*
(i)	Materials price variance	Purchasing agent or purchasing manager.
(ii)	Materials quantity variance	Plant superintendent, departmental supervisors, machine operators, quality control department and material handlers.
(iii)	Labour rate standard	Personnel (employment) department manager, departmental supervisor and plant superintendent.
(iv)	Labour efficiency variance	Plant superintendent, departmental supervisors, production scheduling department, quality control department, material handlers and machine operators.
(v)	Overhead expenditure variance	Variable portion is the responsibility of the individual foreman or supervisor, they are expected to keep actual expenses within the budget. Fixed portion is the responsibility of top management.
(vi)	Overhead efficiency variance	Same personnel who are responsible for labour efficiency variance.
(vii)	Overhead volume variance	Top management and production schedulers.

Analysis of Variances by Causes

Reasons for the variance should be determined and plans for necessary corrective action made either by discussing possible causes with the supervisors or by examining underlying data and records. The analysis of variances by causes is therefore an important aspect of the use of standard costs to attain effective cost control. For any standard cost variance, there are many possible causes. The following list is not all inclusive but does indicate causes responsible for variances.

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Possible Causes of Standard Cost Variances

Materials Price Variance

1. Recent changes in purchase price of materials.
2. Failure to purchase anticipated quantities when standards were established resulting in higher prices owing to non-availability of quantity purchase discounts.
3. Not taking cash discounts anticipated at the time of setting standards resulting in higher prices.
4. Substituting raw material differing from original materials specifications.
5. Freight cost changes and changes in purchasing and storekeeping costs if these are debited to the materials cost.

Materials Quantity Variance

1. Poor materials handling.
2. Inferior workmanship by machine operator.
3. Faulty equipment.
4. Cheaper, defective raw material causing excessive scrap.
5. Inferior quantity control inspection.
6. Pilferage.
7. Wastage due to inefficient production method.

Labour Rate Variance

1. Recent labour rate changes within industry.
2. Employing a man of a grade different from the one laid down in the standard.
3. Labour strike leading to utilisation of unskilled help.
4. Labour layoff causing skilled labour to be retained at higher rates, so as to prevent resignations and job switching.
5. Employee sickness and vacation time.
6. Paying a higher overtime allowance than provided for in the standard.

Labour Efficiency Variance

1. Machine breakdown, use of defective machinery and equipment.
2. Inferior raw materials.
3. Poor supervision.
4. Lack of timely material handling.
5. Poor employee performance.
6. Inefficient production scheduling—delays in routing work, materials, tools and instructions.
7. Inferior engineering specifications.
8. New inexperienced employees.
9. Insufficient training of workers.
10. Poor working conditions—inadequate or excessive heating, lighting, ventilation, etc.

Overhead Volume Variance

(Factors causing either idle time or overtime of plant and facilities)

1. Failure to utilise normal capacity.
2. Lack of sales order.
3. Too much idle capacity.

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4. Inefficient or efficient utilisation of existing capacity.
5. Machine breakdown.
6. Defective materials.
7. Labour troubles.
8. Power failures.

OVERHEAD EFFICIENCY VARIANCE

These included all causes which are listed under labour efficiency variance.

Analysis of Variances by Products

Since management usually wants current true costs when decisions are to be made with respect to pricing and related questions, variances are often analysed by products in order to arrive at current product costs. Companies producing non-standard goods according to customer's specifications may also help analyse variances by job orders. The analysis of variances by causes is useful in deciding whether or not cost variances should be allocated to products in arriving at product costs for pricing. Standard product costs should be reviewed periodically and revised when it is found that the standard product costs in use are no longer useful for the purpose.

Variance Reports to Management

Variance reports basically aim to inform managers responsible for the operation when actual performance differs from the standards. To be effective, the report must be timely, accurate and clearly understood by the recipients.

Control of production and costs is a matter of timing; the effectiveness of the control is often in direct proportion to the speed with which variances are reported. Timely reporting often requires daily and weekly reporting of performance information. Therefore, it is important to focus managerial attention on off-standard conditions immediately following each shift, day or week, rather than to accumulate and summarise variances from standards each month. A month, and generally even a week, is too long a period for many off-standard conditions to remain unchecked and uncorrected, because the time interval may prevent positive identification of employees who are responsible for the unsatisfactory work.

Variance analysis reports are primarily control reports. In developing and reporting the variances, it should be remembered that the variance data must (i) deal with relevant distinctions, (ii) be understandable, (iii) measure with reasonable accuracy what they are supposed to measure, (iv) be presented and explained concisely, (v) be timely, and (vi) provide the amount of details needed by different persons at each level of management.

LIMITATIONS OF STANDARD COSTING

Standard costs are not without their shortcomings. The first limitation is regarding the predetermined nature of standard costs. The accuracy of standard costs is limited by the knowledge and skill of the people who created them and they contain the prejudices of their makers. Such badly conceived standard costs do not enjoy the confidence of the users of the system.

Secondly, it is difficult to select a type of standard (ideal, currently attainable, normal, etc.) which can help in cost control and achieve other managerial purposes. If standards are too low, they defeat the objective of standard costing and bring the operating efficiency down. If they are too high, they can create ill-will and encourage employees to beat the system by fair means or foul.

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Thirdly, a good programme of standard costing requires that both management and operating personnel should have full confidence in it and standards should be fair and workable. Educating employees is necessary in this regard. However, lack of acceptability, education and communication is a major difficulty in operating a standard costing system.

In spite of the above limitations, standard costing has developed into an extraordinary and very useful tool and has contributed much in providing different kinds of cost data for so many different purposes.

CONTROL RATIOS

Control ratios are useful to management to know whether the deviations of actuals from budgeted results are favourable or unfavourable. These control ratios are expressed in percentage. The ratio is taken as favourable if it is 100% or more. In case it is less than 100%, the ratio is considered as unfavourable.

Control ratios are as follows:

1. *Activity Ratio* Activity ratio is used to measure the level of activity achieved over a period. It is obtained when the number of standard hours equivalent to the output produced are expressed at a percentage of the budgeted hours

$$\text{Activaty ratio} = \frac{\text{Standard hrs for actual production}}{\text{Budgeted hours}} \times 100$$

2. *Capacity Ratio* This ratio points out to what extent budgeted hours have been utilised. This ratio shows the relationship between actual working hours and budgeted working hours.
3. *Efficiency Ratio* Efficiency ratio shows the degree of efficiency achieved in production. It is derived when the standard hours equivalent to the output produced, are expressed as a percentage of the actual hours spent in producing the output.

$$\text{Efficiency ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$$

Example 19.35

Based on the data given below show the calculation of:

(i) Efficiency ratio;
(ii) Production volume ratio;
(iii) Idle capacity ratio.

Data	*Standard Hour of Output*	*Hours of Actual Operations*
Theoretical capacity	100	100
Theoretical capacity less Unavoidable loss time	95	95
Planned activity for period	81	90
Actual activity for period	68	85

(ICWA, Stage 2, June 2005, Dec. 2006)

Solution:

(i) Efficiency ratio: $\dfrac{\text{Output Expressed in standard hour}}{\text{Actual Hours Spent}} \times 100$

$$= \frac{68}{85} \times 100 \text{ or } 80\%$$

(ii) Production volume ratio:

$$\frac{\text{Actual Output in standard hour}}{\text{Budgeted output in standard hours}} \times 100$$

$$= \frac{68}{81} 100 \text{ or } 84\%$$

(iii) Idle capacity ratio:

$$\frac{\text{Practical capacity in standard hour} - \text{Budgeted Capacity}}{\text{Practical capactity in standard hours}} \times 100$$

$$= \frac{95 - 81}{95} 100 \text{ or } 14.7\%$$

Example 19.36

In a day of 8 hours, a direct worker is expected to produce 12 units of product P or 16 units of product Q or 10 units of product R. The budgeted production of a month is 225 units of P, 180 units of Q and 300 units of R. During the month of November 2002, 450 direct labour hours were worked and the actual production was 240 units of P, 400 units of Q and 250 units of R.

Calculate the efficiency and capacity ratios. *(ICWA Final, Dec, 1999)*

Solution:

	Standard Time		
P	8/12	=	0.6667 per unit
Q	8/16	=	0.5 per unit
R	8/10	=	0.8 per unit

Budgeted hours: *(Hours)*

P	225 units × 0.6667	150
Q	180 units × 0.5	90
R	300 units × 0.8	240
		480

Standard hours produced: *(Hours)*

P	240 × 0.667	160
Q	400 × 0.50	200
R	250 × 0.8	200
		560
Actual hours:		450

Capacity utilisation ratio	450/480 × 100	= 93.75%
Efficiency ratio	560/450 × 100	= 124.44%

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Example 19.37

Calculate from the following figures:

(i) Efficiency ratio
(ii) Activity Ratio and
(iii) Capacity Ratio

Budgeted Production	880 units
Standard Hours Per Unit	10
Actual Production	750 units
Actual Working Hours	6,000

(CA Inter, May 1999; B. Com (Hons), Delhi)

Solution:

$$\text{(i) Efficiency Ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$$

$$= \frac{750 \text{ units} \times 10 \text{ hours}}{6{,}000} \times 100 = 125\%$$

$$\text{(ii) Activity Ratio} = \frac{\text{Standard hours for actual production}}{\text{Budgeted hours}} \times 100$$

$$= \frac{750 \text{ units} \times 10 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 85.23\%$$

$$\text{(iii) Capacity Ratio} = \frac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$$

$$= \frac{6000 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 68.18\%$$

Example 19.38

In a manufacturing shop product X requires 2.5 man-hours and product Y requires 6 man-hours. In a month of 25 working days of 8 hours a day, 2000 units of X and 1000 units of Y were produced. The company employs 50 workers in the shop and the budgeted man-hours are 108,000 for the year. You are required to work out the capacity ratio, activity ratio and efficiency ratio.

(ICWA, Inter)

Solution:

Standard man-hours produced:

Product X: 2,000 units @	2.5 Man-hours		= 5,000 Man-hours
Product Y: 1,000 units @	6 Man-hours		= 6,000 Man-hours
		Total	= 11,000 Man-hours

Budgeted man-hours per month = 108,000/12
= 9000

Actual man-hours worked = 50 workers × 25 days × 8 hours = 10000 man-hours

Ratios:

$$\text{Activity ratio} = \frac{\text{Standard man-hours produced}}{\text{Budgeted man-hours}} \times 100$$

$$= \frac{10,000}{9,000} \times 100 = 122.22\%$$

$$\text{Efficiency ratio} = \frac{\text{Standard man-hours produced}}{\text{Actual man-hours worked}} \times = 100$$

$$= \frac{11,000}{10,000} \times 100 = 111.00\%$$

Example 19.39

A factory produces two products P and Q. P takes 10 hours to produce and Q requires 16 hours as per the budget. A month has 25 budgeted days of 8 hours each. During the month 500 units of P and 400 units of Q were produced. The factory employs 50 workers. They actually worked for 9 hours daily for 24 days. Calculate;

(i) Efficiency ratio; *
(ii) Capacity ratio; *
(iii) Calendar ratio. *

(B.Com.(Hons), Delhi, 2007)

Solution:

(i) $\text{Efficiency ratio} = \frac{\text{Budgeted Hours for Actual output}}{\text{Actual Hours worked}} = \times 100 = \frac{11400}{10800} \times 100 = 105.5\%$

(ii) $\text{Capacity ratio} = \frac{\text{Actual Hours worked}}{\text{Budgeted Hours}} \times 100 = \frac{10800}{10000} \times 100 = 108\%$

(iii) $\text{Calender ratio} = \frac{\text{Actual Days worked in the month}}{\text{Budgeted days in the month}} \times 100 = \frac{24}{25} \times 100 = 96\%$

Activity ratio has not been asked in the question. However, it will be calculated as follows:

$$\text{Activity ratio} = \frac{\text{Budgeted hours for actual output}}{\text{Budgeted Hours}} \times 100 = \frac{11400}{10000} \times 100 = 114\%$$

THEORY QUESTIONS

1. Define and explain the concepts of standard cost and standard costing.

(B. Com. (Hons), Delhi, 2000)

2. Discuss briefly the use of standard costs in the following management activities: cost reductions, operating performance, evaluation, product pricing decisions and providing incentives.
3. Compare and contrast the usefulness of ideal standards, basic standards, and currently attainable standards.

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4. "Standard costs are bases for a proper managerial control of manufacturing operation." Define standard cost and explain the above statement. *(B. Com. (Hons), Delhi)*
5. What is standard costing and how would you distinguish it from budgetary control?
6. What are the points of similarity and difference between budgeted and standard costs.
7. "Variance analysis is an integral part of standard cost accounting." Explain this statement.
8. By purchasing low-grade materials, a company reports favourable material price variance, but it consistently experiences unfavourable material quantity variances. What relationship may exist between these conditions? Is the price variances really favourable?
9. What are the shortcomings of historical costs for managerial uses?
10. What is the difference between an estimated cost and a standard cost? *(B. Com. (Hons), Delhi, 2003)*
11. Describe briefly how standard costs are set for (a) material (b) labour.
12. Briefly explain the meaning of each of the following variances: material prices, material usage, labour efficiency, and labour rate.
13. Discuss some of the problems that might be created by standards which are set too high and by standards which are too loose.
14. What are the advantages and limitations of standard costing?

    (B. Com. (Hons), Delhi)
15. Discuss briefly shortcomings of standard cost system. *(B. Com. (Hons), Delhi, 2004)*
16. Explain why overhead variances are generally treated as period costs.
17. Discuss the information which a well-designed cost report should give to management from the point of view of production and control. How should such information be given?
18. What is a "two variance analysis" of factory overheads. Give a brief description.

    (B. Com. (Hons), Delhi)
19. Explain the term 'variance' and distinguish between controllable and uncontrollable variances.

    (B. Com. (Hons), Delhi 2000)
20. Describe briefly the managerial use of variances. *(B. Com. (Hons), Delhi 2001)*
21. Point out the difference between historical costing and standard costing.

    (B.Com. (Hons) Delhi, 2003)
22. Briefly distinguish between the two cost control techniques 'Budgetary Control' and 'Standard Costing'.

    (ICWA Inter, Stage 1, Dec 2005)
23. In analysing variance it is found frequently that an adverse variance from one standard is related directly to a favourable variance from another. Give two examples of such a situation and comment briefly on each.

    (ICWA Inter, Stage II, Dec. 2003)
24. Distinguish between standard costs and budgeted costs.

    (B.Com. (Hons), Delhi ,2002)
25. What is sales value volume variance?

    (ICWA Inter, Stage 1, June 2006)
26. Define variance analysis. What are the ways of disposing cost variances?

    (ICWA Inter, Stage 1, June 2005)
27. What is fixed production overhead variance? Explain how this is calculated and further analysed.

    (ICWA Inter, Stage 1, Dec. 2003)
28. Distinguish between budgetary control and standard costing. *(B.Com. (Hons), Delhi, 2007)*
29. Explain fixed overhead cost variance. *(B.Com. (Hons), Delhi, 2007)*
30. Briefly describe the following control ratios:
    (i) Activity ratio
    (ii) Capacity ratio
    (iii) Efficiency ratio *(B.Com. (Hons) Delhi, 2007)*

31. In analysing variance, it is found frequently that an adverse variance from one standard is related directly to a favourable variance from another.
Give two examples of such a situation and comment briefly on each.

(ICWA Stage 2, Dec. 2003)

Ans: Two examples where Adverse variance may be off set by a favourable variance are as under:

(i) **Direct Materials:** A favourable price variance may arise when material is purchased at cheaper price. But the quality may be poor and this may result in inefficient usage causing an adverse usage variance.

(ii) **Direct Wages:** Employing worker of higher grade may lead to adverse wage rate variance. But this may be offset by favourable efficiency variance because more skilled workers do the work in less time than allowed.

SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions.

1. The difference between the standard hours for the actual output and actual hours is

(a) Labour rate variance.
(b) Overhead cost variance.
(c) Labour efficiency variance.
(d) Overhead volume variance.

2. Cost variance includes all but one of the following

(a) Direct material variance.
(b) Direct labour variance.
(c) Variable overhead variance.
(d) Sales variance.

3. A standard cost system may be used in

(a) Either job order costing or process costing.
(b) Job order costing but not process costing.
(c) Process costing but not job order costing.
(d) Neither process costing nor job costing.

4. If actual hours worked exceed the standard hours allowed what type of variance will occur

(a) Favourable labour usage (efficiency) variance.
(b) Favourable labour rate variance.
(c) Unfavourable labour usage (efficiency) variance.
(d) Unfavourable labour rate variance.

5. An unfavourable materials price variances occurs because of

(a) Price increases in raw materials.
(b) Price decreases in raw materials.
(c) Less than anticipated normal wastage in the manufacturing process.
(d) More than anticipated normal wastage in the manufacturing process.

6. Which of the following is a purpose of standard costing?

(a) Determine a break even production level.
(b) Control costs.
(c) Allocate cost with more accuracy.
(d) Eliminate the need for subjective decisions by management.

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7. When calculating variances from standard costs, the difference between actual and standard price multiplied by actual quantity gives a

(a) Total price and quantity variance.
(b) Price variance.
(c) Volume variance.
(d) Mix variance.

8. If a company follows a practice of isolating variances at the earliest point in time, what would be the appropriate time to isolate and calculate a material price variance?

(a) When material is issued.
(b) When material is purchased.
(c) When material is used in production.
(d) When purchased order is originated.

9. In a standard cost system the materials price variance is obtained by multiplying the

(a) Actual price by the difference between actual quantity purchased and standard quantity used.
(b) Actual quantity purchased by the difference between actual price and standard price.
(c) Standard price by the difference between standard quantity purchased and standard quantity used.
(d) Standard quantity purchased by the difference between actual price and standard price.

10. How is a labour rate variance computed?

(a) Difference between standard and actual rate multiplied by standard hours.
(b) Difference between standard and actual hours multiplied by actual rate.
(c) Difference between standard and actual rate multiplied by actual hours.
(d) Difference between standard and actual hours multiplied by the difference between standard and actual rate.

11. Materials usage variances are normally chargeable to which department?

(a) Production
(b) Purchasing
(c) Finished goods
(d) Materials storage

PROBLEMS

Material Cost Variances

1. The standard set for material consumption was 100 kg @ Rs. 2.25 per kg

In a cost period:		
	Opening stocks was	100 kg @ Rs. 2.25 per kg
	Purchase made	500 kg @ Rs. 2.15 per kg
	Consumption	110 kg

Calculate:

(a) Usage variance.
(b) Price variance: (i) when variance is calculated at point of purchase; (ii) when variance is calculated at point of issue on FIFO basis; (iii) when variance is calculated at point of issue on LIFO basis.
(c) What is the effect on closing stock valuation when materials are charged out to cost on basis (ii) and (iii) above? *(ICWA Inter)*

Ans: (a) Usage variance Rs. 22.50 (A) (b) (i) Rs. 50 (F) (ii) Re 1 (F) (iii) Rs. 11 (F)

2. Standard material and standard price for manufacturing one unit of a product is given below:

	Standard Material	*Standard price*
Material A	5 kg	@ Rs. 4
Material B	3 kg	@ Rs. 6

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The actual production of the product is 400 units.
The actual material A 2500 kg @ Rs. 3.90
B 1000 kg @ Rs. 6.25
Calculate the materials subusage variance. *Ans:* Rs. 1425 (unfavourable)

3. From the following particulars compute: (a) materials cost variance; (b) materials price variance; (c) materials usage variance:

Quantity of materials purchased	3,000	units
Value of materials purchased	Rs. 9,000	
Standard quantity of materials required per kg of output	30	units
Standard rate of material	Rs. 2.50	per unit
Opening stock of materials	Nil	
Closing stock of materials	500	units
Output during the period	80	kg

(B. Com. (Hons), Delhi)

Ans: (a) MCV Rs. 1,500 (A), (b) Material Price Variance Rs. 1,250 (A) (C) Material Usage Variance Rs. 250 (A)

4. The standard materials cost to produce a tonne of chemical X is:
300 kg of material A @ Rs. 10 per kg
400 kg of material B @ Rs. 5 per kg
500 kg of material C @ Rs. 6 per kg
During a period, 100 tonnes of mixture X was prduced from the usage of:
35 tonnes of material A at a cost of Rs. 9,000 per tonne
42 tonnes of material B at a cost of Rs. 6,000 per tonne
53 tonnes of material C at a cost of Rs. 7,000 per tonne
Calculate the price, usage and mix variances.

(B. Com. (Hons) Delhi)

Ans: MPV Rs. 60,000 (A),Usage Variance Rs. 78,000 (A) mix variance Rs. 11,333 (A)

5. A company manufacturing 'distempers' operates a costing system. The standard cost of one of the products of the company shows the following standards:

Materials	*Quantity*	*Standard price per kg (Rs.)*	*Total Rs.*
A	40 kg	75	3,000
B	10 kg	50	50
C	50 kg	20	1,000
Material cost per unit (Total)			4,500

The standard input mix is 100 kg and the standard output of the finished product is 90 kg.
The actual results for period are:
Materials used

A	=	2,40,000 kg	@ Rs. 80/kg
B	=	40,000 kg	@ Rs. 52/kg
C	=	2,20,000 kg	@ Rs. 21/kg

Actual output of the finished product = 4,20,000 kg
You are required to calculate the material price, mix and yield variances.

(ICWA, Inter)

Ans: Materials price Rs. 15,00,000 (A), Mateial mix Rs. 19,00,000 (A), Material yield Rs.15,00,000 (A)

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6. S.V. Ltd. manufacturers a single product, the standard mix of which is:

Material A 60% at Rs. 20 per kg
Material B 40 % at Rs. 10 per kg

Normal loss in production is 20% of input. Due to shortage of Material A, the standard mix was changed. Actual results for March 2002 were;

Material A	105 kg at Rs. 20 per kg
Material B	95 kg at Rs. 9 per kg
Input	200 kg
Loss	35 kg
Output	165 kg

Calculate:

(i) Material Price Variance
(ii) Material Usage Variance
(iii) Material Mix Variance
(iv) Material Yield Variance

(B. Com. (Hons), Delhi)

Ans: (i) Rs. 95 (F) (ii) Rs. 250 (F) (iii) Rs.150 (F) (iv) Rs. 100 (F)

7. The standard cost of a certain chemical mixture is:

35% Material A at Rs. 25 per kg
65% Material B at Rs. 36 per kg

A standard loss of 5% is expected in production
During a period there is used:

125 kg of Material A at Rs. 27 per kg and
275 kg of Material B at Rs. 34 per kg

The actual output was 365 kg

Calculate:

(a) Material Cost Variance
(b) Material Price Variance
(c) Material Mix Variance
(d) Material Yield Variance

(B Com. (Hons), Delhi. 1996)

Ans: (a) Rs. 373 (A) (b) Rs. 300 (F) (c) Rs. 165 (A)(d) Rs. 508 (A)

8. Mixers Ltd. is engaged in producing a 'standard mix' using 60 kg of chemical *x* and 40 kg of chemical *y*. The standard loss of production is 30%. The standard price of *x* is Rs. 5 per kg and of *y* Rs. 10 per kg.
The actual mix and yield were as follows:

x 80 kg. @ Rs. 4.50 per kg
y 70 kg. @ Rs. 8.00 per kg.

Actual yield 115 kg.
Calculate Direct Material Cost, Price, Usage, Mix and Yield variances.

(B.Com. (Hons), Delhi)

Ans: Material cost Rs. 230 (F), Price Rs. 180 (F), Usage Rs. 50 (F), Mix Rs. 50 (A), Yield Rs. 100 (F)

9. One kilogram of product K requires two chemicals A and B. The following were the details of product K for the month of June 2008.

(a) Standard mix: Chemical A 50% and chemical B 50%
(b) Standard price per kilogram of chemical A Rs. 12 and chemical B Rs. 15.
(c) Actual input of chemical B 70 kilogram.
(d) Actual price per kilogram of chemical A Rs. 15.
(e) Standard normal loss 10% of total input.
(f) Material cost variance total Rs. 650 adverse.
(g) Material yield variance total Rs. 135 adverse.

You are required to calculate:

(i) Material mix variance.
(ii) Material usage variance.
(iii) Material price variance.
(iv) Actual loss of actual input.
(v) Actual input of chemical A.
(vi) Actual price per kilogram of chemical B.

(CA, Inter)

Ans: (i) Rs. 45 (F) (ii) Rs. 180 (A) (iii) Rs. 470 (A) (iv) 20 kg (v) 40 kg (vi) Rs. 20

10. S.V. Ltd. manufactures BXE mixing three raw materials. For every batch of 100 kg of BXE, 125 kg of raw materials are used. In April 2003, 60 batches were prepared to produce an output of 5,600 kg of BXE. The standard and actual particulars from April 2003 are as follows:

Standard			*Actual Raw material*		
Raw material	*Mix %*	*Price per kg (Rs.)*	*Mix %*	*Price per kg (Rs.)*	*Purchased kg*
A	50	10	60	21	5000
B	30	10	20	8	2000
C	20	5	20	6	1200

Calculate all variances.

(CA, Inter)

Ans: Material cost variance Rs. 17,500 (A); Material price variance Rs. 300 (A); Material usage variance Rs. 14,500 (A); Material mix variance Rs. 7500 (A); Material yield variance Rs. 7000 (A)

11. The standard material inputs required for 1000 kg of a finished product are given below:

Material	*Quantity (in kg)*	*Standard Rate per kg (in Rs.)*
P	450	20
Q	400	40
R	250	60
	1,100	
Standard Loss	100	
Standard Output	1,000	

Actual production in a period was 20,000 kg of the finished product for which the actual quantities of material used and the prices paid therefore are as under:

Material	*Quantity used (in kg)*	*Purchased price per kg (in Rs.)*
P	10000	19
Q	8500	42
R	4500	65

Calculate:

(i) Material Cost Variance (MCV)
(ii) Material Price Variance (MPV)

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(iii) Material Usage Variance (MUV)
(iv) Material Mix Variance (MMV)
(v) Material Yield Variance (MYV)

Present a reconciliation among the variances. *(ICWA Inter June 1996)*

Ans: (i) Rs. 39,500 (A); (ii) Rs. 29,500 (A); (iii) Rs. 10,000(A); (iv) Rs. 26,360 (F); (v) Rs. 36,360 (A)

Labour Cost Variances

12. From the data given below, calculate labour variances for the two departments:

	Deptt. A	*Deptt. B*
Actual gross wages (Direct)	Rs. 2,00,000	Rs. 1,80,000
Standard hours produced	8000	6000
Standard rate per hour	Rs. 30	Rs. 35
Actual hours worked	8200	5800

(ICWA Inter)

		Deptt. A	*Deptt. B*
Ans:	Labour cost variance	Rs. 40,000 (F)	Rs. 30,000 (F)
	Labour rate varianc	46,000 (F)	23,000 (F)
	Labour efficiency	6000 (A)	Rs. 7000 (F)

13. The details regarding composition and the weekly wage rates of labour force engaged on a job scheduled to be completed in 30 hours are as follows:

Category of workers	*No. of labourers*	*Standard hourly wage rate*	*Actual no.of labourers*	*Hourly wage rate*
Skilled	75	60	70	70
Semi-skilled	45	40	30	50
Unskilled	60	30	80	20

The work is actually completed in 32 hours. Calculate the various labour variances. *(B. Com. (Hons) Delhi)*

Ans: Labour cost variance, Rs. 13,000 (A), Rate variance Rs. 6,400 (A), Labour efficiency 6,600 (A), Mix variance Rs. 9,600 (F), Labour sub efficiency Rs. 16,200 (A).

14. Calculate standard labour time for machine part No. 2235 from the following data:

Standard batch size	100 pieces
Set-up time	64 minutes
Operating time (each piece):	
Fixing job on machine	= 2 minutes
Cutting time	= 10 minutes
Removing job from machine	= 3 minutes

Allow 10% on total operation time for inspection during process and allow further 5% on total time for fatigue. *(ICWA Inter year)*

Ans: Standard time for 100 pieces 1800 minutes.

15. Standard hours for manufacturing two products M and N are 15 hours per unit and 20 hours per unit respectively. Both products require identical kind of labour and the standard wages rates per hour is Rs. 5. In the year 2001, 10000 units of M and 15000 units of N were manufactured. The total of labour hours actually worked were

4,50,000 and the actual wage bill came to Rs. 23,00,000. This include 12,000 hours paid for @ Rs. 7 per hour and 9,400 hours paid for @ Rs. 7.50 per hour, the balance having been paid at Rs. 5 per hour. You are required to compute the labour variances. *(ICWA Inter)*

Ans: Labour cost variance Rs. 50,000 (A); Labour rate variance Rs. 47,500 (A); Labour efficiency variance Rs. 2,500 (A)

16. The Standard cost card for a product shows:

Material cost 2 kg @ Rs. 2.50 each	Rs. 5.00 per unit
Wages 2 hours @ Rs. 10 each	Rs. 20 per unit

The actuals which have emerged from business operations are as follows:

Production	8000 units
Material consumed 16500 kg @ Rs 2.40 each	Rs. 39,600
Wages paid 18000 hours @ Re 8 each	Rs. 1,44,000

Calculate the appropriate material and labour variances. *(B. Com. (Hons), Delhi)*

Ans: Material cost variance Rs. 400 (F) Material price variance Rs. 1650 (F) Material usage variance Rs. 1250 (A) Labour cost variance Rs. 16,000 (F) Labour rate variance Rs. 36,000 (F) Labour efficiency variance Rs. 20,000 (A)

17. The following standards have been set to manufacture a product:

Direct materials:

2 units of A at Rs. 4 per unit	8.00
3 units of B at Rs. 3 per unit	9.00
15 units of C at Re. 1 per unit	15.00
	32.00
Direct labour 3 hrs @ Rs. 8 per hour	24.00
Total standard prime cost	56.00

The company manufactured and sold 6000 units of the product during the year. Direct material cost were as follows:

12,500 units of A at Rs. 4.40 per unit.
18,000 units of B at Rs. 2.80 per unit.
88,500 units of C at Rs. 1.20 per unit.

The company worked 17500 direct labour hours during the year. For 2500 of these hours the company paid at Rs. 12 per hour while for the remaining the wages were paid at the standard rate. Calculate materials price and usage variances and labour rate and efficiency variances.

(B. Com. (Hons), Delhi)

Ans: Material price variance Rs. 19,100 (A) Material usage variance Rs. 500 (A) Labour rate variance Rs. 10,000 (A) Labour efficiency variance Rs. 4,000 (F)

18. From the following data of A and Co. Ltd. relating to budgeted and actual performance for the month of March, 2008, compute the Direct Material and Direct Labour Cost Variances.

Budgeted data for March:

Units to be manufactured	1,50,000
Units of direct material required (based on standard rates)	4,95,000
Planned purchase of raw materials (Units)	5,40,000
Average unit cost of direct material	Rs. 8
Direct labour hours per unit of finished goods	3/4 hr
Direct labour cost (Total)	Rs. 29,92,500

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Actual data at the end of March:

Units actually manufactured	1,60,000
Direct material cost (Purchase cost based on units actually issued)	Rs. 43,41,900
Direct material cost (Purchase cost based on units actually purchased)	Rs. 45,10,000
Average units cost of direct material	Rs. 8.20
Total direct labour hours for March	1,25,000
Total direct labour cost for March	Rs. 33,75,000

(ICWA Inter, Dec.)

Ans: MCV Rs. 1,17,900 (A), MPV Rs. 1,05,900 (A), MUV Rs. 12,000 (A), LCV Rs. 1,83,000 (A), LRV Rs. 50,000 (A), LEV Rs. 1,33,000 (A)

19. The direct labour strength of a section of an engineering factory is 100 workers paid at the rate of Rs. 6.00 per day of 8 hours each. The normal production is 1000 pieces per week of 48 hours. During a particular week an order for 1500 pieces was completed spending 7650 hours made up of 6300 hours at normal wages and 1350 hours at overtime wages at double rate. The total wages came to Rs. 6,300. Calculate the average labour cost per piece during the week and analyse the labour cost variance for the week. *(ICWA, Inter)*

Ans: Labour cost variance Rs. 900 (A), Labour efficiency variable Rs. 337.50, Labour rate variable Rs. 382.5 (F), Labour overtime variance Rs. 945 (A)

20. The standard labour component and the actual labour complement engaged during the month are given as follows:

		Skilled	*Semi-skilled*	*Unskilled*
(a)	Standard number of workers in a group	30	10	10
(b)	Standard wage rate (rupee per hour)	5	3	2
(c)	Actual number of workers employed during the month in the group	24	15	12
(d)	Actual wage rate per hour (Rs.)	6	2.5	2

During the month of 200 working hours, the group produced 9600 standard hours of work.

Required:

Calculations showing wage rate variance, labour efficiency variance, labour mix variance and total labour cost variance. *(ICWA, Inter)*

Ans: Labour cost variance Rs. 2700 (A); Labour rate variance Rs. 3300 (A); Labour efficiency variance Rs. 2400 (A); Labour mix variance Rs. 3000 (F)

21. The following was the composition of a group of workers in a factory during a particular month, in one of the production departments. The standard composition of workers and wage rate per hour were as below:

Skilled : Two workers at a standard rate of Rs. 20 per hour each
Semi-skilled : Four workers at a standard rate of Rs. 12 per hour each
Unskilled : Four workers at a standard rate of Rs. 8 per hour each

The standard output of the group was four units per hour, of the product. During the month in question, however, the actual composition of the group and hourly rates paid were as under:

Nature of worker	*No. of workers*	*Wage rate per worker per hour*
Skilled	2	Rs. 20
Semi-skilled	3	Rs. 14
Unskilled	5	Rs. 10

The group was engaged for 200 hours during the month, which included 12 hours when no production was possible due to machine break down. 810 units of the product were recorded as output of the group during the month.

You are required:

(a) to compute the standard unit labour cost of the product;
(b) to compute the total variance in labour cost during the month;
(c) analyse the variances in (b) above into sub-variances and reconcile.

(ICWA, Inter)

Ans: St. unit labour cost Rs. 30 per unit Labour cost variance Rs. 2100 (A); Labour rate variance Rs. 3200 (A); Labour efficiency variance Rs. 1740 (F); Labour idle time variance Rs. 1440 (A); Labour mix variance Rs. 800 (F)

22. From the following data prepare a unit cost statement showing the prime cost of products A and B together with analysis of variances:

		Product A	*Product B*
Material:	Standard	600 kg @ Rs. 5.00	90 kg @ Rs. 3.00
	Actual	580 kg @ Rs. 5.50	100 kg @ Rs. 2.80
Labour:	Standard	80 hrs @ Rs. 2.00	16 hrs @ Rs. 2.80
	Actual	92 hrs @ Rs. 1.75	14 hrs @ Rs. 2.00

(ICWA Inter, June, 1998)

Ans:

	Products	
	A	*B*
St. prime cost	Rs. 3160	Rs. 314.80
Actual prime cost	3351	316.40
Material price variance	290 (A)	20 (F)
Material usage variance	100 (F)	30 (A)
Labour rate variance	23 (F)	2.80 (F)
Labour efficiency variable	24 (A)	5.60 (F)

Overhead Cost Variance

23. Vinak Ltd. has furnished you the following information for the month of August, 2008:

	Budget	Actual
Output (Units)	30,000	32,500
Hours	30,000	33,000
Fixed overhead	Rs. 45,000	50,000
Variable overhead	Rs. 60,000	68,000
Working days	25	26

Calculate the variances on the basis of output.

(ICWA Inter (NS), CA Inter (NS))

Ans: Total overhead cost variance Rs. 4,250 (A)
Variable overhead cost variance Rs. 3,000 (A)
Variable overhead expenditure variances Rs. 2000 (A)
Variable overhead efficiency variance Rs. 1000 (A)
Fixed overhead cost variance Rs. 1,250 (A)
F. Expenditure variance Rs. 5000 (A)
F. Volume variance Rs. 3,750 (F)
F. Efficiency variance Rs. 750 (A)
F. Capacity variance Rs. 2700 (F)
F. Calender variance Rs. 1,800 (F)

24. A cost accountant of a company was given the folling information regading the overhead for February 2003:

(a) Overhead cost variance Rs. 1,400 adverse
(b) Overhead volume variance Rs.1,000 adverse

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(c) Budgeted hours of February 2003, Rs. 1200 hours
(d) Budgeted oveheads for Febuary 2003, Rs.6000
(e) Actual rate of recovery of overhead = Rs. 8 per hour

You are required to assist him in computing the folling for February 2003:

(a) Overhead expenditure veriance
(b) Actual overheads incurred
(c) Actual hours for actual producation
(d) Overheads capacity variance
(e) Overhead efficiency variance
(f) Standerd hours for actual producation

(C A,Inter)

Ans: (a) Rs.400 (A), (b) Rs. 6,400, (c) 800 hrs, (d) Rs.2,000 (A), (e) Rs.1000 (F), (f)1000 hrs

25. The standard cost card for product 'SIMCO' reveals:

	Rs.
Standard materials	
2 kg of A Rs. 2 per kg	4.00
1 kg of B Rs. 6 per kg	6.00
Direct labour (3 hours @ Rs. 6 per hour)	18.00
Variable overheads (3 hours @ Rs. 4 per direct labour hour)	12.00
Total standard cost per unit	40.00

It is proposed to produce 10000 units of SIMCO in the month of March and budgeted cost based on the information contained in the standard cost card are as follows:

Direct materials	
A 20000 kg @ Rs. 2 per kg	40,000
B 10000 kg @ Rs. 6 per kg	60,000
Direct Labour (30000 hours @ Rs. 6 per hour)	1,80,000
Variable Overhead (30000 hours @ Rs. 4 per direct labour)	1,20,000
	4,00,000

The actual results are:

Direct materials	Rs.
A 19,000 kg @ Rs. 2.20 per kg	41,800
B 10000 kg @ Rs. 5.60 per kg	56,560
Direct Labour (28,500 hours @ Rs. 6.40 per hour)	1,82,400
Variable Overheads	1,04,000
	3,84,760

Actual production was 9000 units

From the above, calculate the following variances:

(a) Materials: Price and usage
(b) Labour: Wages rate and labour efficiency
(c) Variable overehad total and overhead expenditure variance *(B. Com. (Hons), Delhi)*

Ans: MPV Rs. 240 (F), MUV Rs. 8,600 (A), LRV Rs. 11,400 (A), LEV Rs. 9000 (A), Total variable overhead variance Rs. 4000 (F), Variable overhead expenditure variance Rs. 10,000 (F)

26. Compute the missing data indicated by the question marks from the following:

Particulars	*A*	*B*
Standard price per unit	Rs. 12	Rs. 15
Actual price per unit	Rs. 15	Rs. 20
Standard input (kg.)	50	?

Actual input (kg.)	?	70
Material price variance	?	?
Material usage variance	?	Rs. 300 Adverse
Material cost variance	?	?

Material mix variance for both products together was Rs. 45 Adverse.

(CA, Inter)

Ans: Standard input (B) 50 kg. Actual input (A) 40 kg Material price variance A, Rs. 120 (A), B Rs. 350 (A), Material usage variance A, Rs. 120 (F) Material cost variance A Rs. NIL, Material cost variance B Rs. 650 (A)

27. From the following data, calculate overhead variances:

	Budget	*Actual*
Output	15000 units	16000 units
No. of working days	25	27
Fixed overheads	Rs. 30,000	Rs. 30,500
Variable overheads	Rs. 45,000	Rs. 47,000

There was an increase of 5% in capacity.

Sales Variances

28. Pioneer Plastics Limited operates a budgetary control and standard costing system. From the following data calculate:

(i) Sales variance
(ii) Sales volume variance
(iii) Sales price variance

Product	*Budget*			*Actual*		
	Std. selling price per unit	*Std. cost price per unit*	*Units to be sold*	*Sales value*	*Units sold*	*Sales volume*
A	10.00	12.00	100	Rs. 1,200	100	1,100
B	9.40	12.00	50	600	50	600
C	7.50	9.00	100	900	200	1,700
D	4.00	6.00	75	450	50	300
Total	—	—	325	3,150	400	3,700

(C.A. Inter)

Ans: Sales value variance Rs. 550 (F), Sales price variance Rs. 200 (A), Sales volume variance Rs. 750 (F).

29. PH Ltd. furnishes the following information relating to budgeted sales and actual sales for April 2008.

	Product	*Sales quantity (units)*	*Sellingprice per unit (Rs.)*
Budgeted sales	A	1,200	15
	B	800	20
	C	2,000	40
Actual sales	A	880	18
	B	880	20
	C	2,640	38

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Calculate the following variances:
(i) Sales quantity variance
(ii) Sales mix variance
(iii) Sales price variance
(iv) Total sales variances *(CA Inter)*

Ans: Rs. 22,400 (F); Rs. 11,000 (F); (Rs. 2640 (A), Rs. 19,760 (F)

30. Compute the following variance from the data given below:
(i) Total sales margin variance
(ii) Sales margin volume variance
(iii) Sales margin price variance
(iv) Sales margin quantity (sub-volume) variance.

	Budgeted Qty units	*Actual Qty units*	*Budgeted sale price per unit Rs.*	*Actual sale price per unit Rs.*	*Standard cost per unit Rs.*
X	240	400	50	45	30
Y	160	200	25	20	15

(CA Inter)

Ans: (i) Rs. 600 (F), (ii) Rs. 3,600 (F), (iii) Rs. 3,000 (A), (iv) Rs. 3200 (F)

31. From the following information about sales, calculate:
(a) Total Sales Variance
(b) Sales Price Variance
(c) Sales Volume Variance
(d) Sales Mix Variance
(e) Sales Quantity Variance

	Product nos.	*Standard rate in Rs. per unit*	*Rs.*	*Product*	*Actual rate in Rs. per unit*	*Rs.*
A	5,000	5	25,000	6,000	6	36,000
B	4,000	6	24,000	5,000	5	25,000
C	3,000	7	21,000	4,000	8	32,000
	12,000		70,000	15,000		93,000

(ICWA Inter)

Ans: (a) Rs. 23,000 (F), (b) Rs. 5,000 (F), (c) Rs. 18,000 (F), (d) Rs. 500 (F), (e) Rs. 17,500 (F)

32. Compute the missing data indicated by the question marks from the following:

		Product R	Product S
Sales quantity			
	Standard (units)	?	400
	Actual (units)	500	?
Price/Unit			
	Standard	Rs. 12	Rs. 15
	Actual	Rs. 15	Rs. 20
Sales price variance		?	?
Sales volume variance		Rs. 1.20 (F)	?
Sale value variance		?	?

Sales mix variance for both the products together was Rs. 450 F. 'F' denotes favourable.

(CA, Inter)

Ans: Standard units of R, 400 units, Actual units of S, 400 units, Sales price variance R, Rs. 1,500 (F), for S, Rs.4000 (F) Sales volume variance, Rs. 6,000 (F) Sales value variance for R, Rs. 2700 (F), for S, Rs. 10,000 (F)

Control Ratios

33. Narang Ltd., produces two commodities, Good and Better, in one of its departments. Each unit takes 5 hrs and 10 hrs as production time, respectively. 1,000 units of Good and 600 units of Better were produced during March 2008. Actual man-hours spent in this production were 10000. Yearly budgeted hours are 96000. Compute the various control ratios. *(B. Com. (Hons), Delhi)*

Ans: Capacity ratio 1.25
Efficiency ratio 1.10
Activity ratio 1.8

34. ABC Ltd. manufactures two products A and B. Product A takes 6 hours to make while product B take 12 hours. In a month of 25 days of 8 hours each, 1200 units of A and 750 units of B were produced. The firm employs 75 men in the department responsible for producing these two products. The budgeted hours are 186,000 per annum. You are required to calculate activity ratio, capacity ratio and efficiency ratio. *(ICWA Inter)*

Ans: Activity ratio 104.5%
Capacity utilisation ratio 96.8%
Efficiency ratio 108%

35. From the following data, calculate activity ratio. A factory manufactures two products A and B. Standard time to manufacture product A is 2 hours and product B 10 hours. The budgeted and actual production in December 2008 were as follows:

	Budgeted production	*Actual production*
Product A	125 units	100 units
Product B	30 units	24 units

Total hours worked were 660

Ans: Activity ratio 80%

36. If the 'activity ratio' and 'capacity ratio' of a company is 104% and 96% respectively, find out its 'efficiency ratio'. *(CA Inter, may 1997)*

Ans: Efficienay ratio 108.33%

BUDGETING

20

Learning Objectives

After reading this chapter, you should be able to:

1 explain concept of budgeting, its objectives and functions, advantages and limitations;
2 understand budgeting process, organisation for budgeting, budget manual, budget period, budget centres, principal budget factor;
3 explain elements of a successful budgeting plan;
4 distinguish between budgets and standard costs;
5 importance and differences between fixed and flexible budgeting;
6 discuss the procedure of preparing different types of functional and financial budgets, and
7 explain the concept of Zero Base Budgeting (ZBB), Planning, Programming and Budgeting System (PPBS), Performance Budgeting.

CONCEPT OF BUDGETING

One of the primary objectives of cost accounting is to provide information to business managements for planning and control. Budgeting acts as tool of both planning and control. Budgeting is a formal process of financial planning using estimated financial and accounting data. The Institute of Cost and Management. Accountants (UK) defines a budget as "a financial and/or quantitative statement, prepared and approved prior to a defined period of time, of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and the employment of capital."

Budgeting and Forecasting

Sometimes the terms "budgeting" and "forecasting" are used interchangeably. Both terms have some similarities, for example, both relate to furture events and involve prediction of something. The basic difference between budgeting and forecasting lies in degree of sophistication involved in the predictions used by them. According to the National Association of Accountants (USA), "forecasting is a process of predicting or estimating a future happening". Forecasting is an essential part of the budgeting process. Forecasting is estimating future events and their effects on the budget. Forecasting comes to an end after mere estimating. Budgeting is a process of preparing budgets and further control aspects are involved in its

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procedure. Besides, forecasting can be made by a firm for purposes other than budgeting, such as a forecast of general business conditions. Such forecasts are sometimes not used in budgeting.

Thus, budgeting is not merely forecasting of a particular event. It is not simply an estimation or prediction; it is a plan. In simple terms, budgeting is an attempt, at the beginning of the year (or at any other period), to plan the profit and loss account for the year and to aim for a definite balance sheet at its end, instead of relying upon chance.

CONCEPT OF BUDGETARY CONTROL

Budgetary control is a means of control in which the actual state of affairs is compared with the budget so that appropriate action may be taken with regard to any deviations before it is too late. Briefly, the use of a budget to control a firm's activities is known as budgeting control. Budgetary control has the following main objectives:

1. To provide an organised procedure for planning. It provides a detailed plan of action for a business over a definite period of time.
2. To coordinate all the activities of various departments of a business firm in such a manner that the maximum profit will be achieved for the minimum use of resources.
3. To provide a means of determining the responsibility for all deviations from the plan (budget), and to supply information on the basis of which necessary corrective action may be taken. Thus, budgetary control has the objective of controlling cost.

OBJECTIVES AND FUNCTIONS OF BUDGETING

An effective budgeting system is vital to the success of a business firm. Budgeting is needed in organisations to perform the following functions: (i) Planning, (ii) coordination, (iii) communication, and (iv) control and performance evaluation.

Planning

Almost all business activities require some planning to ensure efficient and maximum use of scarce resources. The budget is a formal planning framework that provides specific deadlines to achieve departmental objectives and contributes towards the overall objectives of an organisation. A budget incorporates expected performance and present managerial targets. These targets guide the business operations and help in overcoming problems and analysing the future. Budgeting influences the formulation of all business strategies and subsequently assists business managers in executing such strategies.

Coordination

Coordination is a managerial function under which all factors of production and all departmental activities are balanced and integrated to achieve the objectives of the organisation. The budgeting process provides the basis for individuals in all parts of the organisation to exchange ideas on how best to achieve these objectives. According to Horngreen*, budgets help management to coordinate in the following ways:

1. The existence of a well-laid plan is the major step towards achieving coordination. Executives are forced to think of the relationships among individual operations, and the company as a whole.
2. Budgets help to restrain the empire-building efforts of executives. Budgets broaden individual

* Charles T. Horngreen, *Cost Accounting*, *A Managerial Emphasis*, Prentice-Hall of India, New Delhi, p. 123.

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thinking by helping to remove unconscious biases on the part of engineers, sales and production officers.

3. Budgets help to search out weaknesses in the organisational structure. The formulation and administration of budgets isolate problems of communication, of fixed responsibility, and of working relationships.

Communication

It is necessary in an efficient organisation that all people be informed about the objectives, policies, programmes and performances. This is made possible through their participation in the budgeting process. Budgets inform each manager of what others have agreed to do. They also inform managers of the resources available to achieve objectives and targets.

Control and Performance Evaluation

Budgeting enters into control at three points:

1. When a budget is being formulated, departments analyse their plans for the furture and submit estimates as per their requirements, justfying each of their demands by demonstrating a need.
2. After budgets of different departments have been reviewed and approved they become targets that set desirable limits on spending.
3. At the end of the budget period, a comparison of actual expenditures with budget expenditure is made as a means of judging performance and fixing responsibility for deviations.

Budgets are the basis of performance evaluation in an organisation as they reflect realistic estimates of acceptable and expected performance. It is more accurate, reliable and reasonable to measure current performance against a budget rather than against a vague expectation or against results of previous year when conditions might have changed.

ADVANTAGES OF BUDGETING

Budgeting plays an important role in the effective use of resources and achieving overall organisational goals. It has the following advantages:

1. Budgeting compels and motivates management to make an early and timely study of its problems. It generates a sense of caution and care, and adequate study among managers before decisions are made by them.
2. Budgeting provides a valuable means of controlling income and expenditure of a business as it is a "plan for spending".
3. Budgeting provides a tool through which managerial policies and goals are periodically evaluated, tested and established as guidelines for the entire organisation.
4. Budgeting helps in directing capital and other resources into the most profitable channels.
5. Budgeting coordinates and correlates all business activities. It enables management to decentralise responsibility without losing control of the business. It reveals weaknesses, inefficiencies, deviations in the organisation very promptly which can be checked immediately to achieve a desired goal.
6. The use of budgeting in an organisation develops an attitude of "cost consciousness," stimulates the effective use of resources, and creates an environment of profit-mindedness throughout the organisation.
7. It provides a norm, basis or yardstick for measuring performance of departments and individuals working in organisations.
8. Budgeting encourages productive competition, provides incentive to perform efficiently and gives a sense of purpose to each individual in the organisation.

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9. Budgeting provides a systematic and disciplined approach to the solution of problems in the organisation. Horngreen observes: "The uppermost point is that budgets provide a discipline that brings planning to the forefornt as a key managerial responsibility."
10. Budgeting, if executed in nearly every enterprise, helps the total national economy by providing stability of employment, economic use of resources and effective prevention of waste.

LIMITATIONS OF BUDGETING

While budgeting has many advantages that are vital to an organisation, it has certain limitations which require careful consideration:

1. Planning, budgeting or forecasting is not an exact science; it uses approximations and judgement which may not be cent per cent accurate. At best, a budget is an estimate; no one knows precisely what will happen in the future.
2. The success and utility of budgeting depends on the cooperation and participation of all members of management. Many a time budgeting has failed because executive management has paid only lip service to its execution.
3. A budget is only a tool and does not eliminate nor take over the place of management. Executives generally feel "circled in" by a budget and its related figures. They fail to understand that budget is meant to provide detailed information, goals and targets which may help them in achieving the company objectives.
4. The establishment of a budgeting process takes time. Also, sometimes too much is expected from a budget and in case expectations are not fulfilled, the blame is put on the budget.
5. Excessive emphasis on budgeting may result in attempts by lower level management and employees to buck the system by providing inaccurate estimates of future costs and revenues. As the end of budget period approaches and employees realise that actual expenses have not been as great as allowed by the budget, there may be a temptation to spend excessive amounts in order to "use up" the budget allowance. Such activities result in sub-optimal profits for the company.

BUDGETING PROCESS

The budgeting process or programme varies widely from one organisation to another. Differences in management style, organisation objectives, structure of competition and similar factors affect the procedures companies adopt in budget preparations. However, there are a set of guidelines (procedures) which are used in the budgeting process by a large number of organisations. These common steps can be listed as follows:

1. *Obtaining estimates of sales, production levels, expected costs, and availability of resources from each sub-unit/division/department* The departmental heads or managers are required to provide estimates of future conditions and activities that will have an impact on the company.
2. *Coordinating estimates* In many organisations, the budget committee evaluates the different plans submitted by the various organisational units to determine the potentiality of plans in the overall interest of the company and to estimate what resources are available and can be fairly allocated among the various units of the organisation.
3. *Communicating the budget to responsible managers and the concerned departments* After individual budget plans have been approved in the light of organisational goals and availability of resources, the budgets should be communicated to departments and responsible managers. Changes and modifications incorporated in the final budget should be made known to managers to obtain their cooperation and support for the budgets.

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4. *Implementing the budget plan* The final budget is presented to the managers concerned and adopted as the plan of operation for the coming budget period.
5. *Reporting interim progress towards budgeted objectives* As a feedback in the budgeting process, performance reports are prepared to inform departmental managers and top management about the performances achieved in terms of budgeted figures. Such an investigation may call for a need to revise the budget during the year. This feedback of information can also be used as a basis for preparing the next year's budget.

ORGANISATION FOR BUDGETING (THE BUDGET COMMITTEE)

Responsibility for budget direction and execution is usually placed in the hands of a Budget Committee which reports directly to top management. In large companies the budget committee is composed of executives incharge of major functions of the business and includes the sales manager, HRD manager, finance manager, the production manager, the chief engineer, the treasurer and the chief accounts officer.

The principal functions of the budget committee are to:

1. Decide the company's general policies and objectives.
2. Receive and review individual budget estimates concerting different departments/divisions.
3. Suggest changes, modifications in accordance with organisational objectives.
4. Approve budgets which act as an authority/target for departmental action.
5. Receive and analyse performance reports regarding the implementation of budgets.
6. Suggest corrective action to improve efficiency and achieve budgetary goals.

BUDGET MANUAL

A budget manual is a document which defines the responsibilities of persons engaged in a budgetary programme and sets out the routine, the forms and records required under budgeting. Budget manuals specify the procedures to be followed in developing the budget. Since organisations differ in terms of structure, method of production, and operating requirements, it is difficult to prepare a budget manual suitable for use in all business enterprises.

THE BUDGET PERIOD

The budget period is an important factor in developing a comprehensive budgeting programme. The length of the budget period depends on the type of business, the length of the manufacturing cycle from raw material to finished product, the ease of difficulty of forecasting future market conditions and other factors. However, a business enterprise generally prepares a Short-range budget, and a Long-range budget.

Short-range Budget

Short-range budgets may cover periods of three, six or twelve months depending upon the nature of the business. Most manufacturing firms use one year as the planning period. Wholesale and retail firms usually employ a six-month budget which is related to their selling seasons. In determining the period of the short-range budget, the following factors should be considered:

1. The budget period should be long enough to cover complete production of various products.
2. For business of a seasonal nature, the budget period should cover at least one entire seasonal cycle.
3. The budget period should be long enough to allow for the financing of production well in advance of actual needs.

4. The budget period should coincide with the financial accounting period to compare actual results with budget estimates and thus to facilitate better interpretation of the performance.

Long-range Budget

A long-range budget or planning is defined as a systematic and formalised process for directing and controlling future operations towards a desired objective for periods extending beyond one year. Such budgets cover specific areas, such as future sales, future production, long-term capital expenditures, extensive research and development programmes, financial requirements, profit forecast. They evaluate the future implications associated with present decisions and help management in making present decisions and select the most profitable alternative.

There are many factors which are duly considered while preparing long term budgets, such as market trends, economic factors, growth of population, consumption pattern, industrial production, national income, government economic and industrial policy. Quantitative sales can be budgeted for a three to five years period. After forecasting sales, a budgeted profit and loss account can be prepared relating anticipated sales to corresponding cost and thus net operating profit can be forecasted. Likewise, a balance sheet for many years can be prepared to forecast cash, inventory levels, accounts receivable, accounts payable, liabilities, etc. The forecasted profit and loss account and balance sheet for a long-range is a very useful tool in accomplishing the objectives of the organisation as a whole.

ELEMENTS OF A SUCCESSFUL BUDGETING PLAN

The success of the budgeting process in an organisation depends on the following essential elements:

1. *Accurate forecasting of business activities* Forecasting is a prerequisite in a budgeting process. It is not only the starting point, but is also critical to the development of an accurate budget.
2. *Coordinating business activities* Budgeting needs to coordinate all the individual budgets into an integrated plan as each budget has certain implications for the other budgets. There must be coordination between sales, production, purchasing, personnel budgets.
3. *Communicating the budgets* The success of a comprehensive budgeting programme depends on communication of individual budgets to the different units in the organisation. Managers are not responsible for budget unless the budget is communicated clearly, concisely and in an authoritative manner to them.
4. *Acceptance and cooperation* Successful budgeting also requires that budgets should be accepted by the people who must execute them. Budgeting should have the active cooperation of the entire organisation from the top to the bottom.
5. *Reasonable flexibility* The budgeting programme should contain reasonable flexibility if the situation so demands. However, it should be noted that too much flexibility and too much tightness are both undesirable. Too much flexibility will weaken the cost control and the budget will become inoperative. Similarly, too much rigidity not permitting reasonable deviations will create problems and restrictions in the implementation of the budget.
6. *Providing a framework for evaluation* Budgeting provides a basis to evaluate the performance of different departments.

BUDGET CENTRES

An organisation is usually broken down into different budget centres for administrative and control purposes. A budget centre is the lowest level in an organisation for which detailed costs are budgeted, separately from those of other budget centres. The main factor is setting up budget centres is one of the fixing responsibility

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for action and inaction. To ensure adequate cost control, the budget centres should fulfil the following conditions:

1. The budget of a particular budget centre should specify precisely the costs controllable by the person responsible for that centre.
2. Costs for which responsibility is joint, for example, work carried out by a maintenance department, should be kept separate from costs which can be controlled by one manager.
3. Cost that are apportioned between two or more budget centres should also be controlled and for such costs one person should be made responsible.

LIMITING OR PRINCIPAL BUDGET FACTOR

When budgets are made, there is invariably some factor which governs or sets a limit to the quantity which can be made or sold. This is known as the limiting or principal budget factor. The Institute of Cost and Management Accountant (UK) defines a principal budget factor as "the factor the extent of whose influence must first be assessed in order to ensure that the functional budgets are reasonably capable of fulfilment." In the field of sales, the limiting factor is customer demand which is influenced by many factors, such as price and quality of the product, competition, the general purchasing power of the public, advertising, etc. In the field of production, the principal budget factor may be plant capacity, the supply of labour of the right quality, or the availability of scarce materials.

BUDGETS AND STANDARD COSTS

Standard costs and budgets are both vital tools in planning, operation and control of a business enterprise. Both differ in the following respects:

1. A standard costing system can operate without any comprehensive budgeting system.
   But budgets in absence of standard costs will only be fair estimates and cannot provide a reasonable base against which the actual results can be compared.
2. The objectives of budgeting are different from standard costing. A budget is a profit plan reflecting anticipated financial inflows and outflows. Budgets include both income and expenditure, but standards are set usually for expenses only.
   Standard costs are developed only for the production and related manufacturing cost.
3. Budgets project the volume of business and levels of costs which should be maintained. That is, they reflect cost ceilings which should not be exceeded if the budgeted profit is to be attained. Budgeted costs are expected costs.
   Standard costs emphasise the cost levels to which cost should be reduced. If costs reach this level, profit will be increased. Standards are minimum targets which are to be attained by actual performance at specific efficiency. Standard costs aims at what the costs should be.
4. Budgets covering the entire business present the forecasted profit and loss account and sometimes balance sheet also. Therefore, budgets act as guides for operating the business on a definite course of action.
   Standards are frequently used only in labour operation and do not represent expected costs but the cost that should be in a certain assumed conditions of performance. Horngreen* observes that the term "standard" is a unit concept and the term budgeted cost is a total concept. It may be helpful to think of a standard as a budget for the production of a single unit of output.

* Charles T. Horngreen, *Cost Accounting, A Managerial Emphasis*, Prentice-Hall of India, New Delhi p. 173.

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5. Budgets if achieved by the organisation do not usually involve much variance analysis.
   Under standard costing detailed variance analysis is carried out to find out deviations so that corrective action may be taken.
6. Review and revision of budgets is more frequently based on the changing circumstances than those of standard costs.
   Standard costs are more static and subject to less change.
7. Budgets are equally important for planning, organisation, coordination and control functions of management.
   Standard costs contribute relatively more to the control function than other managerial functions although standards are used for all business functions.
8. Budgets are the maximum limits of expenses above which expenditure should not be incurred. Budgets are projects of financial accounts.
   Standards are minimum targets which are to be attained.
9. In budgeting, no further analysis is required if costs are within the budgets.
   Detailed analysis is needed in case of variances whether they are favourable or unfavourable.

In spite of the above differences, there are some similarities between standard costing and budgeting. Both have in common the establishment of predetermined measures of performance and the comparison of actual and planned performance so as to disclose deviations which are used for the purpose of cost control. Both help in the preparation of reports which compare actual costs and predetermined costs for management planning and control. Standards are almost indispensable to the work of establishing and operating a budget. A study made by the national Association of Accounts (USA) concludes that standard costs are especially valuable in developing the cost side of the budget because they provide a reliable and convenient source of data for converting the budgeted production schedule into requirements for raw materials, labour and services.

FIXED AND FLEXIBLE BUDGETING

Fixed Budgeting

The Institute of Costs and Management Accounts (UK) defines a fixed budget as the budget which is designed to remain unchanged irrespective of the level of activity actually attained. It is based on a single level of activity. A fixed budget performance report compares data from actual operations with the single level of activity reflected in the budget. Fixed budgets do not change when production level changes.

However, in practice, fixed budgeting is rarely used. The main reason is that actual output is often significantly different from the budgeted output. In such a case the budget cannot be used for the purpose of cost control. The performance report may be misleading and will not contain very useful information. For example, if actual production is 12000 units in place of the budgeted 10000 units, the costs incurred cannot be compared with the budget which relates to different levels of activity. Since, in fixed budgeting, units are overlooked, a cost to cost comparison without considering the units may give misleading results. The performance report prepared under fixed budgeting merely discloses whether actual costs were higher or lower than budgeted costs. Therefore, the fixed budget is unable to provide useful information when actual output differs significantly from expected or budgeted output. The fact the costs and expenses are affected by fluctuations in volume limits the use of the fixed budget. Clearly, the idea of comparing performance at one activity level with a plan that was developed at some other activity level is nonsense from the viewpoint of judging how efficiently the manager has produced any given output.

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A fixed budget can be usefully employed when budgeted output is close enough to the actual output. If output can be estimated within close limits, the fixed budget can be a good basis for performance measurement. Maximum managerial control may be exercised by making comparisons with actual operating figures.

Flexible Budgeting

A flexible budget is a budget that is prepared for a range, that is, for more than one level of activity. It is a set of alternative budgets to different expected levels of activity. The flexible budget is also known by other names, such as variable budget, dynamic budget, sliding scale budget, step budget, expenses formula budget and expenses control budget. The underlying principle of a flexible budget is that every business is dynamic, ever-changing, and never static. Thus, a flexible budget might be developed that would apply to a "relevant range" of production, say 8000 to 12000 units. Under this approach, if actual production slips to 9000 units from a projected 10000 units, the manager has a specific tool (that is., the flexible budget) that can be used to determine budgeted cost at 9,000 units of output. The flexible budget provides a reliable basis for comparisons because it is automatically geared to changes in production activity. A flexible budget has the following important features:

1. It covers a range of activity (output).
2. It is flexible, that is, easy to change with variation in production levels.
3. It facilitates performance measurement and evaluation.

Planning or budgeting for a range of activity rather than for a single level of activity is always preferable due to the uncertainty about the changes in activity levels. In flexible budgeting, that range of activity is selected which is likely to occur. Most often, one activity level at each extreme of the activity range is selected, with one or more in between. Among different activity levels the most likely activity level is made the basis for planning business operations. Flexible budgeting makes it easy to adjust plans to changing production levels without any delay. The flexibility involved in this budget makes a very useful decision making tool for management.

Steps in Flexible Budgeting

The following steps (stages) are involved in developing a flexible budget:

1. Deciding the range of activity to which the budget is to be prepared.
2. Determining the cost behaviour patterns (fixed, variable, semi-variable) for each element of cost to be included in the budget.
3. Selecting the activity levels (generally in terms of production) to prepare budgets at those levels.
4. Preparing the budget at each activity level selected by associating the activity level with corresponding costs. The corresponding costs to be attached with each activity level are determined in terms of their behaviour, that is., fixed, variable, semi-variable.

Advantages of Flexible Budgeting

Flexible budgeting is budgeting that is automatically tailored to any level of activity. Although it is most often associated with the control of overhead, a flexible budget may also include direct materials and direct labour. Welsch* has listed three specific uses of the flexible budget.

* Glenn A. Welsch, *Budgeting, Profit Planning and Control*, P.22

1. To facilitate development of the departmental expense budgets for inclusion in the profit plans.
2. To provide expense goals for the managers of responsibility centres during the period covered by the profit plan.
3. To provide adjusted budget allowances for comparison purposes (against actual expenses) in the monthly performance reports.

In general, flexible budgeting has the following important advantages:

1. *Accurate budgeting* The use of flexible budgets may result in the preparation of more accurate budgets. Flexible budgeting techniques require that consideration is to be given to the output factor in budget preparation. Since all costs do not behave in the same manner (as some costs rise faster than others when production increases) a budget giving consideration to the volume (output) factor is bound to be more accurate than one where volume is not considered.
2. *Accurate performance measurement* The flexible budgeting technique incorporates changes in activity level and compares actual results with the budget in terms of output achieved. This facilitates more meaningful comparison and evaluation between actual and budgeted data as comparable data are compared.
3. *Coordination* Flexible budgeting results in coordination between all activities/departments of a business. Production is planned in relation to expected sales, materials and labour are acquired to meet expected production requirements. Facilities are provided to achieve budgetary goals, and funds are made available for the investments necessary to have higher output.
4. *Control tool* Flexible budgeting is an effective management control tool. Comparisons between the budgeted costs (at the actual production level) and actual costs form the basis for analysing cost variances and fixing responsibility for the same. In fact, managers themselves feel motivated in controlling costs for which they are responsible. This contributes to cost control throughout the organisation.

Example 20.1

The following are the budget estimates of plant servicing department in a manufacturing company:

Items of cost	*Planned at 6000 service hour (Rs.)*	*Planned at 9000 service hour (Rs.)*
Salaries	28,000	28,000
Indirect materials	42,000	63,000
Miscellaneous costs	16,000	20,500

Required:

Prepare a flexible budget for the department for 7,000, 8,000 and 9,500 service hours.

(B.Com. (Hons), Delhi, 2007)

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Solution:

Flexible Budget of the Department

	7000 Service hrs (Rs.)	*8000 Service hrs (Rs.)*	*9,500 Service hrs (Rs.)*
Salaries (fixed)	28,000	28,000	28,000
Indirect materials (Variable @ Rs. 7 per hour)	49,000	56,000	66,500
Miscellaneous costs:			
Variable @ Rs. 1.5 per hour	10,500	12,000	14,250
Fixed	7,000	7,000	7,000
	94,500	1,03,000	1,15,750

Working Notes:

(i) *Salaries* are fixed as they are constant at both 6000 service hours and 9000 service hours.

(ii) *Indirect materials*

Increase in cost = Rs. 63,000 – Rs. 42,000

= Rs. 21,000

Increase in service hours = 9000 – 6000

= 3000 hours

Variable portion of indirect material

= Rs. 21,000 ÷ 3000 hrs

= Rs. 7 per hour

Indirect material at 6000 hrs = 6000 × Rs. 7 = Rs. 42,000

Indirect material at 9000 hrs = 9000 × Rs. 7 = Rs. 63,000

Thus, indirect materials in total are variable cost

(iii) Miscellaneous costs

Increase in cost = Rs. 20,500 – 16,000

= 4,500

Increase in hrs = 9000 – 6,000 = 3000

Variable portion = Rs. 4,500 ÷3000 hrs

= Rs. 1.5 per hour

Miscellaneous cost at any level, say 6000 hrs

Variable portion = 6000 hrs × 1.5 = Rs. 9,000

Remaining fixed miscellaneous cost = Rs. 16,000 – 9,000 = Rs. 7,000

Example 20.2

GMR Ltd. has supplied the following summary of its operating results for the year ending 31st March 2007:

	Rs. Lakhs
Sales (40000 units)	48.00
Less: Trade discount	2.40
Net Sales	45.60
Cost of sales:	
Direct materials	14.40
Direct wages	12.60
Factory overhead	6.30
Administration overhead	3.60
Selling and distribution overhead	4.50

The following changes are to be incorporated in the budget for the year ending 31st March 2008:

(i) Sales quantity to be increased by 25%.
(ii) Material prices to increase by 15%.
(iii) Direct wage rates to go up by 12%
(iv) Factory overhead will increase by 15%. In addition, a new facility will be added to the factory laboratory at a recurring cost of Rs. 12,500 per annum.
(v) Administration and selling and distribution overhead are estimated to go up by 10% and 14% respectively.
(vi) There will be no change in the rate of trade discount.
(vii) There will be no change in inventory.

You are required to present the budget for the year ending 31st March 2008 showing the details of total cost,sales and profit.

(B.Com.(Hons), Delhi, 2007)

Solution:

Cost, Sales and Profit Budget for the years ending 31st March 2007

	Rs. Lakhs
Sales $48 \times \frac{125}{100}$	60
Less: Trade discount 5% of 60	– 3
(i) Net sales	57
Direct materials $14.40 \times \frac{125}{100} \times \frac{115}{100}$	20.70
Direct wages $12.60 \times \frac{125}{100} \times \frac{112}{100}$	17.64
Factory overheads $6.30 \times \frac{115}{100}$ + Rs. 0.125 lacs	7.37
Administration overheads $3.60 \times \frac{110}{100}$	3.96

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Selling and distribution overheads $4.50 \times \frac{114}{100}$	5.13	
Cost of sales	54.80	
Profit = 57 – 54.80	Rs. 2.20	lakhs

Example 20.3

A factory is currently running at 50% capacity and produces 5000 units at a cost of Rs. 90 per unit as per details given below:

Material	50
Labour	15
Factory overheads	15 (Rs. 6 fixed)
Administrative overheads	10 (Rs. 5 fixed)

The current selling price is Rs. 100 per unit. At 60% working, material cost per unit increases by 2% and selling price per unit falls by 2%. At 80% working, material cost per unit increases by 5% and selling price perunit falls by 2.5%. Prepare a flexible budget showing profits of the factory at 60% and 80% working and offer your comments.

(B.Com. (Hons), Delhi 2004)

Solution:

Flexible Budget

Present Capacity 50% (5000 Unit)

	Nature of Cost	*50% Capacity 5000 Units*		*60% Capacity 6000 Units*		*80% Capacity 8000 Units*	
		Per Unit Rs.	*Total Rs. (Lakhs)*	*Per Unit Rs.*	*Total Rs. Lakhs*	*Per Unit Rs.*	*Total Rs. Lakhs*
Raw Materials	V	50	2.50	51	3.06	52.50	4.20
Labour	V	15	0.75	15	0.90	15.00	1.20
Factory Overhead (Rs. 9)	V	09	0.45	09	0.54	09.00	0.72
Adm. Overheads (Rs. 5)	V	05	0.25	05	0.30	05.00	0.40
(1) Total Variable Cost		79	3.95	80	4.80	81.50	6.52
Factory Overhead (Rs. 6 Fixed)	F	06	0.30	–	0.30	–	0.30
Adm. Overheads (Rs. 5 Fixed)	F	05	0.25	–	0.25	–	0.25
(2) Total Fixed Cost		11	0.55	09	0.55	07.00	0.55
(3) Total Cost (1 + 2)		90	4.50	89	5.35	88.50	7.07
(4) Profit		10	0.50	09	0.53	09.00	0.73
(5) Sales		100	5.00	98	5.88	97.50	7.80

Example 20.4

G.S. Ltd. manufactures a single product for which market demand exists for additional quantity. Present sales of Rs. 60,000 per month utilises only 60% capacity of the plant. Marketing manager assures that with the reduction of 10% in the price he would be in a position to increase the sale by about 25% to 30%.

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The following data are available:

(i)	Selling price	Rs. 10 per unit
(ii)	Variable cost	Rs. 3 per unit
(iii)	Semi-variable cost	Rs. 6,000 fixed + 50 paise per unit
(iv)	Fixed cost	Rs. 20,000 at present level estimated to be Rs. 24,000 at 80% output.

You are required to prepare the following statements:

(i) The operating profits at 60%, 70% and 80% levels at current selling price; and
(ii) The operating profits at proposed selling price at the above levels.

(B.Com. (Hons), Delhi, 2004)

Solution:

Statement of Cost and Profit (at Current Prices)

	60% capacity 6000 units	*70% capacity 7000 units*	*80% capacity 8000 units*
	Rs.	Rs.	Rs.
Fixed Cost	20,000	20,000	20,000
Semi-variable Cost: Fixed	6,000	6,000	6,000
Variable @ 50 paise per unit	3,000	3,500	4,000
Variable costs @ Rs. 3 per unit	18,000	21,000	24,000
Total Cost	47,000	50,500	54,000
Sales	60,000	70,000	80,000
Profit	13,000	19,500	26,000

Statement of Cost and Profit (at Proposed Price)

	60% capacity 6000 units	*70% capacity 7000 units*	*80% capacity 8000 units*
	Rs.	Rs.	Rs.
Total Cost	47,000	50,500	54,000
Sales @ Rs. 9 per unit	54,000	63,000	72,000
Profit	7000	12,500	18,000

Example 20.5

Figures regarding sales, cost and profit at 50% capacity are given below:

	Rs.
Sales	20,00,000
Direct cost	8,00,000
Factory overheads	4,00,000
Office overheads	2,00,000
Selling overheads	3,00,000
Profit	3,00,000

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Every 10% increase in sale beyond 50% capacity is possible only after reducing the price by 1% on the base level of 50% capacity. Direct material cost is 25% of the total direct cost at 50% capacity. With every 10% increase in capacity above this level, the price of direct material comes down by 2%. 50% of the factory overheads are fixed and the rest are full variable. Office overheads are of step character. Every 10% increase in output results in 2% increase in office overheads over 50% capacity. Selling overheads increase in proportion of sales value.

Prepare a flexible budget at 80% capacity level.

(B.Com. (Hons), Delhi, 2003)

Solution:

Flexible Budget

Particulars	*At 50% of Capacity* Rs.	*At 80% Capacity* Rs.
Direct cost	8,00,000	12,60,800
Factory overheads		
Variable	2,00,000	3,20,000
Fixed	2,00,000	2,00,000
Factory cost	12,00,000	17,80,800
Office overheads	2,00,000	3,39,587
Cost of production	14,00,000	21,20,387
Selling overheads	3,00,000	4,65,600
Cost of sales	17,00,000	25,85,987
Profit	3,00,000	5,18,013
Sales	20,00,000	31,04,000

Working Notes:

(i) At 50% capacity direct material is 25% of direct cost that is $8,00,000 \times \frac{25}{100}$ = Rs. 2,00,000

At 80% capacity = $\frac{2,00,000}{50} \times 80$ = Rs. 3,20,000

Less 2% decrease with every 10%

Remaining direct cost at 50% capacity

Rs. 8,00,000 – Rs. 2,00,000 = Rs. 6,00,000

Increase in capacity = $\frac{3,20,000 \times 6}{100} = \frac{19,200}{3,00,800}$

At 80% capacity = $\frac{6,00,000 \times 80}{50} = \frac{9,60,000}{12,60,800}$

(ii) Factory overhead = Rs. 2,00,000 (Fixed)

Variable at 80% capacity = $\frac{2,00,000 \times 80}{50}$ = Rs. 3,20,000

(iii) Office overheads

At 50% capacity = Rs. 2,00,000

At 60% capacity = $\frac{2,00,000}{50} \times 60$	Rs. 2,40,000
Add: 2% increase	4800
	2,44,800
At 70% capacity = $\frac{2,44,800}{60} \times 70$	Rs. 2,85,600
Add: 2% increase	5,712
	2,91,312
At 80% capacity = $\frac{2,91,312}{70} \times 80$	Rs. 3,32,928
Add: 2% increase	6,659

(iv) Selling overhead: proportionate to sale value

Rs. $\frac{3,00,000}{20,00,000} \times 31,04,000$ = Rs. 4,65,600

(v) Sales at 80%

$\frac{20,00,000}{50} \times 80$	Rs. 32,00,000
Less: 1% Decrease with every 10% increase in sale that is, 3% of Rs. 32,00,000	96,000
	Rs. 31,04,000

Example 20.6

G. Ltd. is currently operating at 75% of its capacity. In the past two years the level of operations were 55% and 65% respectively. Presently, the production is 75000 units. The company is planning for 85% capacity level during 2000-2001.

The cost details are as follow:

Particulars:	55% Rs.	65% Rs.	75% Rs.
Direct materials	11,00,000	13,00,000	15,00,000
Direct labour	5,50,000	6,50,000	7,50,000
Factory overheads	3,10,000	3,30,000	3,50,000
Selling overheads	3,20,000	3,60,000	4,00,000
Administrative overheads	1,60,000	1,60,000	1,60,000
	24,40,000	28,00,000	31,60,000

Profit is estimated @ 20% on sales. The following increases in costs are expected during the year:

	In percentage
Direct materials	8
Direct labour	5
Variable factory overheads	5
Variable sellign overheads	8
Fixed factory overheads	10
Fixed selling overheads	15
Administrative overheads	10

Prepare a flexible budget for the period 2000–2001 at 85% level of capacity and ascertain the profit on sales.

(B.Com. (Hons), Delhi, 2002, CA Inter May 1999)

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Solution:

Statement showing the flexible budget at 85% capacity level during 200–2001.

	Working Notes	*85% capacity level*
		Rs.
Sales	1	47,31,500
Variable Costs:		
Direct Material	2	18,36,000
Direct Labour	3	8,92,500
Variable Factory	4	1,78,500
Variable Selling Overhead	5	3,67,200
Total Variable cost		32,74,200
Contribution		14,57,300
Fixed Cost:		
Factory Overhead	6	2,20,000
Selling Overhead	7	1,15,000
Administrative Overhead	8	1,76,000
Total Fixed Cost		5,11,000
Total Cost of Sales		37,85,200
Profit (I – IV)		9,46,300

Working Notes:

1. It is given that budgeted profit is 20% of sales is equal to 25% of cost of sales. Total cost of sales at 85% capacity level is as follows:

   Sales = Rs. 37,85,200 $\times \frac{125}{100}$ = Rs. 47,31,500.

2. Raw material is variable in nature. The raw material cost at 75% level = Rs. 15,00,000
   At 65% level = Rs. 13,00,000
   At 10% level = Rs. 2,00,000

   At 85% level material cost = Rs. 15,00,000 + Rs. 2,00,000 = Rs. 17,00,000 with 8% increase, the budgeted raw material cost will be:

   Rs. $\frac{17,00,000 \times 108}{100}$ = Rs. 18,36,000

3. Direct wages is also variable in nature
   Direct Labour at 75% level = 7,50,000
   Direct Labour at 65% level = 6,50,000
   Direct Labour at 10% level = 1,00,000
   Direct Labour at 85% level = Rs. 7,50,000 + Rs. 1,00,000 = Rs. 8,50,000

   With 5% increase = Rs. $\frac{8,50,000 \times 105}{100}$ = Rs. 8,92,500

4. Factory Overhead is semi-variable in nature. Therefore, the same has to be segregated into variable portion and fixed portion.

$$\frac{\text{Rs. } 3,50,000 - \text{Rs. } 3,30,000}{75 - 65} = \frac{20,000}{10} = \text{Rs. } 2,000$$

Variable Factory Overhead at 85% = Rs. 2,000 × 85 = Rs. 1,70,000.

With 5% increase = $\frac{\text{Rs. } 1,70,000 \times 105}{100}$ = Rs. 1,78,500

5. Variable Selling Overhead

$$= \frac{\text{Rs. } 4,00,000 - \text{Rs. } 3,60,000}{75 - 65}$$

$$= \frac{40,000}{10} = \text{Rs. } 4,000$$

At 85% level Rs. 4,000 × 85 = 3,40,000

With 8% increase $\frac{\text{Rs. } 3,40,000 \times 108}{100}$ = Rs. 3,67,200

6. Total Factory Overhead (55% level) = 3,10,000

Less: Variable portion Rs. 2,00,000 × $\frac{55}{10}$ = 1,10,000

Fixed Portion 2,00,000

With 10% increase = Rs. 20,000 × $\frac{110}{100}$ = 2,20,000

7. Total Selling Overhead (55% level) = 3,20,000

Less: Variable portion = 40,000 × $\frac{55}{10}$ = 2,20,000

Fixed Portion 1,00,000

With 15% increase = $\frac{\text{Rs. } 1,00,000 \times 115}{100}$ = Rs. 1,15,000

8. Administration overhead.

= Rs. 1,60,000 × $\frac{110}{100}$ = Rs. 1,76,000

Example 20.7

From the following data, prepare a flexible budget for production of 40000 units and 75000 units, distinctly showing variable cost and fixed cost as well as total cost. Also indicate element-wise cost per unit. Budgeted output is 100,000 units and budgeted cost per unit is as follows:

Direct Material	95
Direct labour	50
Production overhead (variable)	40
Production overhead (fixed)	5
Administration overhead (fixed)	5
Selling overhead (10% fixed)	10
Distribution overhead (20% fixed)	15

(B. Com. (Hons), Delhi 2000)

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Solution:

Flexible Budget

	100,000 units		*40000 units*		*75000 units*	
	Per unit	*Total*	*Per unit*	*Total*	*Per unit*	*Total*
Variable cost:	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Direct material	95	95,00,000	95	38,00,000	95	71,25,000
Direct labour	50	50,00,000	50	20,00,000	50	37,50,000
Production overhead	40	40,00,000	40	16,00,000	40	30,00,000
Selling overhead $= \frac{10 \times 90}{100}$	9	9,00,000	9	3,60,000	9	6,75,000
Distribution overhead $= \frac{15 \times 80}{100}$	12	12,00,000	12	4,80,000	12	9,00,000
Total variable cost	206	20,600,000	206	82,40,000	206	1,54,50,000
Fixed Cost:						
Production overhead	5	5,00,000	12.50	5,00,000	6.67	5,00,000
Administrative overhead	5	5,00,000	12.50	5,00,000	6.67	5,00,000
Selling overhead	1	1,00,000	2.50	10,00,000	1.33	1,00,000
Distribution overhead	3	3,00,000	7.50	30,00,000	3.00	3,00,000
Total fixed cost	14	14,00,000	35.00	14,00,000	17.67	14,00,000
Total Cost	260	2,20,00,000	231.00	96,40,000	223.67	1,68,50,000

Example 20.8

Brilliant Ltd. is engaged in production of certain products, 100% capacity being 10000 units per month. Given below are the information for the just concluded previous two months:

	Month 1	Month 2
Unit Produced	6000	9000
Costs (other than direct material and labour)		
	Rs.	Rs.
Salaries	30,000	30,000
Power	30,000	39,000
Consumable Stores	30,000	45,000
Repair	40,000	46,000
Indirect Shop Labour	15,000	22,500
Depreciation	25,000	25,000
Inspection	10,000	13,000

Rate of production per hour is 10 units. Direct material costs are Rs. 20 per unit and direct labour hour costs per hour are Rs. 80. You are required to compute cost of production segregating fixed, semi-variable and variable costs separately at 100%, 80% and 50% capacity utilisation levels respectively. Also work out the overhead absorption rate per hour at 100% capacity utilisation level. (Show your workings as part of the answer).

(ICWA, Stage 2, Dec. 2005)

Solution:

Workings:

As a first step the Semi-variable Expenses to be identified by seeing which of the expenses do not vary directly in proportion to the activity levels.

	Diff. In capacity	Diff. in overhead	Variable	Fixed	Total
		Rs.	Rs.	Rs.	Rs.
Power	30%	9,000			
	1%	300			
at capacity level	60%	18,000	18,000	12,000	30,000
	90%	27,000	27,000	12,000	39,000
	100%	30,000	30,000	12,000	42,000
	80%	24,000	24,000	12,000	36,000
	50%	15,000	15,000	12,000	27,000

Similarly Repairs and Inspection costs are to be calculated.

Brilliant Ltd.

Cost of production at various capacity levels

Capacity	100%	80%	50%
Units	10000	8000	5000
Production hours	1000	800	500
	Rs.	Rs.	Rs.
Element of cost:			
Direct Material	2,00,000	1,60,000	1,00,000
Direct Labour	80,000	64,000	40,000
Prime cost	2,80,000	2,24,000	1,40,000
Factory Overheads:			
Variable:			
Consumables	50,000	40,000	25,000
Ind. shop labour	25,000	20,000	11,500
Semi variable:			
Power	42,000	36,000	27,000
Repairs	48,000	44,000	38,000
Inspection	14,000	12,000	9,000
Fixed:			
Salaries	30,000	30,000	30,000
Depreciation	25,000	25,000	25,000
	2,34,000	2,07,000	1,65,500
Total cost of production	5,14,000	4,31,000	3,05,500

Overhead absorption rate at 100% capacity = Rs. 2,34,000/1000 = Rs. 234

Example 20.9

The cost of an article at a capacity level of 5000 units is given in the Table below under column A. For a variation of 25% in capacity above or below this level, the individual expenses vary, as indicated in column B.

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	A (Rs.)	B (Rs.)
Material cost	25,000	100% variable
Labour cost	15,000	100% variable
Power	1,250	80% semi-variable
Repairs and maintenance	2,000	75% semi-variable
Stores	1,000	100% variable
Inspection	500	20% semi-variable
Administrative overheads	5,000	25% semi-variable
Selling overheads	3,000	50% semi-variable
Depreciation	10,000	100% fixed
Total	62,750	
Cost per unit	12.55	

You are required to prepare the production cost Budget (flexible) at 4000 units and 6000 units.

(ICWA Inter, Stage II, Dec. 2004)

Solution:

Production Cost (flexible) Budget

(Figures are in Rs.)

	4000 units	6000 units
Material Cost (variable)	20,000	30,000
Labour Cost (variable)	12,000	18,000
Stores (variable)	800	1,200
Power (semi-variable)	1,050	1,450
Repairs and Maintenance (semi-variable)	1,700	2,300
Inspection (semi-variable)	480	520
Administrative overheads (semi-variable)	4,750	5,250
Selling overhead (semi-variable)	2,700	3,300
Depreciation (fixed)	10,000	10,000
Total	53,480	72,020
	13.37	12.00

Example 20.10

A newly established manufactured company has an installed capacity to produce 100,000 units of a consumer product annually. However its practical capacity is only 90%. The actual capacity utilisation may be substantially lower, as the firm is new to the market and demand is uncertain. The following budget has been prepared for 90% capacity utilisation:

	Cost per unit Rs.	
Direct Materials	12	
Direct Labour	8	
Direct Expense	5	
Production Overheads	10 –	(40% variable)
Administration Overheads	5	(100% fixed)
Selling and Distribution	6	(50% variable)

You are required to prepare budgets at 60%, 70% and 80% levels of capacity utilisation giving clearly the unit variable cost, the unit fixed cost and the total costs under various heads at all the above levels.

(ICWA Inter, Stage 1, Dec. 2003)

Solution:

Notes:

1. Variable Overheads:
   Production overhead: 40% of Rs. 10 = Rs. 4.00
   Selling and Distribution overhead: 50% of Rs. 6 = Rs. 3.00
2. Fixed Overheads:
   Practical capacity is 90% that is, of 100.000 = 90,000 units

Production overhead: (60% of Rs. 10 = Rs. 6) = 90,000 × Rs. 6 = Rs. 5,40,000
Administration overhead: 9,00,000 × 5 = Rs. 4,50,000
Selling and Distribution overhead (50% of Rs. 6 = 3): 90,000 × 3 = Rs. 2,70,000

Flexible Budget of a Consumer Product

Capacity production (units)	*60% 60000*		*70% 70000*		*80% 80000*	
	Total Cost (Rs. in lakhs)	*Cost per unit (Rs.)*	*Total Cost (Rs. in lakhs)*	*Cost per. unit (Rs.)*	*Total Cost (Rs. in lakhs)*	*Cost per unit (Rs.)*
Direct Costs:						
Direct materials	7.20	12.00	8.40	12.00	9.60	12.00
Direct labour	4.80	8.00	5.60	8.00	6.40	8.00
Direct expenses	3.00	5.00	3.50	5.00	4.00	5.00
Variable overheads:						
Production overhead	2.40	4.00	2.80	4.00	3.20	4.00
Selling and Distribution overhead: (Ref. W.N.1)	1.80	3.00	2.10	3.00	2.40	3.00
Total variable cost (A)	19.20	32.00	22.40	32.00	25.60	32.00
Fixed overheads:						
Production overhead	5.40	9.00	5.40	7.71	5.40	6.75
Administration ovrhead	4.50	7.50	4.50	6.43	4.50	5.62
Selling and Distribution Overhead.(Ref. W.N.2)	2.70	4.50	2.70	3.86	2.70	3.38
Total fixed cost (B)	12.60	21.00	12.60	18.00	12.60	15.75
Total Cost (A + B)	31.80		35.00		38.20	
Cost per unit (Rs.)		53.00		50.00		47.75

TYPES OF BUDGETS

Budgets are the end product of the budgeting process. The numbers and types of budgets in a business enterprise depend on the size and nature of the business. However, in a manufacturing concern, the following budgets are generally prepared:

(A) Operating and functional budgets:

1. Sales budget
2. Production budget
3. Production cost budget
   (i) Direct materials budget
   (ii) Direct labour budget
   (iii) Factory overhead budget

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4. Ending inventories budget
5. Cost of goods sold budget
6. Selling expense budget
7. Administrative expense budget
8. Budgeted income statement

(B) Financial budgets:

1. Capital expenditure budget
2. Research and development budget
3. Cash budget
4. Budgeted balance sheet
5. Budgeted statement of changes in financial position.

Sales Budget

The most important budget, which all other budgets are contingent upon, is the sales budget. All budgets, such as production budget, selling and distribution budget and others are all affected by the sales budget and are dependent upon the revenue derived from sales.

A specimen of sales budget is given in Fig. 20.1.

ABC Company Ltd.
Sales Budget for the
year Ending December 31, 2008

Products	*Budgeted sales units*	*Budgeted sales price (Rs.)*	*Total*
A	70,000	80,000	56,00,000
B	80,000	1,20,000	96,00,000
Total	1,50,000		1,52,00,000

Fig. 20.1 Sales Budget

Forecasting Sales

Developing a sales budget requires forecasting future sales levels. The three main factors that should be considered by management in forecasting sales are: (a) information concerning past performance, (b) information about present conditions within the individual company and in each sales territory, and (c) data concerning the industry and general business conditions.

The information about past performance is the starting point for sales forecasting. The sales record for past years, and particularly for the year just ending should be available to management in minute detail.

The second essential step in forecasting sales is the accumulation of data regarding conditions within the company and in each sales territory. The management can obtain a good picture of sales prospects through information sent to the head office by salesmen, dealers, and sales officers of different territories.

Information about general business conditions are known as "business barometers" and they should be considered in preparing a sales forecast. The following are important business indicators:

1. Gross national product, which is the total market value of output of goods and services produced in the entire economy.
2. Personal income and purchasing power of the population.
3. Unemployment conditions.
4. Government crop reports.

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5. Steel, coal and oil production.
6. Wholesale price indices.
7. Business failures.
8. Industrial production index.
9. Governmental policies.
10. Cyclical phases of the country's economy.

Sales Analysis

After collecting all relevant information for a sales forecast, a sales analysis or budget is prepared. The sales budget is usually prepared on the lines of (i) product, (ii) territory, and (iii) customer.

Production Budget

After preparing the sales budget, the production budget is prepared. A production budget is stated in physical units. it specifies the number of units of each product that must be produced to satisfy the sales forecasts and to achieve the desired level of closing finished goods inventory. Essentially, the production budget is the sales budget adjusted for inventory changes as follows:

Units to produce = Budgeted sales + Desired closing inventory of finished goods – Beginning inventory of finished goods

A specimen production budget in given in Fig. 20.2.

ABC Company
Total Production Budget for the Month of December, 2008

	Products	
	A	B
Budgeted sales (units)	70,000	80,000
Add: Desired closing finished goods inventory	20,000	30,000
	90,000	1,10,000
Less: Beginning finished goods inventory	40,000	50,000
Units to be produced	50,000	60,000

Fig. 20.2 Production Budget

The production budget, like other budgets, is detailed by months or quarters along with a tentative annual budget. Further, budgets are prepared for every production centre for comparison with actual production.

Production Cost Budget

A production cost budget summarises the materials budget, labour budget, the factory overhead budget, and may be expressed and analysed by departments and or products. A production cost budget, also known as a manufacturing budget is made up of three budgets: (i) materials, (ii) labour, and (iii) factory overhead.

Direct Materials Budget

This budget specifies the cost of direct materials used and the cost of the direct materials purchased. Figure 20.3 explains the calculation of the direct materials budget. The usage part of the direct materials budget determines the cost of purchases of direct materials.

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ABC Company
Direct Materials Budget for the Year Ending December 2008

A. Usage Budget

	Products		
	A	*B*	*Total*
Budgeted production in units	50000	60000	
Direct materials requirements			
Product A 5 kg per unit	× 5		
Product B 8 kg per unit		× 8	
Direct materials usage (kg)	2,50,000	4,80,000	
Cost per kg	Re 1.00	Rs. 1.50	
Cost of direct materials used	Rs. 2,50,000	Rs. 7,20,000	Rs 9,70,000

B. Purchase Budget

	Direct material (in kg)		
	A	*B*	*Total*
Direct materials usage	2,50,000	4,80,000	
Budgeted closing direct materials inventory	+ 50,000	+ 75,000	
Total requirements	3,00,000	5,55,000	
Beginning direct materials inventory	70,000	1,00,000	
Purchase of direct materials	2,30,000	4,55,000	
Cost per kg	× Re 1.00	× Rs. 1.50	
Cost of purchase	Rs. 2,30,000	Rs. 6,82,500	Rs. 9,12,500

Fig. 20.3 Direct Materials Budget

The direct materials budget is useful in the following ways:

1. It helps the purchasing department to prepare a schedule to ensure delivery of materials when needed.
2. It helps in fixing minimum and maximum levels of inventories in the stores department.
3. It helps the finance manager to determine the financial requirements to meet production targets.

The materials budget usually deals with direct materials only. Supplies and indirect materials are generally included in the factory overhead budget.

Direct Labour Budget

The labour budget estimates the labour, adequate in number and grades, to enable the production budget to be achieved. It is generally preferable to prepare a separate direct labour budget and to include indirect labour in the factory overhead budget. The labour budget prepared must disclose the following information: (i) the number of each type or grade of worker required in each period to achieve the budgeted output; (ii) budgeted cost of such labour in each period; and (iii) period of training necessary for different types of workers.

Figure 20.4 illustrates the preparation of a direct labour budget.

ABC Company
Direct Labour Budget for the Year Ending December 2008

	Products		
	A	*B*	*Total*
Budgeted production requirements	50,000	60,000	
Direct labour hours per unit	3	2	
Total direct labour hours	1,50,000	1,20,000	2,70,000
Direct labour cost per hour	Rs 5.00	Rs 5.00	Rs 5.00
Total direct labour cost (Rs.)	Rs. 7,50,000	Rs. 6,00,000	Rs. 13,50,000

Fig. 20.4 Direct Labour Budget

Factory Overhead Budget

The factory overhead budget is prepared on the basis of the chart of accounts which reflects different expense accounts and which properly classifies expenses accounts and details the cost centres or departments. Although expenses can be classified in different manners such as natural classification, variability, the preparation of the factory overhead budget requires that expenses should be classified by departments since expenses are incurred by various departments. In this way, departmental heads should be held accountable for expenses incurred by their departments.

Figure 20.5 depicts the factory overhead budget where in overhead costs have been classified into fixed and variable components.

Ending Inventories Budget

An inventory budget can be prepared to find out the values of direct materials and finished goods inventory as shown in Fig. 20.6.

ABC Company
Factory Overhead Budget for the Year Ending December 2008
(Based on budgeted capacity of 2,70,000 direct labour hours)

Items	*Direct labour*	*Rate per direct hours* Rs.	*Total cost* Rs.
A. Variable factory overhead:			
(i) Supplies	2,70,000	1.00	2,70,000
(ii) Repairs	2,70,000	0.50	1,35.000
(iii) Indirect labour	2,70,000	1.00	2,70,000
(iv) Others	2,70,000	0.40	1,08,000
Total variable factory overhead cost			7,83,000
B. Fixed factory overhead cost:			
(i) Supervision		Rs. 4,00,000	
(ii) Depreciation		5,50,000	
(iii) Property tax		2,50,000	
(iv) Others		1,77,000	
Total fixed factory overhead cost			13,77,000
Total factory overheads cost			21,60,000
Predetermined overhead rate	$= \text{Rs.} \frac{21,60,000}{2,70,000}$ hours		
	= Rs. 8.00 per direct labour hour		

Fig. 20.5 Factory Overhead Budget

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ABC Company
Ending Inventory Budget for the Year Ending December 2008

		Rs.
Direct materials inventory		
Product A	5,000 kg × Re 1.00 per kg	50,000
Product B	75,000 kg × Rs. 1.50 per kg	1,12,500
		1,62,500
Finished goods inventory		
Product A	20,000 units × Rs. 25.00	5,00,000
Product B	30,000 units × Rs. 30.00	9,00,000
		14,00,000

Fig. 20.6 Ending Inventories Budget

Cost of Goods Sold Budget

After preparing direct materials, direct labour, factory overhead, and ending inventory budgets, the cost of goods sold budget can be prepared. The cost of goods sold budget summarises all the above budgets as shown in Fig. 20.7.

Selling Expenses Budget

Closely related with the sales budget is the selling and distribution cost budget which shows the budgeted costs of promoting sales for the budget period. It is also known as the marketing expense budget. The selling cost budget is made up of a number of cost items, some of which are fixed and some variable. The principal fixed expenses are salaries and depreciation; the principal variable expenses are commissions, travel advertising and bad debts.

ABC Company
Cost of Goods Sold Budget for the Year Ending Dec. 31, 2008

	Rs.	Rs.
Direct materials:		
Beginning inventory	2,00,000	
Purchases	9,12,500	
	11,12,500	
Less: Closing inventory	1,62,500	
Cost of direct materials used		9,50,000
Direct labour		13,50,000
Factory overhead		21,60,000
Total factory cost		44,60,000
Beginning finished goods inventory		25,00,000
Total goods available for sale		69,60,000
Closing finished goods inventory		14,00,000
Cost of goods sold		55,60,000

Fig. 20.7 Cost of Goods Sold Budget

Figure 20.8 exhibits an annual selling expenses budget classified according to fixed and variable expenses. Separate budgets for each of these expenses may be prepared especially in the case of a large company.

ABC Company
Selling Expense Budget for the Year Ending December 31, 2008

Items	*Costs (Rs.)*	*Total costs Rs.*
(A) *Variable selling expenses:*		
(i) Sales commission	35,000	
(ii) Salary and wages	40,000	
(iii) Advertising	15,000	
(iv) Travelling	22,000	1,12,000
(B) *Fixed selling expenses:*		
(i) Warehousing	60,000	
(ii) Advertising	30,000	
(iii) Marketing manager's salary	60,000	
(iv) Depreciation	27,000	
		1,77,000
Total selling expenses		2,89,000

Fig. 20.8 Selling Expenses Budget

Administrative Expenses Budget

The administrative expenses budget covers the administrative costs for non-manufacturing business activities. The administrative expense budget contains expenses like directors' remuneration, legal charges, audit fees, salaries, rent, office expenses, interest, property taxes, postage, telephone, telegraph, etc. These expenses should be properly classified under different headings to determine the responsibility of cost incurrence and control. For example, these expenses can be classified into different categories such as company administration, general accounting, general office, etc. Figure 20.9 presents an administrative expense budget.

ABC Company
Administrative Expenses Budget for the Year Ending December 31, 2008

Items	*Amount Rs.*	*Amount Rs.*
(A) Variable administrative expenses:		
(i) Supplies	35,000	
(ii) Clerical wages	60,000	
Total variable administrative expenses		95,000
Fixed administrative expenses:		
(i) Director's remuneration	1,20,000	
(ii) Legal charges	20,000	
(iii) Depreciation	25,000	
(iv) Salaries	30,000	
(v) Rent	60,000	
(vi) Postage, telephone, etc.	32,000	
Total fixed administrative expenses		2,87,000
Total administrative expenses		3,82,000

Fig. 20.9 Administrative Expense Budget

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Budgeted Income Statement

A budgeted income statement summarises all the individual budgets, that is, sales budget, cost of goods sold budget, selling budget, and administrative expense budget. No new estimates are made; figures are taken from budgets previously prepared. This budget determines income before taxes. If the tax rate is available, net income after taxes can also be computed. Figure 20.10 exhibits a budgeted or projected income statement.

Capital Expenditure Budget

The budgeting of capital expenditure is one of the most important areas of managerial decisions. Capital expenditures represent long-term commitments. Also, the benefits of capital expenditure spread over a long period of time. Capital expenditure budgets are prepared for both short and long-range projects depending on the requirements of the business firm. Short-range projects are implemented during the current accounting period. Long-range projects are not executed in the current period, they are expressed only in general terms. They become budget commitments only when the time for their implementation approaches.

ABC Company
Budgeted Income Statement for the Year Ending December, 2008

		Rs.
Sales		1,52,00,000
Cost of goods sold		55,60,000
Gross margin		96,40,000
Selling expenses	2,89,000	
Administrative expenses	3,82,000	6,71,000
Income before taxes		89,69,000
Income taxes (assuming 50%)		44,84,500
Net Income		44,84,500

Fig. 20.10 Budgeted Income Statement

Research and Development Budget

The research and development budget is the most important tool for planning and controlling research and development costs. It compels management to think in advance about the fairness of these expenses both in total amounts and in each field of a research programme. It helps in coordination with the company's other plans and projects. Since the research and development programmes compete with other desirable activities in allocation of funds, coordination is needed to balance financially immediate and long-term company plans. Also, this budget guides the research and development department to plan correctly the staff and equipment requirements and special facilities needed for the work.

Cash Budget

A cash budget contains detailed estimates of cash receipts (cash inflows) and disbursements (cash outflows) for the budget period or some other specific period. The preparation of a cash budget has the following objectives:

1. It indicates the effect on the cash position of seasonal requirements, large inventories, unusual receipts, and slowness in collecting receivables.

2. It indicates the cash requirements needed for a plant or equipment expansion programme.
3. It points up to the need for additional funds from sources such as bank loans or sales of securities and the time factors involved.
4. It indicates the availability of cash for taking advantage of discounts.
5. It assists in planning the financial requirements of bond redemption, income tax instalments, and payments to pensions and retirement funds.
6. It shows the availability of excess funds for short-term investments.

Period of Cash Budget

The period of time covered by a cash budget depends on the type of business, management planning needs, and cash position. A cash budget many generally be related to the following time periods:

1. *Operational cash planning* Cash budgets may be prepared monthly, weekly or even daily to meet informational requirements of management.
2. *Short-range* Short-range cash budgeting is prepared annually and is in correspondence with the annual profit plan. It indicates cash inflows and outflows as generated by the annual profit plan.
3. *Long-range* Long-range budgeting does not disclose detailed estimates of revenue and expenses. The effects of business expansion and long-term trends are incorporated in long-range cash budgeting. Long-range cash projection is in accord with (i) the timing of the capital expenditure projects, and (ii) the timing of the long-range profit plan (usually five years).

Preparation of a Cash Budget

A cash budget may be prepared by following either of the three generally accepted procedures:

1. The receipts and disbursements method.
2. The adjusted profit and loss or adjusted net income method.
3. Balance sheet method.

In the first method, all anticipated cash receipts are carefully forecasted such as cash sales, cash collections from debtors, dividends, interest on investments, proceeds from sale of assets, royalties, bank loans, etc. Likewise, cash disbursements for materials purchases, supplies, salaries, repayment of loans, dividends, taxes, expenses, purchases of plant or equipment are also determined. This method is useful for short-range cash projection but is not appropriate for long-term cash budgeting. This method is in accordance with the annual profit plan.

The second approach is the profit and loss or adjusted net income method. The starting point in this approach is budgeted profit reflected in the income statement. Basically, projected profit is converted from an accrual basis to a cash basis. That is, the budgeted profit of a period is adjusted for non-cash transactions and expected cash-oriented changes in asset and liability accounts not affected by profit calculations. Using the budgeted profit for a period as a starting point, various non-cash transactions are added back to net profit for the period. Non-cash items are depreciation, bad and doubtful accounts, expired insurance premiums, and income tax accruals. After this, anticipated decreases in assets or increase in liabilities are further added and anticipated increases in assets or decreases in liabilities are deducted. The budgeted cash at the end of a period is the cash balance at the beginning of the period plus the net cash increase (or minus the net cash decrease) as indicated in the analysis of the adjusted profit method.

The third approach is the balance sheet method. In this approach closing balances of all (budgeted) balance sheet items except cash and bank balances are found and put in a budgeted balance sheet. If the total of liabilities side items is more than the total of asset side items, the balancing figure will be cash/bank balance. On the contrary if the total of assets side items is more than the total of liabilities side items, the balancing figure will be bank overdraft or shortage in cash. Budgeted figures of closing balance sheet items can be found after adjusting the opening balance sheet items with the transactions anticipated for the year.

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Budgeted or Projected Balance Sheet

A projected balance sheet represents the expected financial position at a particular date. The projected balance sheet is prepared from the budgeted balance sheet at the beginning of the budget period and the expected changes in the account balances reflected in the operating budgets, capital expenditure budgets, and cash budget. The projected balance sheet also automatically determines the arithmetical accuracy of other budgets since they are used in preparing the forecasted balance sheet.

Budgeted Statement of Changes in Financial Position

The projected statement of changes in financial position is usually prepared from data in the budgeted income statement and changes between the projected balance sheet at the beginning of the budget period and projected balance sheet at the end of the budget period. This projected statement is very useful to management in the financial planning process.

Master Budget

A master budget sometimes called a comprehensive budget, is the summary or total budget package for a business firm. It is the end product of the budget-making process. It shows the budgeted profit and loss account for the budget period and the budgeted balance sheet at the end of the period. It reveals the top management's goals of revenues, expenses, net income, cash flows, and financial position. The other budgets prepared by a business firm are specific, that is, they deal with separate distinct activities of the organisation such as sales, production, selling and distribution and administrative activities. They incorporate plans and budgetory goals for a small segment of a business enterprise. However, to achieve business objectives, it is necessary to have coordination among different budgets reflecting diverse activities of a business firm. For example, there should be coordination between sales and production departments and the goals of the production department should match the goals of the sales department. In the absence of coordination among the budgets, a business firm may have problems, such as surplus inventory, shortage of stock, non-availability of raw materials and other resources, employees dissatisfaction, etc. A master budget takes the macro (aggregate) view of the business enterprise and coordinates sales with production; raw materials, manpower, machinery and other resources with production targets, and the like. The master budget is an integrative tool that cuts across divisional boundaries in order to coordinate the firms' diverse activities. While master budgets provide plans for an entire system, operating budgets provide plans for the organisation's sub-system, that is, operating budgets constitute the building blocks used to complete the master budget.

REVISION OF BUDGETS

As stated earlier in the chapter, successful budgets should have adequate flexibility to meet changing business conditions. Since budgets are used for planning, operation, coordination and control, they should be revised if changes occur in the environment. Revision of budgets may be necessary due to the following factors some of which might have been considered earlier in the development of budgets:

1. Errors committed in preparing the budgets which may subsequently be known.
2. Emergence of unforeseen and unanticipated situations which may cause the budget to be revised.
3. Changes in internal factors, for example, production, forecast, capacity utilisation, etc.
4. Changes in external factors, for example, market trends, nature of the economy, prices of inputs and resources, consumers' tastes and fashions.

Changes in the above factors do not affect a firm's budgets if they are of minor significance. Some changes, however, considerably affect budgets and in this situation management is faced with two problems:

1. Whether only individual budgets should be changed; and
2. Whether the master budget be changed.

Regarding the first question, most business firms are in agreement and suggest that specific individual budgets should be changed. For instance, if there is likely to be a significant change in expected sales (increase or decrease), production and purchasing departments should be informed about this to avoid over-stocking or under-stocking.

A revision of the master budget is debatable and sometimes is opposed mainly on two counts: (i) the master budget process is highly complex and expensive; (ii) the evaluation process may take care of these changes if the changes take place. The second argument is more or less on middle ground. While it argues for revision when changes do occur, it focuses on actual effects rather than projected changes. It is felt that this avoids making small changes in the plan that are of little consequence. Those who support the revision of the master budget argue that the revised budget is a better and more effective basis for performance evaluation and control. By revising budget, all members of the organisation come to know of the expectations and standards for which they will be accountable.

Example 20.11

You are producing an alloy. Production of one ton of alloy requires 1.5 tons Iron and 0.5 ton of zinc. The producer plans to sell 50000 tons of alloy during the year 2005. Prepare Materials Procurement Budget for the year 2005 from the following:

Balances as on Jan. 1, 2005:	
Stock of alloy	6,000 tonnes
Stock of iron ore	12,000 tonnes
Stock of zinc	4,000 tonnes
Iron ore on order	5,000 tonnes
Zinc on order	3,000 tonnes
Balances as desired on Dec. 31, 2005:	
Stock of alloy	5,000 tonnes
Stock of iron ore	8,000 tonnes
Stock of zinc	3,000 tonnes
Iron ore on order	7,000 tonnes
Zinc on order	2000 tonnes

(B.Com.(Hons), Delhi, 2005)

Solution:

Computation of Quantity of Production of Alloy:

= Sales + closing stock – opening stock

= 50,000 + 5000 – 6,000 = 49,000 tonnes.

Procurement Budget for the Year 2005

Particulars	Iron	Zinc
(1) Quantity of Product of Alloy (tonnes)	49,000	49,000
(2) Quantity of R.M. Required for 1 ton of Alloy (tonnes)	1.5	0.5
(3) Raw Material Consumption (1) × (2)	73,500	24,500
Add: closing stock (tonnes)	15,000	5,000
Total Requirements (tonnes)	88,500	29,500
less: outstanding (tonnes)	17,000	7,000
Procurement of RM (tonnes)	71,500	22,500

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Example 20.12

A single product company estimated its sales for the next year quarterwise as under:

Quarter	*Sales Units*
I	30000
II	37500
III	41250
IV	45000

The opening stock of finished goods is 10000 units and the company expects to maintain the closing stock of finished goods at 16250 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 10000 kg and the closing stock at the end of the year is required to be maintained at 5000 kg. Each unit of finished output required 2 kg of raw materials.

The company proposes to purchase the entire annual requirement of raw materials in the first three quarters in the proportion and at the prices given below:

Quarter	*Purchase of raw materials % to total annual requirement in quantity*	*Price per kg Rs.*
I	30%	2
II	50%	3
III	20%	4

The value of the opening stock of raw materials in the beginning of the year is Rs 20,000. You are required to present the following for the next year, quarterwise:

(i) Production budget in units.
(ii) Raw material consumption budget in quantity.
(iii) Raw material purchase budget in quantity and value.
(iv) Priced stores ledger card of the raw material using First in First out method.

(B. Com. (Hons.), Delhi 2005,CA Inter, May 1995)

Solution:

Basic Calculations
Total Annual Production (In Units)

Sales in 4 Quarters (units)	1,53,750
Add: Desired Closing Balance (units)	16,250
	1,70,000
Less: Opening Balance (units)	10,000
Total Number of units to be produced in the next year	1,60,000

(i) Production Budget (In Units)

Quarters	*I Units*	*II Units*	*III Units*	*IV Units*	*Total Units*
Sales	30,000	37,500	41,250	45,000	1,53,750
Production in Current Quarter *(80% of the sale of current quarter)*	24,000	30,000	33,000	36,000	
Production for Next Quarter *(20% of the sale of next quarter)*	7,500	8,250	9,000	12,250*	
Total Production	31,500	38,250	42,000	48,250*	1,60,000

*Difference in Balancing Figure.

(ii) Raw Material Consumption Budget (In Quantity)

Particulars	*Quarters*				*Total*
	I	*II*	*III*	*IV*	
Units to be produced in each Quarter (1)	31500	38250	42000	48250	160,000
Raw material consumption per unit (kg) (2)	2	2	2	2	
Total raw material consumption (kg) (1 × 2)	63000	76500	84000	96500	320,000

(iii) Raw Material Purchase Budget (In Quantity)

Raw Material Required for Production (kg)	320,000
Add: Desired Closing Balance of Raw Material (kg)	5000
	325,000
Less: Opening Balance (kg)	10000
Material to be Purchased (kg)	315,000

Raw Material Purchase Budget (In Value)

Quarters	*% of Annual Requirement (Qty.) for Purchasing Raw Material*	*Quantity of Raw Material to be purchased (kg)*	*Rate per kg (Rs.)*	*Amount (Rs.)*
1	*2*	*3*	*4*	*5 = 3 × 4*
I	30	94500 (315,000 × 30%)	2	189,000
II	50	157,500 (315,000 × 50%)	3	472,500
III	20	63000 (315,000 × 20%)	4	252,000
Total		315,000		913,500

(iv) Stores Ledger Card
(*of the raw material using FIFO method*)

	Quarters											
	I			*II*			*III*			*IV*		
Particulars	*kg*	*Rate Rs.*	*Value Rs.*	*kg*	*Rate Rs.*	*Value Rs.*	*kg*	*Rate Rs.*	*Value Rs.*	*kg*	*Rate Rs.*	*Value Rs.*
Opening Balance:(1)	10000	2	20,000	41500	2	83,000	122,500	3	3,67,500	38500	3	1,15,500
										63000	4	2,52,000
Purchases: (2)	94500	2	189,000	157,500	3	4,72,500	63000	4	2,52,000			
Consumption: (3)	63000	2	126,000	41500	2	83,000	84000	3	2,52,000	38500	3	1,15,500
				35000	3	1,05,000				58000	4	2,32,000
Balance: (4)	41500	2	83000	122,500	3	3,67,500	38500	3	1,15,500	5000	4	20,000
(4) = (1) + (2) – (3)							63000	4	2,52,000			

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Example 20.13

The following data pertains to Mr. Y for the month budget for November 2000:

	Rs.
Direct materials used	847
Beginning finished goods inventory	?
Ending finished goods inventory	94
Direct manufacturing labour	389
Manufacturing overhead	?
Cost of goods manufactured	1,878
Cost of goods sold	?
Cost of goods available for sale	1,949

Prepare the cost of goods sold budget for the month of Nov. 2000 by filling the missing figures.

(B. Com. (Hons), Delhi 2001)

Solution:

	Rs.
Direct material used	847
Beginning finished goods inventory	71
Ending finished goods inventory	94
Direct manufacturing labour	389
Manufacturing overhead	642
Cost of goods manufactured	1,878
Cost of goods sold	1,855
Cost of goods available for sale	1,949

As, we know that cost of goods manufactured is the aggregate of Direct material, Direct manufacturing labour and Manufacturing overhead.

∴ Rs. 1,878 = Rs. 847 + 389 + Manufacturing overhead

∴ Rs. 1,878 – 847 – 389 = Manufacturing overhead

∴ Rs. 642 = Manufacturing overhead

Cost of goods available for sale = Cost of goods manufactured + Opening balance of finished goods.

Rs. 1,949 = Rs. 1,878 + Opening balance of finished goods

Rs. 1,949 – Rs. 1,878 = Opening balance of finished goods

Rs. 71 = Opening balance of finished goods.

Cost of goods sold = Cost of goods manufactured + Opening balance of finished goods – Closing balance of finished goods

Cost of goods sold + Rs. 1,878 + Rs. 71 – Rs. 94

Cost of goods sold = Rs. 1,855

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Cost of goods sold budget for the month of November, 2000

		Rs.
Direct material used		847
Direct manufacturing labour		389
Manufacturing overhead		642
	Cost of goods manufactured	1,878
Add:	Opening balance of finished goods	71
	Cost of goods available for sale	1,949
Less:	Closing stock of finished goods	94
	Cost of goods sold	1,855

Example 20.14

Nestley Ltd. has prepared the following sales budget for the first five months of 1998:

	Sales Budget (Units)
January	10800
February	15600
March	12200
April	10400
May	9800

Inventory of finished goods at the end of every month is to be equal to 25% of sales estimate for the next month. On 1st Jan., 1998, there were 2700 units of product on hand. There is no work-in-progress at the end of any month.

Every unit of product requires two types of materials in the following quantities:

Material A—4 kg

Material B—5 kg.

Materials equal to one half of the requirement of next month's production are to be in hand at the end of every month. This requirement was met on 1st Jan., 1998.

Prepare the following budgets for the quarter ending 31st March, 1998:

(a) Production Budget (Quantitative)

(b) Material Purchase Budget (Quantitative). *(B. Com. (Hons), Delhi 1999)*

Solution:

Nestley Ltd.
Production Budget (In Units)
For quarter ending 31st March, 1998

Particulars	*Jan.*	*Feb.*	*March*
Sales	10800	15600	12200
Add: Closing Stock	3900	3050	2600
	14700	18650	14800
Less: Opening Stock	2700	3900	3050
	12000	14750	11750

Materials Requirement Budget
For the quarter ending 31st March, 1998

Particulars	*Jan.*	*Feb.*	*March*
Production (units)	12000	14750	11750
Material A	*kg*	*kg*	*kg*
Required for Production	48000	59000	47000
Add: Desired Closing Stock	28500	23500	20500
	76500	82500	67500
Less: Opening Stock	24000	28500	23500
	52500	54000	44000
Material B			
Required for Production	60000	73750	58750
Add: Desired Closing Stock	36875	29375	25625
	96875	103,125	84375
Less: Opening Stock	30000	36875	29375
	66875	66250	55000

Working Notes:

1. Production for April in Units

Sales	10400
Add: Closing Stock	2450
	12850
Less: Opening Stock	2600
	10250

2. Material required for Production in April
   A $10250 \times 4 = 41000$ kg
   B $10250 \times 5 = 51250$ kg

Example 20.15

A company manufactures two products X and Y. A forecast of unit to be sold in the first 4 months of the year is given below:

Months	*Product X*	*Product Y*
January	1000	2800
February	1200	2800
March	1600	2400
April	2000	2000
May	2400	1600

Other information are as follows:

Cost per unit (Rs.)	Product X	Product Y
Direct Material	12.50	19.00
Direct Labour	4.50	7.00
Factory overhead/unit	3.00	4.00

There will be no opening and closing work-in-progress (WIP) at the end of any month and finished product (in units) is equal to half of the budgeted sale of the next month should be in stock at the end of each month (including previous year-December).
You are required to prepare:

(i) Production Budget for the period January to April, and
(ii) Summarised Production Cost Budget. *(ICWA, Inter, Stage II, Dec. 2004, Dec. 2006)*

Solution:

Production Budget of X and Y for the period January to April.
Budgeted Production = Budgeted Sales + Desired Closing Inventory – Opening Inventory.

Month	Projected Sales (units)		Planned Inventory level (units)				Budgeted Production (units)	
					Closing		Opening	
	X	Y	X	Y	X	Y	X	Y
January	1000	2800	600	1400	500	1400	1100	2800
February	1200	2800	800	1200	600	1400	1400	2600
March	1600	2400	1000	1000	800	1200	1800	2200
April	2000	2000	1200	800	1000	1000	2200	1800
Total Budgeted Production in Units							6500	9400

Production Cost Budget of X and Y for the period January to April

	Product X			Product Y			Total Cost
	Cost/unit (Rs.)	Budgeted Production	Total cost (Rs.)	Cost/unit (Rs.)	Budgeted Production	Total Cost (Rs.)	X and Y (Rs.)
Direct Material	12.50	6500	81,250	19.00	9400	1,78,600	2,59,850
Direct Labour	4.50		29,250	7.00		65,800	95,050
Factory O/H	3.00		19,500	4.00		37,600	57,100
Total	20.00		1,30,000	30.00		2,82,000	4,12,000

Example 20.16

The following information relating to the third and last quarter of 2003–04 are furnished by a company which manufactures and sells a single product:

		Third quarter (Actual)	Last quarter (Estimate)
Sales		Rs. 6,24,000	Rs. 6,60,000
Inventory of raw material and finished goods:			
	Opening balance	Closing balance	Closing balance
Raw material A (kg)	25000	23500	25000
Raw material B (kg)	12650	13400	15000
Finished goods (units)	670	700	1000
Unit cost data:			
Raw material A :	10 kg @ Rs. 3 = Rs. 30		
Raw material B :	5 kg @ Rs. 2 = Rs. 10		

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Direct labour (Machine time 5 hrs @ Rs. 4): Machine shop = Rs. 20
Assembly 2 hrs. @ Rs. 5 (labour time) = Rs. 10

Production overheads:
Machine shop @ Rs. 12 per machine hr.
Assembly @ Rs. 10 per labour hr.

Selling and Administration O.H. : 20% of production cost
Profit margin : 10% on selling price

Production and sales occur evenly during the budget period. You are required to prepare for the last quarter of the year.

(a) Production budget (in units)
(b) Purchase budget (quantity and value)
(c) Production cost budget. *(ICWA, Inter, Stage 1, June 2004)*

Solution:

... Company
Cost of Production and Selling Price per Unit.

	Rs.	Rs.
Direct Material.		
A = 10 kg @ Rs. 3	30.00	
B = 5 kg @ Rs. 2	10.00	40.00
Direct labour:		
Machine shop = 5 hrs. @ Rs. 4	20.00	
Assembly = 2 hrs. @ Rs. 5	10.00	30.00
Production overheads:		
Machine shop = 5 hrs @ Rs. 12	60.00	
Assembly = 2 hrs. @ Rs. 10	20.00	80.00
Production Cost		150.00
Selling and Administration overheads @ 20%		30.00
Cost of sales		80.00
Profit Margin 10% on S.P. (or 10/90 on cost)		20.00
Selling Price		200.00

(a) Production Budget for last quarter of 2003–04

	Units
Sales in last quarter (4th quarter) 660,000/200	3300
Add: Closing balance at end of 1st qtr.	1000
Less: Opening balance	(700)
Production for last quarter	3600

(b) Purchase Budget for last quarter of 2003–04

	Material A		*Material B*		*Total*
	Qty. (kg)	*Amt. (Rs.)*	*Qty. (Kg)*	*Amt. (Rs.)*	*Value (Rs.)*
Consumption (Prodn. × Qty./unit) A = 3600 × 10 kg B = 3600 × 5 kg	36000		18000		
Add: Closing balance	25000		15000		
Less: Opening balance	(23500)		(13400)		
Purchase to be made	37500		19600		
Price per kg.		3		2	
Total value		1,12,500		39,200	1,51,700

(c) Production cost Budget for last quarter of 2003–04

Particulars	*Cost (Rs.)*	*Total (Rs.)*
Direct Material:		
A: 36,000 @ Rs. 3	1,08,000	
B: 18,000 @ Rs. 2	36,000	1,44,000
Direct Labour:		
Machine Shop: 18000 hrs. @ Rs. 4	72,000	
Assembly: 7200 hrs. @ Rs. 5	36,000	1,08,000
Production overheads:		
Machine shop: 18000 @ Rs. 12	2,16,000	
Assembly shop: 7200 @ Rs. 10	72,000	2,88,000
Total		5,40,000

Example 20.17 (Sales Overhead Budget)

You are requested to prepare a sales overhead budget from the estimates given below:

Advertisement	Rs. 2,500
Sales of the sales department	5,000
Expenses of sales department	1,500
Counter salesmen's salaries and dearness allowance	6,000
Commission to counter salesmen at 1% on their sales	

Travelling salesmen's commission at 10% on their sales and expenses at 5% on their sales.

The sales during the period were estimated as follows:

Counter sales	*Travelling salesmen*
Rs. 80,000	Rs. 10,000
1,20,000	15,000
1,40,000	20,000

(B. Com. (Hons), Delhi)

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Solution:

Sales Overhead Budget for the Period Ending

	Estimated sales		
	Rs. 90,000	*Rs. 1,35,000*	*Rs. 1,60,000*
Fixed overheads:			
Advertisement	2,500	2,500	2,500
Salaries of sales department	5,000	5,000	2,500
Expenses of sales department	1,500	1,500	1,500
Counter salesmen's salaries and DA	6,000	6,000	6,000
	15,000	15,000	15,000
Variable overheads:			
Counter salesmen's commission @ 1% on sales	800	1,200	1,400
Travelling salesmen's commission @ 10%	1,000	1,500	2,000
Expenses @ 5%	500	750	1,000
	2,300	3,450	4,400
Total sales overheads	17,300	18,450	19,400

Example 20.18 (Cash Receipts Budget)

A company normally collects cash from credit customers as follows: 50 per cent in the month of sale, 30 per cent in the first month after sale, 18 per cent in the second month after sale, and 2 per cent are never collected. Sales, all on credit, are expected to be as follows:

	Rs.
January	5,00,000
February	6,00,000
March	4,00,000
April	5,00,000

(a) Calculate the amount of cash expected to be received from customers during March.
(b) Calculate the amount of cash expected to be received from customers during April.

Solution:

	Rs.
(a) Budgeted cash collection in March:	
From January sales (.18 × 500,000)	90,000
From February sales (.30 × 600,000)	1,80,000
From March sales (.50 × 400,000)	2,00,000
Total Budgeted Collections in March	4,70,000
(b) Budgeted cash collections in April:	
From February sales (.18 × 600,000)	1,08,000
From March sales (.30 × 400,000)	1,20,000
From April sales (.50 × 500,000)	2,50,000
Total budgeted collections in April	4,78,000

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Example 20.19 (Cash Budget)

The January 1 cash balance of the Jay Company is Rs. 5,000. Sales for the first four months of the year are expected to be as follows: January, Rs. 65,000; February, Rs. 54,000; March, Rs. 66,000; and April, Rs. 63,000. On January 1, uncollected amounts for November and December of the previous year are Rs. 13,500 and Rs. 39,150, respectively. Collections from customers follow this pattern; 55% in the month of sale, 30% in the month following the sale, 13% in the second month following the sale, and 2% uncollectable.

Materials purchases for December were Rs. 10,000. Forecast purchases for the coming year are: Rs. 12,500; February, Rs. 16,500; March, Rs. 13,000; and April, Rs. 14,000. Purchases are usually paid by the 10th of the month following the month of purchase. Other cash expenditures of Rs. 41,000 are forecasted for each month.

Calculate:

(i) Expected cash collection during February
(ii) Expected cash balance, February 1
(iii) Expected cash balance, February 29.

Solution:

Cash Budget of Jay Company for Months of January and February

	January (Rs.)	*February (Rs.)*
Opening Balance	5,000	27,550
Receipts—From customers	73,550	60,510
(A)	78,550	88,060
Payments:		
For purchases	10,000	12,500
Other expenditure	41,000	41,000
Total Payments (B)	51,000	53,500
Closing Balance (A) – (B)	37,550	34,560
Thus;		
(i) Expected cash collections during February	= Rs 60,510	
(ii) Expected cash balance–February 1	= Rs 27,550	
(iii) Expected cash balance–February 29	= Rs 34,560	

Working Note:

Collections on account of sales

January

For November arrears 13,500 × 13/15	= Rs.	11,700
For December arrears $\frac{39,150}{45} \times 30$	=	26,100
For January sales 65,000 × 55/100	=	35,750
		73,550

February

For December arrears $\frac{39,150}{45} \times 13$	= Rs.	11,310
For January sales 65,000 × 30/100	Rs.	19,500
For February sales 54,000 × 55/100	=	29,700
		60,510

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Example 20.20

Based on the following information, prepare a Cash Budget for ABC Ltd:

	1st Quarter (Rs.)	2nd Quarter (Rs.)	3rd Quarter (Rs.)	4th Quarter (Rs.)
Opening cash balance	10,000	–	–	–
Collection from customers	1,25,000	1,50,000	1,60,000	2,21,000
Payments:				
Purchase of material	20,000	35,000	35,000	17,000
Other expenses	25,000	20,000	20,000	17,000
Salary and wages	90,000	95,000	95,000	1,09,200
Income tax	5,000	–	–	–
Purchase for machinery	–	–	–	20,000

The company desires to maintain a cash balance of Rs. 15,000 at the end of each quarter. Cash can be borrowed or repaid in multiple of Rs. 500 at an interest of 10% per annum. Management does not want to borrow cash more than what is necessary and wants to repay as early as possible. In any event, loans cannot be extended beyond four quarters. Interests is computed and paid when the principal is repaid. Assume that borrowings take place at the beginning and repayments are made at the end of the quarters.

(ICWA Stage 2, June 2006)

Solution:

Cash Budget for ABC Ltd.

Particulars	*1st Quarter (Rs.)*	*2nd Quarter (Rs.)*	*3rd Quarter (Rs.)*	*4th Quarter (Rs.)*
Opening Cash balance	10,000	15,000	15,000	15,325
Add: Collection from customers	1,25,000	1,50,000	1,60,000	2,21,000
(A) Total cash available	1,35,000	1,65,000	1,75,000	2,36,325
Payments:				
Purchase of materials	20,000	35,000	35,000	17000
Other expenses	25,000	20,000	20,000	17,000
Salary and wages	90,000	95,000	95,000	1,09,200
Income tax	5,000	–	–	–
Purchase of machinery	–	–	–	20,000
(B) Total cash payment	1,40,000	1,50,000	1,50,000	163200
Minimum cash balance reqd.	15,000	15,000	15,000	15,000
(C) Total cash required	1,55,000	1,65,000	1,65,000	178200
Excess (Deficit) A-C	(20,000)	–	10,000	58125
Financing:				
Borrowing	20,000	–	–	–
Repayment	–	–	(9000)	(11000)
Interest Payment	–	–	(675)*	(1,100)*
(D) Total effect of financing	20,000	–	(9,675)	(12,100)
Cash balance at the end of quarters (A + D – B)	15,000	15,000	15,325	61025

*9,000 × 0.10 × 9/12 = Rs. 675. Similarly interest has been calculated for one year @ 10% per annum on Rs. 11,000.

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ZERO BASE BUDGETING (ZBB)

Zero base budgeting (ZBB) is a method of budgeting whereby all activities are revaluated each time budget is formulated and every item of expenditure in the budget is fully justified. That is, ZBB involves starting from scratch or zero.

In traditional budgeting, departmental managers need justify only increases over the prior year's budget known as incremental budgeting. This implies that what is already being spent is automatically sanctioned. Under the ZBB concept, each department's functions are reviewed completely and all expenditures, rather than only the increases, must be approved.

Also in some departments ascertainment of budgeted costs is easier than other departments. For example, in production departments, it is easier to determine costs of inputs to achieve a level of budgeted output. But, in other departments such as accounts, personnel, research and development, it is difficult to even identify the output, and therefore equally greater difficult to determine the cost of input to sustain (unidentifiable) output. Consequently, the budgets of previous year tend to be subjectively increased as the next year budgeted expenditure. However, the previous year's budgets may be inefficient and adjusting merely new year's budgets to the previous year's budget may result in wastage. ZBB overcomes this problem, to a certain extent, ZBB rejects the traditional view of annual budgeting as an incremental process which takes into account current expenditure plus an estimate of next year's expenditure to arrive at the next budget. Instead the projected expenditure for existing programmes should start from base zero with each year's budgets being compiled as if the programmes were being launched for the first time.

Application of ZBB

ZBB involves the following stages (steps):

(1) Each separate activity of the organisation is identified and called a decision package. A decision package is a document that identifies and describes a specific activity in such a manner that management can (i) evaluate it and rank it against other activities competing for limited resources and (ii) decide whether to approve or disapprove it.
(2) Each decision package must be justified, that is it should be enquired into whether a decision package promotes the goals of an enterprise.
(3) If justified, then the cost of minimum efforts needed to sustain each decision package is determined.
(4) Alternatives for each decision package are considered in order to select better and cheaper options for the package.
(5) Incremental decision packages are also justified and costed in the above manner. These incremental packages describe the costs and benefits of additional work that would be done above that required by the base package for the minimum amount of work needed to carry out the activity.
(6) Managers rank their decision packages in order of priority for resource allocation.
(7) Resources are allocated to the packages.

Advantages of ZBB

(1) It represents a move towards allocation of resources by need and benefit and thus results in more efficient allocation of resources.
(2) It identifies and eliminates wastage and obsolete operations.
(3) It ensures that the best possible methods of performing jobs are used and that new ideas emerge.
(4) It creates a questioning attitude rather than one which accepts that current practices represent value for money.

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(5) It leads to increased staff involvement which may lead to improved motivation and greater interest in the job.
(6) It increases communication and coordination within the orgnisation.
(7) Managers become more aware of the costs of inputs which helps them to identify priorities.
(8) The documentation of decision packages provides management with a deep, coordinated knowledge of all the organisation's activities.
(9) It is useful especially for service departments where it can be difficult to identify output.

Disadvantages of ZBB

(1) The cross involved in preparing a vast number of decision packages in a large firm are very high.
(2) It is very time-consuming and a large amount of additional paper work is involved.
(3) Managers develop fear and feel threatened by ZBB and therefore may oppose new ideas and changes.
(4) The ranking of decision packages and allocation of resources is subjective to a certain degree, which can result in departmental conflict.
(5) Administration and communication of ZBB process may become critical problems because more managers become involved in this process than in most budgeting and planning procedures and these problems are further compounded in large organisations.

PLANNING, PROGRAMMING AND BUDGETING SYSTEM (PPBS)

Planning, Programming and Budgeting System (PPBS) is used in non-profit or non-commercial organisations to enable them to make more informed decisions about resources allocation. PPBS differs from traditional non-profit and non-manufacturing budgets in the sense that the latter are prepared as line item budgets whereas the former (PPBS) are prepared on the basis of programmes, that is, planned activities that have specified objectives. In PPBS, budgets for line/functional items for whole department are not presented. Instead, the expenses associated with specific programmes are detailed. For instance, a railway authority may have the programmes of total computerisation of its booking system, a municipal authority may have programmes of providing drinking water or providing health facilities in the city. Such programmes require greater coordination among several departments to make a specific programme successful.

PPBS is taken by extending the planning period beyond the one-year budget period. PPBS is the counterpart of the long term planning process which is operated in profit oriented organisations. PPBS is based on a rational model of decision making and involves the following stages:

(1) Identify and define the objectives of programme.
(2) Select performance or output measures to assess the effectiveness of the programme.
(3) Identify and evaluate alternative methods of achieving the objectives laid down for each specific programme. For this, costs and benefits associated with each alternative course of action should be detailed.
(4) Select the appropriate programmes on the basis of cost benefit analysis as done in (3).
(5) Implement the selected alternative and monitor its performance to ensure that the objectives of the programmes are achieved given the resources allocated to those programmes.

PPBS has certain advantages compared to traditional department/functional budgets:

(1) PPBS leads to a more effective allocation of resources by cutting across departmental barriers, providing to managers specific information related to the activities and by coordinating scarce resources and skilled personnel located in different departments on a particular programme or project.
(2) PPBS compels management to identify and evaluate the activities, functions or programmes which are carried out in terms of their objectives, efficiency and effectiveness.

(3) Programme budgeting provides adequate information which will enable management to assess the effectiveness of its plans and to focus on the organisation's outputs (the objectives to be achieved).
(4) PPBS enables management to have long term perspective and commitments in certain programmes while preparing the annual budget. For instance, an education programme may involve capital expenditure for a ten-year period. In this situation, the decision markers will have to keep in mind future commitments and resources availability while constructing the annual programme budget. In this way, the annual budget is placed in the long term context and becomes a part of long term programme.

PERFORMANCE BUDGETING

The concept of performance budgeting is used extensively in the Government and Public sector undertakings. A performance budget is essentially a projection of the Government activities and expenditure thereon for the budget period. It shows budgeted expenses classified by functions and activities and wherever practical, units cost also. In comparison to other budget forms, the objectives of performance budgeting are to provide a closer linkage between planning and action and to provide a more common basis for review, control and reporting.

The basic issues involved in the preparation of performance budgets are that of developing work programmes and performance expectations by assigning responsibilities necessary for the attainment of the goals of objectives of the enterprise. It also involves establishment of well defined centres of responsibility, establishment of targets for each responsibility centre in terms of physical units so that actual performance can be measured against the same, forecasting the amount of expenditure required to meet physical plan laid down and evaluation of actual performance with both physical targets and monetary targets performance.

THEORY QUESTIONS

1. Define "budget" and "budgetary control". Give a description of two important budgets. *(B. Com. (Hons), Delhi)*

2. (a) Define budgetary control and explain its objectives.
(b) Define how functional budgets are built up, taking any one specific example. *(CA Inter)*

3. Explain the meaning of a business budget. How does it serve as an instrument of control? *(B. Com. (Hons))*

4. Discuss the mode of operation of systems of budgets and budgetary control. *(B. Com. (Hons), Delhi)*

5. What do you understand by budgetary control? Explain the mechanism that would lead to effective control. *(ICWA Inter)*

6. What are the advantages arising out of the budgetary control system? What do you think are the essentials of an effective budgetary control system? *(ICWA, Final)*

7. Discuss the objectives and limitations of budgetary control. *(B. Com. (Hons), Delhi)*

8. Define budgetary control and discuss the objectives of introducing a budgetary control system in an organisation. *(ICWA, Inter, State I, Dec. 2006)*

9. Discuss the cardinal features and objectives of budgetary control.

10. Explain the difference between a forecast and a budget. Give examples to illustrate the differences between:
(a) Fixed budget,
(b) Flexible budget, and
(c) Functional budget.

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11. What are functional budgets. Which functional budgets are most commonly used by management? *(CA Inter)*

12. Define budgetary control and distinguish it from standard costing. Discuss the inter-relationship between budgetary control and the standard costing system. *(CA Inter)*

13. Discuss briefly the procedure for the preparation of a sales budget. *(ICWA Inter)*

14. What do you understand by a "flexible budget"? *(B. Com. (Hons), Delhi)*

15. What is a sales budget? How is it prepared? *(B. Com. (Hons), Delhi)*

16. Describe briefly the fundamental functions of business budgets. *(B. Com. (Hons), Delhi)*

17. Explain the concept of a flexible budget. How is it prepared? *(B. Com. (Hons), Delhi)*

18. What is flexible budget? How does the sales forecast differ from the sales budget? *(B. Com, Delhi)*

19. What do you understand by 'Flexible Budget'? How is it prepared? Distinguish between fixed budgeting and flexible budgeting. *((ICWA, Inter, State I, Dec. 2006, B. Com. (Hons), Delhi)*

20. Explain the following:

(a) Zero Base Budgeting (b) Master Budget *(B. Com (Hons) Delhi 1999)*

21. List the important functional budgets prepared by a business. *(B. Com (Hons), Delhi 2000)*

22. Distinguish between budget and forecast. What is a cash budget? What are its uses? *(B. Com. (Hons), Delhi 2000)*

23. Explain three control ratios used for performance evaluation. *(B. Com. (Hons), Delhi, 2001)*

24. State the important features of zero base Budgeting. *(B. Com. Hons, Delhi, 2001)*

25. Distinguish between fixed and flexible budget. *(B. Com. (Hons) Delhi, 2001)*

26. Write short notes on the following:

(a) Flexible Budget

(b) Principal budget factor *(ICWA, Inter, Stage 1, June 2007)*

27. Discuss the necessary steps for the success of budgetary control system in an organisation. *(B.Com.(Hons), Delhi, 2002)*

28. What purpose is served by instituting a budgetary control system in an organisation having both manufacturing and selling activities. *(B.Com.(Hons), Delhi, 2003)*

29. Distinguish between the following:

(i) Zero base budget and conventional budget

(ii) Cost control and cost reduction *(B.Com. (Hons), Delhi, 2003)*

30. ''Budget is an aid to management, not a substitute for management." Comment. *(B.Com. (Hons), Delhi, 2004)*

31. "Standard costing and budgeting control are interrelated but not interdependent". Comment. *(B.Com. (Hons), Delhi, 2004)*

32. Distinguish between standard costing and budgetary control. *(B.Com. (Hons), Delhi, 2005)*

33. What are the main objectives of a system of budgetary control? Do you think budgetary control is subject to certain limitations? *(B.Com. (Hons), Delhi 2005)*

34. Define flexible budget and explain its importance as a budgeting technique and tool of control. *(ICWA Inter, Stage 1, Dec. 2003, June 2006)*

35. Distinguish between 'standard costing' and 'budgeting control'. What are the essential requirements for installing an efficient system of budgetary control? *(B.Com. (Hons), Delhi, 2007)*

36. Distinguish between conventional budgeting and zero base budgeting. *(B.Com. (Hons), Delhi, 2007)*

37. Briefly explain the essentials of an effective budgetary control system. *(B.Com. (Hons), Delhi, 2007)*

38. "Flexible budgets are more realistic and useful than fixed budgets". Do you agree? Explain. *(B.Com. (Hons), Delhi, 2007)*

39. Explain zero base budget. *(B.Com. (Hons), Delhi, 2007)*

40. Distinguish between budgetary control and standard costing. *(B.Com. (Hons), Delhi 2007)*

SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple choice questions:

(i) Information to prepare a flexible budget includes
- (a) Total fixed costs, total variable cost
- (b) Total fixed costs, total variable costs and capacity base
- (c) Unit fixed costs and unit variable costs
- (d) Total fixed costs, variable costs per unit, several levels of activity.

(ii) The scarce factor of production is known as
- (a) Key factor
- (b) Limiting factor
- (c) Critical factor
- (d) All of the above

(iii) Which of the following is a budget designated to furnish budgeted costs for any level of activity actually attained.
- (a) Fixed budget
- (b) Flexible budget
- (c) Master budget
- (d) Production budget

(iv) Flexible budgets are useful for
- (a) Planning purposes only
- (b) Planning, performance evaluation and feedback control
- (c) Control of performance only
- (d) Nothing at all

PROBLEMS

1. The budgeted cost of a factory specialising in the production of a single product at the optimum capacity of 6400 units per annum amounts Rs 1,76,048 as detailed below:

Fixed cost		Rs. 20,688
Variable costs:		
Power	Rs. 1,440	
Repairs etc.	1,700	
Miscellaneous	540	
Direct material	49,280	
Direct labour	1,02,400	1,55,360
		1,76,048

Having regard to possible impact on sales turnover by market trends the company decided to have a flexible budget with a production target of 3200 and 4800 units (the actual quantity proposed to be produced being left to a later date before commencement of the budget period). Prepare a flexible budget for production levels at 50% and 75% capacity. Assume selling price per unit is maintained at Rs. 40 as at present, indicate the effect on net profit. Administration, selling and distribution expenses continue at Rs. 3,600.

Ans: Net profit
- (a) 100%, Rs. 75352
- (b) 75% Rs. 51,192
- (c) 50% Rs. 26032

2. Goldman Company Limited operates on a system of Flexible Budgets. With the aid of the following information, you are required to prepare Flexible Budget at 80%, 90% and 100% level of activity showing the profits that would result at these levels:

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(i) The present sale of 8,00,000 units at Rs. 10 each is at the normal level of 80%. If the output is increased to 90%, the selling price will be reduced by 2.5% and if the output reached 100%, the original selling price will be reduced by 5% in order to reach a wider market.

(ii) The prime cost per unit is Rs. 5 made up of Direct Materials Rs. 3.50, Direct Labour Rs. 1.25 and Direct Expenses Re 0.25. If output reaches 90% level of activity and above, a saving of 5% can be effected in the purchase price of raw materials.

(iii) Variable Overhead—Salesmen's commission will be 5% of the sales value.

(iv) Semi-variable overhead at normal level of activity are:

	Rs.
Supervision	80,000
Power	70,000
Heat and Light	40,000
Maintenance	50,000
Salesmen Expenses	60,000
Indirect Labour	1,00,000
Transport Costs	2,00,000

These are expected to increase by 5% if output reaches 90% level and by a further 10% if it reaches the 100% level.

(v) Fixed overheads are:

	Rs.
Rent and Rates	1,00,000
Depreciation	4,00,000
Advertisement	5,00,000
Administration	7,50,000
Sales Department	2,00,000
General	50,000

(B. Com. (Hons), Delhi 1998)

Ans:

	Capacity levels		
	80%	90%	100%
Profit (Rs.)	10,00,000	13,63,750	15,40,000

3. For production of 10000 electrical automatic irons, the following are the budgeted expenses:

	Per unit
Direct materials	Rs. 60
Direct labour	30
Variable overheads	25
Fixed overheads (Rs. 1,50,000)	15
Variable expenses (direct)	5
Selling expenses (10% fixed)	15
Administration expenses (Rs. 50,000 fixed for all levels of production)	5
Distribution expenses (20% fixed)	5
Total cost of sale per unit	160

Prepare a budget for production of 6000; 7000; and 8000 irons, showing distinctly marginal cost and total cost.

(CA Inter)

Ans:

	6000 units	7000 units	8000 units
Total Cost (Rs.)	2,25,000	11,87,500	13,25,000

4. The following data are available in a manufacturing company for a yearly period.

	Rs. (lakhs)
Fixed expenses:	
Wages and salaries	9.5
Rent, rates and taxes	6.6
Depreciation	7.4
Sundry administrative expenses	6.5
Semi-variable expenses at 50% of capacity:	
Maintenance and repairs	3.5
Indirect labour	7.9
Sales department salaries, etc.	3.8
Sundry administrative salaries	2.8
Variable expenses (at 50% of capacity):	
Materials	21.7
Labour	20.4
Other expenses	7.9
Total cost	98.0

Assume that the fixed expenses remain constant for all levels of production: semi-variable expenses remain constant between 45% and 65% of capacity, increasing by 10% between 65% and 80% capacity and by 20% between 80% and 100% capacity.

Sales at various levels are:	*Rs. (lakhs)*
50% capacity	100
60% capacity	120
75% capacity	150
90% capacity	180
100% capacity	200

Prepare a flexible budget for the year and forecast the profit at 60%, 75%, 90% and 100% capacity. *(ICWA Inter)*

Ans:	60%	75%	90%	100%
Profit (Rs. in lakhs)	12.0	25.2	38.4	48.4

5. A department of Company X attains sale of Rs. 6,00,000 at 80% of the normal capacity and its expenses are given below:

	Rs.
Office salaries	90,000
General expenses	2% of the sales
Depreciation	7,500
Rates and taxes	8,750
Selling costs:	
Salaries	8% of the sales
Travelling expenses	2% of the sales
Sales office	1% of the sales
General expenses	1% of the sales
Distribution costs:	
Wages	15,000
Rent	1% of the sales
Other expenses	4% of the sales

Draw up a flexible administration, selling and distribution costs budget, operating at 90%, 100% and 110% of normal capacity. *(B. Com. (Hons), Delhi 1997)*

Ans:	90%	100%	110%
Total cost (Rs.)	2,49,500	2,63,750	2,78,000

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6. The budget manager of Jaypee Electricals Ltd. is preparing a flexible budget for the accounting year commencing from 1st April 2001. The company produces one product, component—Peekay. Direct material costs Rs. 7 per unit. Direct labour averages Rs. 2.50 per hour and requires 1.60 hours to produce one unit of Peckay.

Salesmen are paid a commission of Re. 1 per unit sold. Fixed selling and administration expenses amount to Rs 85,000 per year.

Manufacturing overhead has been estimated in the following amounts under specified conditions of volume:

Volume of production (in units)	120,000	150,000
Expenses:	(Rs.)	(Rs.)
Indirect material	2,64,000	3,30,000
Indirect labour	1,50,000	1,87,500
Inspection	90,000	1,12,500
Maintenance	84,000	1,02,000
Supervision	1,98,000	2,34,000
Depreciation—Plant and Equipment	90,000	90,000
Engineering services	94,000	94,000
Total manufacturing overhead	9,70,000	11,50,000

Normal capacity of production of the company is 125,000 units.

Prepare a budget of total cost at 140,000 units of output. *(B. Com. (Hons), Delhi)*

Ans: Total cost Rs. 28,55,000

7. The profitability statement of Gourmet Co. Ltd. has been summarised as follows:

	Rs.	Rs.
Sales		15,00,000
Direct materials	4,50,000	
Direct wages	3,00,000	
Variable overheads	1,20,000	
Fixed overheads	4,40,000	13,10,000
Profit		1,90,000

The budgeted capacity of the company is Rs. 20,00,000 but the key factor is sales demand. It is proposed that in order to utilise the existing capacity the selling price of this only product manufactured by the company should be reduced by 5%.

You are required to prepare a forecast statement which should show the effect of the proposed reduction in selling price and include any changes in costs expected during the coming year. The following additional information is given:

(i) Sales forecast Rs 19,00,000 (after reduction).
(ii) Direct material prices are expected to increase by 2%.
(iii) Direct wage rates are expected to increase by 5% per unit.
(iv) Variable overheads are expected to increase by 5% per unit.
(v) Fixed overheads will increase by Rs. 20,000. *(B. Com. (Hons), Delhi)*

Ans: Profit Rs. 2,40,000

8. Paints Private Ltd. Company, manufacturing a single product, is facing severe competition in selling it at Rs. 50 per unit. The company is operating at 60% level of capacity at which level the sales are Rs. 12,00,000 and variable costs are Rs. 30 per unit. Semi-variable costs may be considered as fixed at Rs. 90,000 when output is nil and the variable elements is Rs. 250 for each additional 1% level of activity. Fixed costs are Rs. 1,50,000 at the present level of activity. But at 80% level of activity or above, these costs are expected to increase by Rs. 50,000.

To cope with the competition, the management of the company is considering a proposal to reduce the selling price by 5%. You are required to prepare a statement showing the operating profit at levels of activity of 60%, 70%, 80%, 90% assuming that:

(a) The selling price remains at Rs. 50
(b) The selling price is reduced by 5%

Ans:	60%	70%	80%	90%
Profit (Rs.)	1,65,000	2,32,500	2,50,000	3,17,500

9. Viveka Elementary School has a total of 150 students consisting of 5 sections with 30 students per section. The school plans for a picnic around the city during the week-end to places such as the zoo, the amusement park, the planetarium, etc. A private transport operator has come forward to lease out the buses for taking the students. Each bus will have a maximum capacity of 50 (excluding 2 seats reserved for the teachers accompanying the students). The school will employ two teachers for each bus, paying them an allowance of Rs. 50 per teacher. It will also lease out the required number of buses. The following are the other cost estimates:

	Cost per student (Rs.)
Breakfast	5
Lunch	10
Tea	3
Entrance fee at zoo	2

Rent Rs. 650 per bus
Special permit fee Rs. 50 per bus.
Block entrance fee at the planetarium Rs. 250.
Prizes to students for games Rs. 250.

No costs are incurred in respect of the accompanying teachers (except the allowance of Rs. 50 per teacher). You are required to prepare;

(a) A flexible budget estimating the total cost for the levels of 30, 60, 90, 120 and 150 students. Each item of cost is to be indicated separately.
(b) Compare the average cost per student at these levels.
(c) What will be your conclusions regarding the break-even level of students if the school proposes to collect Rs. 45 per student? *(CA Inter)*

Ans:

		Students				
		30	60	90	120	150
(a)	Total cost (Rs.)	1,900	3,300	3,900	5,300	5,900
(b)	Average cost per student (Rs.)	66.63	55	43.33	44.17	39.33

		Levels		
		upto 50	51 to 200	101 to 150
(c)	Break even point (No. of students)	52	82	116

10. Bala Company expects to sell 84,000 units of finished goods over the next 3-months period. The company currently has 44000 units of finished goods on hand and wishes to have an inventory of 48000 units at end of the 3-months period. To produce 1 unit of finished goods requires 4 units of raw materials. The company currently has 200,000 units of raw materials on hand and wishes to have an inventory of 220,000 units of raw materials on hand at the end of the 3-months period. How many units of raw materials must the Bala Company purchase during the 3-months period?

Ans: 3,72,000 units

11. Draw a material procurement budget (quantitative) from the following information:
Estimated sales of a product 40000 units. Each unit of the product requires 3 units of material A and 5 units of material B.

Estimated opening balances at the commencement of the next year:

Finished product	5000 units
Material A	12000 units

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Material B	20000 units
Marterials on order:	
Material A	7000 Units
Material B	11000 units
The desirable closing balances at the end of the next year:	
Finished product	7000 units
Material A	15000 units
Material B	25000 units
Marterial on order:	
Material A	8000 units
Material B	10000 units

Ans: Units to be procured A 1,30,000 B 2,14,000

12. A company is drawing its production plan for the year 2007–08 in respect of two of its products 'Gamma' and 'Delta'. The company's policy is not to carry any closing WIP at the end of any month. However, its policy is to hold a closing stock of finished goods at 50% of the anticipated quantity of sales of the succeeding month. For the year 2007–08 the company's budgeted production is 20000 units of 'Gamma' and 25000 units of 'Delta'. The following is the estimated cost data:

Particulars	*Gamma* Rs	*Delta* Rs
Direct Materials per unit	50	80
Direct Labour per unit	20	30
Other Manufacturing Expenses apportionable to each type of product based on production	200,000	375,000

The estimated units to be sold in the first 7 months of the year 2007–08 are as under:

Particulars	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*
Gamma	900	1,100	1,400	1,800	2,200	2,200	1,800
Delta	2,900	2,900	2,500	2,100	1,700	1,700	1,900

You are required to

(a) prepare a production budget showing month-wise number of units to be manufactured:
(b) present a summarised production cost budget for the half-year ending 30.9.2007. *(ICWA Inter)*

Ans: Budgeted production Gamma total 10050 units
Delta total 13300 units, total production cost
Gamma Rs. 8,04,000 Delta Rs. 16,62,500

13. Gama Engineering Company Limited manufactures two products X and Y. An estimate of the number of units expected to be sold in the first seven months of 2001 is given below:

	Product X	*Product Y*
January 2001	500	1400
February	600	1400
March	800	1200
April	1000	1000
May	1200	800
June	1200	800
July	1000	900

It is anticipated that:

1. There will be no work-in-progress at the end of any month; and
2. Finished units equal to half and anticipated sales for the next month will be in stock at the end of each month (including December 2000).

The budgeted production and production costs for the year ending 31st December, 2001 are as follows:

	Product X	*Product Y*
Production (units)	11000	12000
Direct materials per unit (Rs)	12	19
Direct wages per unit (Rs)	5	7
Direct manufacturing charges apportionable to each type of product (Rs)	33,000	48,000

You are required to prepare:

(a) A production budget showing the number of units to be manufactured each month.
(b) A summarised production cost budget for the six-month period January to June 2001.

Ans:

	X	Y
Total production units	5550	6350
Total cost	1,11,000	1,90,500

14. The following are the estimated sales of a company for eight months ending 30.11.2008:

Months		*Estimated Sales (units)*
April	2008	12000
May	2008	13000
June	2008	9000
July	2008	8000
August	2008	10000
September	2008	12000
October	2008	14000
November	2008	12000

As a matter of policy, the company maintains the closing balance of finished goods and raw materials as follows:

Stock item	Closing balance of a month
Finished goods	50% of the estimated sales for the next month
Raw materials	Estimated consumption for the next month.

Every unit of production requires 2 kg of raw material costing Rs 5 per kg.
Prepare Production Budget (in units) and Raw Material Purchase Budget (in units and cost) of the company for the half year ending 30 September, 2008. *(ICWA Inter)*

Ans: Production budget units 65,000
Raw material purchase budget Rate Rs. 5, Cost Rs. 6,55,000

15. The following are the details of the budgeted and the actual cost in a factory for six months from January to June 2002. From the figures given below you are required to prepare the production cost budget for the period from January to June 2003.

	January–June 2002	
	Budget	*Actual*
Production (units)	20000	18000
Material cost	Rs. 40,00,000 (2000 tonne @ Rs. 2,000)	39,90,000 (@ Rs. 2,100)
Labour cost	Rs. 8,00,000 (@ Rs. 20 per hour)	Rs. 7,99,920 (@ Rs. 22 per hour)
Variable overheads	Rs. 2,40,000	Rs. 2,16,000
Fixed overheads	Rs. 4,00,000	Rs. 4,20,000

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In the first half of 2003, production is budgeted for 25000 units. Material cost per tonne will increase from last year actual by Rs. 100 but it is proposed to maintain the consumption efficiency of 2002 as budgeted.
Labour efficiency will be lower by another 1% and labour rates will be Rs. 22 per hour.
Variable and fixed overheads will go up by 20% over 2002 actuals.
You are required to prepare the production cost budget for the period January–June 2003 giving all the workings.

Ans: Total Cost Rs. 74,86,000

16. ABC Co. wished to arrange overdraft facilities with its bankers during the period April to June 2001 when it will be manufacturing mostly for stock. Prepare a cash budget for the above period from the following data, indicating the extent of the bank facilities the company will require at the end of the each month:

(a)

	Sales Rs.	*Purchases* Rs.	*Wages* Rs.
February	1,80,000	1,24,800	12,000
March	1,92,000	1,44,000	14,000
April	1,08,000	2,43,000	11,000
May	1,74,000	2,46,000	10,000
June	1,26,000	2,68,000	15,000

(b) 50 per cent of the credit sales are realised in the month following the sales and the remaining 50 per cent in the second month following. Creditors are paid in the month of purchase.

(c) Cash at Bank on 1.4.2001 (estimated) Rs.25,000.

Ans:	April	May	June
Closing balance	56,000	–	–
overdraft	–	47,000	1,67,000

17. From the following budget data, forecast the cash position at the end of April, May and June 2002:

Month	Sales	Purchase	Wages	Miscellaneous *expenses*
	Rs.	*Rs.*	*Rs.*	*Rs.*
February	1,20,000	84,000	10,000	7,000
March	1,30,000	1,00,000	12,000	8,000
April	80,000	1,04,000	8,000	6,000
May	1,16,000	1,06,000	10,000	12,000
June	88,000	80,000	8,000	6,000

Additional information:

Sales: 20% realised in the month of sales, discount allowed 2%. Balance realised equally in two subsequent months.

Purchase: These are paid for in the month following the months of supply.

Wages: 25% paid in arrears following month.

Miscellaneous expenses: paid a month in arrears.

Rent: Rs.1,000 per month paid quarterly in advance due in April.

Income Tax: First instalment of advance tax Rs.25,000 due on or before 15th June.

Income from investments: Rs.5,000 received quarterly, in April, July etc.

Cash in hand: Rs.5,000 on 1st April 2002.

Ans:	April	May	June
Closing balance	5680	(–) 7,084)	(–) 62,936

21 RESPONSIBILITY ACCOUNTING AND DIVISIONAL PERFORMANCE MEASUREMENT

Learning Objectives

After reading this chapter, you should be able to:

1. explain the need of divisionalisation;
2. discuss different types of responsibility centres;
3. explain the meaning of responsibility accounting;
4. explain different techniques of measuring divisional performance and
5. understand transfer pricing, its different methods and the objectives in sound transferring pricing system.

NEED OF DECENTRALISATION/DIVISIONALISATION

In small organisations, decision making and management of the business are often done by a single individual. However, in large organisations, especially organisations engaged in manufacturing/undertaking multiple products and activities, successful management of it by the top management becomes more difficult. In order to overcome this difficulty, the large organisation may be decentralised or divisionalised, that is, different responsibility centres may be created where individual managers have the authority over a given area of operation and freedom to make their own decisions. The process of delegating decision authority and responsibility in an organisation is known as decentralisation. Also, the term decentralisation or divisionalisation refers to those situations where individual managers of decentralised subunits are given responsibility for profit and not just costs or revenues.

TYPES OF RESPONSIBILITY CENTRES

A responsibility centre may be defined as an area of responsibility which is controlled by an individual. Generally, the following types of responsibility centres are found:

Cost Centre

A cost or expense centre is a segment of an organisation in which the managers are held responsible for the costs incurred in that segment. Responsibility in a cost centre is restricted to cost. Performance evaluation of

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a cost centre is guided by a cost variance equal to the difference between the actual and budgeted costs for a given period. Cost centre managers have control over some or all of the costs in their segment of business, but not over revenues. Cost centres are widely used forms of responsibility centres. In manufacturing organisations, the production and service departments are classified as cost centres. Also, a marketing department, a sales region or a single sales representative can be defined as a cost centre. Cost centre managers are responsible for the costs that are controllable by them and their subordinates. However, which costs should be charged to cost centres, is an important question in evaluating cost centre managers.

Revenue Centre

A revenue centre is a segment of the organisation which is primarily responsible for generating sales revenue. A revenue centre manager does not possess control over cost, investment in assets, but usually has control over some of the expenses of the marketing department. The performance of a revenue centre is evaluated by comparing the actual revenue with budgeted revenue. The Marketing Manager of a product line, or an individual sales representative are examples of revenue centres.

Profit Centre

A profit centre is a segment of organsiation for which both revenue and costs are accumulated. The main purpose of profit centre is to earn profit. Profit centre managers aim at both the production and marketing of a product. The performance of the profit centre is evaluated in terms of whether the centre has achieved its budgeted profit. A division of the company which produces and markets the products may be called a profit centre. Such a divisional manager determines the selling price, marketing programmes and production policies. Profit centres make managers more concerned with finding ways to increase the centre's revenue by increasing production or improving distribution methods.

Investment Centre

As investment centre is responsible for both profits and investments. The investment centre manager has control over revenues, expenses and the amounts invested in the centre's assets. He also formulates the credit policy which has a direct influence on debt collection, and the inventory policy which determines the investment in inventory.

MEANING OF RESPONSIBILITY ACCOUNTING

The term 'responsibility accounting' refers to the accounting process that reports how well managers (of responsibility centres) have fulfilled their responsibility. Also known as activity or profitability accounting, it is an information system that personalises control reports by accumulating and reporting cost and revenue information according to defined responsibility areas within a company. According to Horngreen[1], the responsibility accounting system recognises various division centres throughout an organisation and traces costs (as well as revenue, assets, and liabilities, where relevant) to the individual managers who are primarily responsible for making decisions about these variables. The responsibility accounting system makes the following important assumptions:

1. The areas of responsibility are defined for which managers should be held responsible.
2. Managers are only charged with the items and responsibility over which they can exercise a significant degree of direct control.

[1] Charles T. Horngreen, *Cost Accounting, A Managerial Emphasis*, Prentice Hall of India.

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3. Managers should actively participate in establishing the goals or budgets against which their performance is measured.
4. Goals defined for each area of responsibility should be attainable with efficient and effective performance.
5. Control (performance) reports should contain significant information related to each area of responsibility.
6. Responsibility centre managers should try to accomplish the budgets and objectives established for their respective areas of responsibility.

MEASURING DIVISIONAL PERFORMANCE

Performance measurement is aimed in respect of all responsibility divisions. The following techniques can be used to measure the performance of a division.

1. Variance Analysis In this technique standard costs and budgets are set in order to provide a basis for comparison with actual performance. Any variance between the two requires that corrective actions should be taken. The performance of cost centre and revenue centre is measured in terms of standard costs and budgets determined for the respective centres. On measuring the performance, attempts are made to minimise the costs of cost centre and increase the revenue of the revenue centre.

2. Profit This measure can be used to judge the performance of a profit centre. Besides, budgetary control and contribution to sales (c/s ratio) can be applied for measuring profit centre's performance. However there is difficulty in measuring profit of a division as net profit is equal to divisional revenue minus total costs. Total costs include direct divisional costs plus allocated fixed costs and this raises the question of finding a suitable cost allocation method. Hence, the determination of divisional profit, that is, its performance, can itself be unreliable if it includes a part of indirect cost.

It is suggested that while measuring the performance of a profit division, it is better to use a measure of divisional revenue less divisional costs and a divisional revenue less divisional controllable costs should be used to measure the performance of divisional manager. Controllable profit (divisional revenue-divisional controllable costs) is a much better measure of divisional manager's performance as it considers all costs—fixed or variable—which are within his control. The full cost can be suitable to measure a division's performance but not the performance of a divisional manager because then he is held responsible for some costs (allocated fixed costs) which is not controllable by him and which he cannot influence directly or indirectly.

3. Return on investment (ROI) This measure expresses divisional profit as a percentage of the firm's investment in the division and is similar to widely accepted 'return on capital employed' method. This is calculated as:

$$\text{ROI} = \frac{\text{Divisional Profit}}{\text{Divisional Investment}}$$

The ROI ratio can be divided into other ratios such as net profit margin and the asset turnover. The net profit margin is the result of firm's pricing policy and its cost control. The asset turnover shows the amount of sales generated by the capital available and whether a firm has over- or under-utilised its assets.

$$\text{ROI} = \underbrace{\frac{\text{Net profit}}{\text{Sales}} \times 100}_{\text{(Net profit margin)}} \times \underbrace{\frac{\text{Sales}}{\text{Capital employed}} \times 100}_{\text{(Asset turnover)}}$$

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The ROI formula recognises that the absolute size of divisional operating profit alone does not provide a basis for measuring its performance, but rather the relation between the division's net income and the assets used in the generation of that income. For example, the fact that division A has net income of Rs. 50,000 does not necessarily mean that it was more successful than Division B which has profit of Rs. 40,000. The difference between these profit levels could be attributable entirely to a difference in the investment size of divisions. In such a situation, ROI proves to be a good measure of performance of a division. For example, assuming that the investments in division A and B are Rs. 2,00,000 and Rs. 1,00,000 respectively, the ROI can better indicate their comparative performances.

$$\text{ROI} = \frac{\text{Divisional Profit}}{\text{Divisional Investment}}$$

$$\text{Division A} = \frac{\text{Rs. } 50{,}000}{2{,}00{,}000} = 25\%$$

$$\text{Division B} = \frac{\text{Rs. } 40{,}000}{1{,}00{,}000} = 40\%$$

Thus, using ROI, it is proved that Division *B* is more efficient and has made more profit than Division A. ROI can be increased by any of the following actions, all other factors remaining constant.

1. An increase in sales price or sales volume.
2. A decrease in operating costs (fixed or variable).
3. A reduction in divisional investment.

ROI has the following advantages:

1. It relates net income to investments made in a division giving a better measure of divisional profitability.
2. It can be used as a basis for other ratios which are useful for analytical purposes.
3. It is easy to understand as it is based on financial accounting measurements.
4. It may be used for interfirm comparisons, provided that the firms whose results are being compared are of comparable size and of the same industry.

ROI has the following limitations:

1. Satisfactory definition of profit and investment are difficult to find. Profit has many concepts such as profit before interest and tax, profit after interest and tax, controllable profit, profit after deducting all allocated fixed costs. Similarly, the term investment may have many connotations such as gross book value, net book value, historical cost of assets, current cost of assets, assets including or excluding intangible assets.
2. While comparing ROI of different companies it is necessary that the companies use similar accounting policies and methods in respect of valuation of stocks, valuation of fixed assets; apportionment of overheads, treatment of research and development expenditure etc.
3. ROI may influence a divisional manager to select investments with high rates of return (that is rates which are in line or above his target ROI). Other investments that would reduce the division's ROI but could increase the value of the business may be rejected by the divisional manager. These types of decision are sub-optimal and can distort an enterprise's overall allocation of resources and may motivate a manager for under investing in order to preserve his ROI. Suppose a division's ROI is 25% as shown below.

$$\text{ROI} = \frac{\text{Profit Rs. } 1{,}00{,}000}{\text{Investment Rs. } 4{,}00{,}000} \times 100 = 25\%$$

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Suppose there is an opportunity to make additional investment of Rs. 2,00,000 which will give 20% ROI. This investment is acceptable to the company because the company requires a minimum 15% ROI for this type of investment. This investment lowers the division's ROI to 23.3% calculated as follows:

Old investment + New investment

$$\text{New ROI} = \frac{\text{Rs. } 1,00,000 + \text{Rs. } 40,000}{\text{Rs. } 4,00,000 + \text{Rs. } 2,00,000} \times 100 = 23.3\%$$

A comparison of old ROI (25%) with the new ROI (23.3%) would imply that performance has declined. Consequently, a divisional manager might decide not to make such an investment.

4. *Residual income (RI)* Residual income can be defined as the net income of a division, less the 'imputed' capital charge on the assets used by the division. The capital charge is the minimum acceptable rate of return and is calculated by applying this required (or target) rate of return to the division's investment base. Theoretically, rate of return should be the division's cost of capital, in most cases, however it is a cut-off rate based on the firm's objectives and strategies. RI is calculated as:

$$\text{RI} = \text{Divisional profit} - (\text{Percent capital charge} \times \text{Divisional investment})$$

The 'divisional profit' and 'divisional investment' are as they are defined in ROI. Using the data given in the above example, that is. divisional profit Rs. 1,00,000, investment Rs. 4,00,000 and further assuming capital charge of 15%, the RI will be Rs. 40,000, calculated as follows:

$$\text{RI} = \text{Rs. } 1,00,000 - (15\% \times \text{Rs. } 4,00,000)$$
$$= 1,00,000 - 60,000$$
$$= \text{Rs. } 40,000$$

Residual income from the additional investment of Rs. 2,00,000 will be

$$\text{RI} = \text{Rs. } 40,000 - (15\% \times \text{Rs. } 2,00,000)$$
$$= \text{Rs. } 10,000$$

Therefore, after making additional investment, the total residual income of the division will be Rs. 50,000, that is,

$$\text{RI} = \text{Profits } 1,00,000 + 40,000 - (15\% \times \text{Rs. } 4,00,000 + 2,00,000)$$
$$= 1,40,000 - 90,000$$
$$= \text{Rs. } 50,000$$

Thus, the additional investment increases residual income, appropriately improving the measure of performance, whereas the use of ROI has worsened the measure of performance as it gives an overall lower ROI.

RI has following advantages:

1. It avoids sub optimal decisions as investment are not rejected merely because they lower the divisional manager's ROI.
2. It maximises growth of the company and increases shareholders' wealth by accepting opportunities which earn a rate of return in excess of the cost of capital.
3. The cost of capital charge on divisional investments ensures that divisional managers are aware of the opportunity cost of funds.
4. Charging each division with the company's cost of capital ensures that decisions taken by different divisions are compatible with the interests of organisation as a whole.

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The following are the weaknesses of RI:

1. Like ROI, it is difficult to have satisfactory definition of 'divisional profit' and 'divisional investment'.
2. It may be difficult to calculate an accurate cost of capital.
3. Identifying controllable and uncontrollable factors at divisional level may be difficult.

Example 21.1

Division *A* and *B* are both considering an outlay on new investment projects.

	Division A	*Division B*
Investment outlay	Rs. 1,00,000	Rs. 1,00,000
Net return on the new investment	Rs. 16,000	Rs. 11,000
Current ROI	18%	11%

The company's cost of capital is 13%. Should the project be accepted or rejected?

Solution:

(i) Using ROI

$$\text{ROI on New investment} = \frac{\text{Net return}}{\text{New investment}}$$

$$\text{Division A} = \frac{\text{Rs.}16{,}000}{\text{Rs.}1{,}00{,}000} \times 100 = 16\%$$

$$\text{Division B} = \frac{\text{Rs.}11{,}000}{\text{Rs.}1{,}00{,}000} \times 100 = 11\%$$

Division A should reject the new investment as its ROI is 16% which is less than the current ROI of 18%. Division B can accept the investment as its current ROI of 11% is equal to new ROI on new investments.

(ii) Using RI

	Division A	*Division B*
Investment	Rs. 1,00,000	Rs. 1,00,000
Net income on new investment	16,000	11,000
Less: Imputed cost of capital 13%	13,000	13,000
Residual Income	3,000	(2,000)

Division A should accept the investment as it will make RI of Rs. 3,000 and Division B should reject it because it will give a loss of Rs. 2,000.

Example 21.2

The following information relates to budgeted operations of Division X of a manufacturing company.

	(Rs.)
Sales (50000 units at Rs. 8)	4,00,000
Less: Variable costs @ Rs. 6 per unit	3,00,000
Contribution margin	1,00,000
Less: Fixed costs	75,000
Divisional profit	25,000

The amount of divisional investment is Rs. 1,50,000 and the minimum desired rate of return on the investment is the cost of capital of 20%.

Required:

(i) Calculate divisional expected ROI
(ii) Calculate divisional expected RI
(iii) Comment on the result of (i) and (ii)
(iv) The divisional manager has the opportunity to sell 10,000 units at Rs. 7.50 per unit. Variable cost per unit would be the same as budgeted, but fixed costs would increase by Rs. 5,000. Additional investment of Rs. 20,000 would also be required. If the manager accepts the special order, by how much and in what direction would his residual income change?

Solution:

(i) $\text{ROI} = \dfrac{\text{Rs. } 25{,}000}{\text{Rs. } 1{,}50{,}000} \times 100 = 16.7\%$

(ii) RI = Divisional profit – Minimum desired rate of return
= Rs. 25,000 – (20% × Rs. 1,50,000)
= 25,000 – 30,000
RI = (Rs. 5,000)

(iii) The desired rate of return is 20% but the division X is expecting to achieve an ROI of 16.7%. The expected profit of Rs. 25,000 is less than the Rs. 30,000 minimum return required, resulting in the negative of Rs. 5,000 residual income.

(iv) Opportunity to sell additional 10,000 units

		Original budget (Rs.)	*Additional budget (Rs.)*	*Total (Rs.)*
	Sales	4,00,000	75,000	4,75,000
Less:	Variable costs	3,00,000	60,000	3,60,000
	Contribution	1,00,000	15,000	1,15,000
Less:	Fixed costs	75,000	5,000	80,000
	Divisional profit	25,000	10,000	35,000
Less:	Cost of capital (20%)	30,000	4,000	34,000
	Residual Income	(5,000)	6,000	1,000

The target residual income changes from a negative balance of Rs. 5,000 to a positive one of Rs. 1,000 as a result of the new opportunity to sell 10000 units. This is due to the fact that Rs. 10,000 expected profit from additional order is offset by a further Rs. 4,000 cost of capital, thereby increasing residual income by Rs. 6,000.

Example 21.3

XYZ company has three divisions whose income statements and balance sheets are summarised below:

	Division X	*Division Y*	*Division Z*
Sales (Rs.)	5,00,000	(d)	(g)
Operating income (Rs.)	25,000	30,000	(h)
Operating assets (Rs.)	1,00,000	(e)	2,50,000
Turnover	(a)	(f)	0.4
Margin	(b)	0.4%	5%
ROI	(c)	2%	(i)

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Required:

(i) Supply the missing data in the Table above and summarise the results.
(ii) Comment on the relative performance of each division. What questions can be raised as a result of their performance?

Solution:

(i) Return of Investment (ROI) is

$$\frac{\text{Operating income}}{\text{Operating assets}} = \frac{\text{Operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Operating assets}}$$

$$= \text{Margin} \times \text{Turnover}$$

(a) Division × Turnover $= \dfrac{5,00,000}{1,00,000} = 5$ times

(b) Division × Margin $= \dfrac{25,000}{5,00,000} = 5\%$

(c) Division × ROI $= \text{Turnover} \times \text{Margin}$

$= 5 \text{ Times} \times 5\%$

$= 25\%$

(d) Division Y Sales

Margin = 0.4% $= 0.004 = \dfrac{30,000}{\text{Sales d}}$

$$d = \frac{30,000}{.004} = \text{Rs. } 75,00,000$$

(e) Division Y operating assets

$$\text{ROI} = \frac{\text{Operating income}}{\text{Operating assets}}$$

$$2\% = \frac{30,000}{\text{Operating assets}}$$

$$e = \frac{30,000}{.02} = \text{Rs. } 15,00,000$$

(f) Division Y Turnover

$$= \frac{\text{Sales}}{\text{Operating assets}}$$

$$= \frac{75,00,000}{15,00,000} = 5 \text{ times}$$

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(g) Division Z Sales

$$\text{Turnover} = \frac{\text{Sales}}{\text{Operating assets}}$$

$$0.4 = \frac{\text{Sales g}}{2,50,000}$$

$$g = 4 \times 2,50,000 = \text{Rs. } 1,00,000$$

(h) Division Z operating income

$$\text{Margin} = \frac{\text{Operating income}}{\text{Sales}}$$

$$5\% = \frac{h}{10,00,000}$$

$$h = 1,00,000 \times 5\% = \text{Rs. } 5,000$$

(i) ROI Division Z

$$= \text{Turnover} \times \text{Margin}$$

$$= 0.4 \times 5\%$$

$$= 2\% \text{ or } \frac{5,000}{2,50,000} = 2\%$$

Summarising the results:

	Div. X	*Div. Y*	*Div. Z*
Turnover	5 times	5 times	0.4 times
Margin	5%	0.4%	5%
ROI	25%	2%	2%

(ii) Division X performed best. It appears that Divisions Y and Z are in trouble. Division Y turns over its assets as often as Division X, but Y's margin on sales in much lower. Thus, Division Y must work on improving its margin. The following questions are raised about Division Y. Is the low margin due to inefficiency? Is it due to excessive material, labour and / or overhead costs?
Division Z, on the other hand, does just as well as Division X in terms of profit margin—both divisions earn 5% on sales. But Division Z has a much lower turnover of capital than Division X. Therefore, Division Z should take a close look at its investments. Is it too much tied up in inventories and receivables? Are there unused fixed assets? Is there idle cash sitting arround?

Example 21.4

ABC is a diversified company producing and distributing different products. Product X division within the company handles a specific product and would like to earn a long-run rate of return of 20%. Product X Division will charge its unit selling price as necessary to provide this return. The following data are available on the division and its products:

Variable cost per unit	Rs. 200
Total annual fixed costs	Rs. 12,20,000
Long run normal demand	10,000 unit each year
Average operating assets owned by the division	Rs. 14,00,000

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Required:

(i) Compute the per unit selling price that will provide the desired rate of return.

(ii) Assume that actual sales fluctuate from 8500 units to 11500 units. Compute the margin, turnover and ROI that would be realised on sales at 8500 units, 10000 units and 11500 units level of activity (use the selling price computed in part 1 for your computations).

Solution:

$$\text{ROI} = \underbrace{\frac{\text{Operating income}}{\text{Sales}}}_{\text{Margin}} \times \underbrace{\frac{\text{Sales}}{\text{Assets}}}_{\text{Turnover}}$$

(i) Total sales Value of 10000 units

Variable cost (Rs. 200 × 10000)	=	Rs. 20,00,000
Fixed cost	=	12,20,000
Return @ 20%		
$(14,00,000 \times \frac{20}{10})$	=	2,80,000
Total sales value		35,00,000

$$\text{Selling price per unit} = \frac{35,00,000}{10,000 \text{ units}} = \text{Rs. } 350$$

(ii) Calculation of Margin, Turnover and ROI at 8500 units

Operating income = (8500 units × Rs. 350) – (8500 × Rs. 200) – Rs. 12,20,000
= 29,75,000 – 17,00,000 – 12,20,000
= Rs. 55,000

$$\text{Margin} = \frac{55,000}{29,75,000} \times 100 = 1.85\%$$

$$\text{Turnover} = \frac{29,75,000}{14,00,000} = 2.125$$

ROI = Margin × Turnover
ROI = 1.85% × 2.125 = 3.93%

or

$$\frac{55,000}{14,00,000} \times 100 = 3.93\%$$

At 10000 units level

Operating income = (10,000 × 350) – (10,000 × 200) – 12,20,000
= 35,00,000 – 20,00,000 – 12,20,000
= Rs. 2,80,000

Margin $= \frac{2,80,000}{35,00,000} \times 100 = 8\%$

Turnover $= \frac{35,00,000}{14,00,000} = 2.5$

ROI $= 8\% \times 2.5 = 20\%$

At 11,500 units

Operating income $= (11500 \times 350) - (11500 \times 200) - 12,20,000$

$= 40,25,000 - 23,00,000 - 12,20,000$

$= 5,05,000$

Margin $= \frac{5,05,000}{40,25,000} \times 100 = 12.25\%$

Turnover $= \frac{40,25,000}{14,00,000} = 2.875$

ROI $= 12.55 \times 2.875 = 36.08\%$

Summary of Calculations

Sales in units	*Margin*	*Capital Turnover*	*ROI*
8500	1.85%	2.125	3.93%
10000	8%	2.5	20%
11500	12.55%	2.875	36.08%

Example 21.5

Compro Electronics is facing stiff competition from imported goods. Its operating income margin has been declining steadily for the past several years; the company has been forced to lower prices so that it can maintain its market share. The operating results for the past three years as follows:

	Year 1	*Year 2*	*Year 3*
Sales	Rs. 1,00,00,000	Rs. 95,00,000	Rs. 90,00,000
Net operating income	12,00,000	10,45,000	9,45,000
Average assets	1,50,00,000	1,50,00,000	1,50,00,000

For the coming year, Compro's CEO plans to install a JIT purchasing and manufacturing system. He estimates that inventories will be reduced by 70 per cent during the first year of operations, producing a 20 per cent reduction in the average operating assets of the company, which would remain unchanged without the JIT system. He also estimates that sales and operating income will be restored to Year 1 levels because of simultaneous reductions in operating expenses and selling prices. Lower selling prices will allow Compro to expand its market share.

Required:

(i) Compute the ROI, margin, and turnover for years 1, 2 and 3.

(ii) Suppose that in year 4 the sales and operating income were achieved as expected but inventories remained at the same level as in year 3. Compute the expected ROI, margin and turnover. Explain why the ROI increased over the year 3 level.

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(iii) Suppose that the sales and net operating income for year 4 remained the same as in year 3 but inventory reductions were achieved as projected. Compute the ROI, margin and turnover. Explain why the ROI exceeded the year 3 level.

(iv) Assume that all expectations for year 4 were realized. Compute the expected ROI, margin and turnover. Explain why the ROI increased over the year 3 level.

Solution:

	Year 1	*Year 2*	*Year 3*
(i) ROI	$= \frac{\text{Rs.}12,00,000}{\text{Rs.}1,50,00,000} \times 100$	$\frac{\text{Rs.}10,45,000}{\text{Rs.}1,50,00,000} \times 100$	$\frac{\text{Rs.}9,45,000}{\text{Rs.}1,50,00,000} \times 100$
	$= 8.00\%$	$= 6.97\%$	$= 6.30\%$
Margin	$= \frac{\text{Rs.}12,00,000}{\text{Rs.}1,00,00,000} \times 100$	$\frac{\text{Rs.}10,45,000}{\text{Rs.}95,00,000} \times 100$	$\frac{\text{Rs.}9,45,000}{\text{Rs.}90,00,000} \times 100$
	$= 12.00\%$	$= 11.00\%$	$= 10.50\%$
Turnover	$= \frac{\text{Rs.}1,00,000}{\text{Rs.}1,50,00,000} \times 100$	$\frac{\text{Rs.}95,00,000}{\text{Rs.}1,50,00,000} \times 100$	$\frac{\text{Rs.}90,00,000}{\text{Rs.}1,50,00,000} \times 100$
	$= 0.67$	$= 0.63$	$= 0.60$

(ii)
$$\text{ROI} = \frac{\text{Rs.}12,00,000}{\text{Rs.}1,50,00,000} \times 100 = 8\%$$

$$\text{Margin} = \frac{\text{Rs.}12,00,000}{\text{Rs.}1,00,00,000} \times 100 = 12\%$$

$$\text{Turnover} = \frac{\text{Rs.}1,00,00,000}{\text{Rs.}1,50,00,000} \times 100 = 0.67$$

The ROI increased because expenses decreased and assets turned over at a higher rate (sales increased).

(iii)
$$\text{Operating assets} = \text{Rs. } 1,50,00,000 \times 80\% = \text{Rs. } 1,20,00,000$$
$$\text{ROI} = \text{Rs. } 9,45,000/\text{Rs. } 1,20,00,000 = \text{Rs. } 7.88\%$$
$$\text{Margin} = \text{Rs. } 9,45,000/\text{Rs. } 90,00,000 = 10.5\%$$
$$\text{Turnover} = \text{Rs. } 90,00,000/\text{Rs. } 1,20,00,000 = 0.75$$

The ROI increased because assets decreased.

(iv)
$$\text{ROI} = \text{Rs. } 12,00,000/\text{Rs. } 1,20,00,000 = 10\%$$
$$\text{Margin} = \text{Rs. } 12,00,000/\text{Rs. } 1,00,00,000 = 12\%$$
$$\text{Turnover} = \text{Rs. } 1,00,00,000/\text{Rs. } 1,20,00,000 = 0.83$$

The ROI increased because expenses decreased and assets turned over at a higher rate (sales increased and the amount of assets decreased). Both margin and turnover increased.

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TRANSFER PRICING

In divisionalised companies, where profit or investment centres are created, there is likely to be inter-divisional transfer of goods or services and this internal transfer create the problem of transfer pricing. A transfer price is that notional value at which goods and services are transferred between divisions in a decentralised organisation. Transfer prices are normally set for intermediate products which are goods and services that are supplied by the selling division to the buying division. The goods that are produced by the buying division and sold to the outside world are known as final products.

A question arises as to how the transfer of goods and services between divisions should be priced. The transfer prices can have impact on the evaluation of each division's performance and measures applied for such measurements of performance.

Objectives in Sound Transfer Pricing System

A question arises as to how the transfer of goods and services between divisions should be priced. The price charged to the interdivisional transfer of goods and services is revenues to the selling division and cost to the buying division. Therefore the price charged will affect the profit of both divisions; benefit (revenue) to one division can be created only at the expense of the other division. For example, the selling division will benefit from charging higher prices for such transfers of goods and services. However, for the buying division, this will result into higher costs. While determining transfer prices a number of criteria (objectives) should be fulfilled.

(i) Transfer prices should help in the accurate measurement of divisional performance (profitability) measurement.

(ii) Transfer prices should motivate the divisional managers into maximising the profitability of their divisions and making decisions that are in the best interests of the organisations as a whole.

(iii) Transfer prices should ensure that divisional autonomy and authority is preserved. The main purpose of decentralisation is to enable divisional managers to exercise greater autonomy and to measure the overall results achieved on a profit centre or investment centre. It is, therefore, not proper to give divisional managers authority by one hand by placing them in charge of divisional operations and to remove that authority by dictating transfer prices that affect the performance of the division.

(iv) Transfer prices should allow goal congruence to take place, which in effect means that the objectives of divisional managers are compatible with the objectives of overall company.

(v) A transfer pricing system, if properly established, can check multinational companies and international groups which may try to manipulate transfer prices between countries in order to minimise the overall tax burden.

Methods of Transfer Pricing

Broadly, there are three bases available for determining transfer prices, but many options are also available within each base. These methods are:

(1) Market-Based Price
(2) Cost-Based Prices
  (a) Variable cost
  (b) Actual full cost
  (c) Full cost plus profit margin
  (d) Standard full cost
(3) Negotiated Prices
(4) Dual prices

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(1) Market-Based Prices

Market price refers to a price in an intermediate market between independent buyers and sellers. When there is a competitive external market for the transferred product, market prices work well as transfer prices. When transferred goods are recorded at market prices, divisional performance is more likely to represent the real economic contribution of the division to total company profit. If the goods cannot be bought from a division within the company, the intermediate product would have to be purchased at the current market price from the outside market. Divisional profits are therefore likely to be similar to the profits that would be calculated if the divisions were separate organisations. Consequently, divisional profitability can be compared directly with the profitability of similar companies operating in the same type of business. In the market price situation, top management will not be tempted to intervene.

Market-based prices are based on opportunity costs concepts. The opportunity cost approach signals that the correct transfer price is the market price. Since the selling division can sell all that it produces at the market price, transferring internally at a lower price would make the division worse off. Similarly the buying division can always acquire the intermediate goods at the market price, so it would be unwilling to pay more for an internally transferred goods. Since the minimum transfer price for the selling division is the market price and the maximum price for the buying division is also the market price, the only possible transfer price is the market price.[2]

However, there are some problems using the market price approach.

Firstly, finding a competitive market price may be difficult if such a market does not exist. Catalogue price may only vaguely relate to actual sales prices. Market prices may change often.

Secondly, another problem with market prices can occur when a selling division is not operating at full capacity and can not sell all its products. To illustrate this point, assume that material used by Division A in a company are being purchased from outside market at Rs. 20 per unit. The same materials are produced by Division B. If Division B is operating is full capacity, say of 50000 units and can sell all its products to either Division A or to outside buyers, then the use of transfer price of Rs. 20 per unit (market price) has no effect on Division B's income or total company profit. Division B will earn revenue of Rs. 20 per unit on all its production and sales, regardless of who buys its product and Division A will pay Rs. 20 per unit, regardless of whether it purchases the materials from Division B or from an outside supplier. In this situation, the use of market price as the transfer price is appropriate.

However, if Division B is not operating at full capacity and unused capacity exists in that division, the use of market price may not lead to maximisation of total company profit. To illustrate this point, assume that Division B has additional unused capacity of 30,000 units and it can continue to sell only 50,000 units to outside buyers. In this situation, the transfer price should be set to motivate the manager of Division A to purchase from Division B if the variable cost per unit of product of Division B is less than the market price. If the variable costs are less than Rs. 20 per unit but the transfer price is set equal to the market price of Rs. 20, then the manager of Division A is indifferent as to whether materials are purchased from Division B or from outside suppliers, since the cost per unit to Division B would be the same, Rs. 20. Infact, there is no gain for Division A to buy materials at Rs. 20 from Division B when same materials is available in the market for Rs. 20 per unit. However, Division A's purchase of 20000 units of materials from outside suppliers at a cost of Rs. per unit would not maximise overall company profit, since this market price per unit is greater than the unit variable cost of Division B, say Rs. 10. Hence, the intracompany transfer could save the company the difference between the market price per unit and Division B's unit variable expenses that is Rs. 10 (Rs. 20 – Rs. 10). This savings of Rs. 10 per unit would add Rs. 2,00,000 (20,000 units X Rs. 10) to overall company profit.

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[2] Don R. Hanen and Maryamne M. Mowen, *Management Accounting,* South Western Publishing Co. 1992, p. 871.

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(2) Cost-Based Prices

When external markets do not exist or are not available to the company or when information about external market prices is not readily available, companies may decide to use some forms of cost-based transfer pricing system.

As stated earlier, cost-based transfer prices may be in different forms such as variable cost, actual full cost, full cost plus profit margin, standard full cost, opportunity cost.

(a) Variable Cost: Variable cost-based pricing approach is useful when the selling division is operating below capacity. The manager of the selling division will generally not like this transfer price because it yields no profit to that division. In this pricing system, only variable production costs are transferred. These costs are direct materials, direct labour and variable factory overhead. Variable cost has the major advantage of encouraging maximum profits for the entire firm. By passing only variable costs alone to the next division, production and pricing decisions are based on cost-volume-profit relationships for the firm as a whole. The obvious problem is that selling division is left holding all its fixed costs and operating expenses. That division is now a loss division, no where near a profit centre.[3]

(b) Actual Full Cost: In actual full cost approach, transfer price is based on the total product cost per unit which will include direct materials, direct labour and factory overhead. When full cost is used for transfer pricing, the selling division cannot realise a profit on the goods transferred. This may be disincentive to the selling division. Further, full cost transfer pricing can provide perverse incentives and distort performance measures. A full cost transfer price would have shutdown the chances of any negotiation between divisions about selling at transfer prices.

(c) Full Cost Plus Profit Margin: Full cost plus mark up (or profit margin) overcomes the weaknesses of full cost basis transfer pricing system. The full cost plus transfer price include the allowed cost of the item plus a mark up or other profit allowance. With such a system, the selling division obtains a profit contribution on units transferred and hence, benefits if performance is measured on the basis of divisional operating profits. However, the manager of the buying division would naturally object that his costs (and hence reported performance) are adversely affected.

The basic question in full cost plus mark up is 'what should be the percentage of mark up'. It can be suggested that the mark up percentage should cover operating expenses and provide a target return on sales or assets.

(d) Standard Costs: In actual cost approaches, there is a problem of measuring cost. Actual cost does not provide any incentive to the selling division to control cost. All product costs are transferred to the buying division. While transferring actual costs any variances or inefficiencies in the selling division are passed along to the buying division. The problem of isolating the variances that have been transferred to subsequent buyer division becomes extremely complex. To promote responsibility in the selling division and to isolate variances within divisions, standard costs are usually used as a basis for transfer pricing in cost-based systems.

Whether transferring at differential costs or full costs, standard costs, where available, are often used as the basis for the transfer. This encourages efficiency in the selling division because inefficiencies are not passed onto the buying division. Otherwise, the selling division can transfer cost inefficiencies to the buying division. Use of standard cost reduces risk to the buyer. The buyer knows that standard costs will be transferred and avoids being charged with suppliers's cost overruns.[4]

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[3] Lane K. Anderson and Harold M Sollenberger, *Management Accounting.* South-Western Publishing Co. 1992, p.174.
[4] Sidney Davidson et al., *Managerial Accounting,* The Dryden Press 1988. p. 683.

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(3) Negotiated Prices

Negotiated prices are generally preferred as a middle solution between market prices and cost-based prices. Under negotiated prices, the managers involved act much the same as the managers of independent companies. Negotiation strategies may be similar to those employed when trading with outside markets. If both divisions are free to deal either with each other or in the external market, the negotiated price will likely be close to the external market price. If all of a selling division's output cannot be sold in the external market (that is, a portion must be sold to the buying division), the negotiated price will likely be less than the market price and the total margin will be shared by the divisions.

Negotiated prices avoids mistrusts, bad feelings and undesirable bargaining interests among divisional managers. Also, it provides an opportunity to achiever the objectives of goal congruence, autonomy and accurate performance evaluation. The overall company is beneficiary if selling and buying divisions can agree upon some mutually transfer prices., Negotiated transfer price is considered as a vital integrating tool among divisions of a company which is necessary to achiever goal congruence. If negotiations help ensure goal congruence, top management has little temptation to intervene between divisions. The agreed prices can also be used for performance measurement without creating any friction. The use of negotiated prices is consistent with the concept of decentralised decision-making in the divisionalised firms.

However, negotiated prices have the following disadvantages:

(1) A great deal of management effort, time and resources can be consumed in the negotiating process.
(2) The final emerging negotiated price may depend more on the divisional manager's ability and skill to negotiate than on the other factors. Thus, performance measures will be distorted leading to incorrect evaluation of divisional performance.
(3) One divisional manager having some private information may take advantage of another divisional manager.

(4) Dual Prices

Under dual prices of transfer pricing, selling division sells the transferred goods at a profit using full cost plus profit margin. But the transfer price for the buying division is the market price. The difference in transfer prices for the two divisions could be accounted for by a special centralised account. This system would preserve cost data for subsequent buyer departments, and would encourage internal transfers by providing a profit on such transfers for the selling divisions.

Dual prices give motivation and incentive to selling divisions as goods are transferred at a profit or mark up. Market price can be considered as the most appropriate base for the buying division. Thus dual pricing system has the function of motivating both the selling division and buying division to make decisions that are consistent with the overall goals of decentralisation—goal congruence, accurate performance measurement, autonomy, adequate motivation to divisional manager.

Example 21.6

A company has two divisions, A and B. Division A manufactures a component which is used by Division B to produce a finished product. For the next period, output and costs have been budgeted as follows:

	Division A	*Division B*
Component units	50,000	
Finished units	—	50,000
Total variable costs	Rs. 2,50,000	6,00,000
Fixed costs	Rs. 1,50,000	2,00,000

The fixed costs are separable for each division. You are required to advise on the transfer price to be fixed for Division A's component under the following circumstances.

(i) Division A can sell the component in a competitive market for Rs. 10 per unit. Division B can also purchase the component from the open market at that price.

(ii) As per the situation described in (i) above, and further assume that Division B currently buys the component from an external supplier at the market price of Rs. 10 and there is reciprocal agreement between the external supplier and another Division C, within the group. Under this agreement the external supplier agrees to buy one product unit from Division C, at a profit of Rs. 4 per unit to that division, for every component which Division B buys from the supplier.

Solution:

(i) Transfer Price = Incremental (marginal) cost + Opportunity costs of the company due to not being able to use the components in the next most profitable way.
= Rs. 5 + Rs. 5 (Contribution foregone by transferring internally as opposed to selling in the open market)
= Rs. 10

The transfer price of Rs. 10 is equal to the market price of the component which is also Rs. 10.

(ii) Transfer Price = Marginal cost + Contribution + Profit foregone by Division C as Division B will acquire its units from Division A in place of external supplier.
= Rs. 5 + Rs. 5 + 4
= Rs. 5 + Rs. 9 (Rs. 9 is the opportunity cost to the whole company)
= Rs. 14

The transfer price of Rs. 14 should result in the Manager of Division B continuing to buy from the external supplier at the market price of Rs. 10. However, the transfer price of Rs. 14 is appropriate from the viewpoint of the organisation as a whole, since, if the component is transferred internally not only will Division A forgo an external profit of Rs. 5, but Division C will also forego an external profit of Rs. 4. It is assumed that Division C could not achieve the same profit by selling elsewhere.

Example 21.7

A company fixes the inter-divisional transfer prices for its products on the basis of cost plus an estimated return on investment in its divisions. The relevant portion of the budget for the Division A for the year 2007–08 is given below:

Fixed Assets	Rs. 5,00,000
Current assets (other than debtors)	3,00,000
Debtors	2,00,000
Annual Fixed Cost of the division	8,00,000
Variable cost per unit of product	10
Budgeted Volume of Production per year (units)	4,00,000
Desired Return on Investment	28%

You are required to determine the transfer price for the Division A.

Solution:

Basic Calculations:

(i) Computation of Investment in Division A.

Fixed Assets	Rs. 5,00,000
Current Assets (Debtors + Other Current Assets)	5,00,000
	Rs. 10,00,000

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(ii) Return on Investment

Desired Return 28% on Rs. 10,00,000	Rs. 2,80,000	
Budgeted Volume of Production p.a.	4,00,000	units
Profit Margin per unit $\frac{2,80,000}{4,00,000}$ =	Re. 0.70	

Computation of Transfer Price for Division A

Variable Cost per Unit	Rs. 10.00
Fixed Cost per unit 8,00,000/4,00,000	2.00
Profit Margin per unit	.70
Transfer Price per unit	Rs. 12.70

Example 21.8

A company has two divisions, Division A and Division B. Division A normally purchase its parts from Division B of the same company. Division A has learned that Division B is increasing its price to Rs. 110 per unit. As a result, Division A manager has decided to purchase the parts from an outside supplier at a unit cost of Rs. 100, Rs. 10 less than it would cost to purchase the same part from Division B. The Division B manager has explained that inflation is the cause of the price increase and that the loss of parts normally transferred to Division A will hurt the division as well as the company profits. The Division B manager feels that the company as a whole would benefit from the sale of parts of Division A. The following costs and unit purchases represent the normal annual transaction.

	Rs.
Units purchased	1,000
Division B's variable cost per unit	95
Division B's fixed cost per unit	10

Required:

(i) Will the company as a whole benefit if Division A purchases the unit from the outside supplier for Rs. 100 per unit? Assume that there are no alternative uses for Division B's facilities.

(ii) What would be the effect if the outside selling price decreases by Rs. 8 per unit, assuming that Divisions B remains idle?

(iii) If Division B's facilities could be put into production for other sales at an annual cost saving of Rs. 14,500, should Division A still purchase from the outside?

Solution:

The straightforward comparative income statement approach has been used to solve the questions:

(i) Division A's action to purchase at Rs. 100

	Buy outside Rs.	Buy Inside Rs.
Total purchase costs	1,00,000	–
Total outlay costs	–	95,000
Net cash outflow to the company as a whole.	1,00,000	95,000

The company as a whole will benefit if Division A buys inside.

	Buy outside Rs.	Buy Inside Rs.
(ii) Total purchase costs	92,000	–
Total outlay costs	–	95,000
Net cash outflow to the company as a whole.	92,000	95,000

The company as a whole will benefit if Division A buy from the outside supplier at Rs. 92 per unit.

	Buy outside Rs.	Buy inside
(iii) Total purchase costs	1,00,000	–
Total outlay costs	–	95,000
Revenue (or cost savings) from using Division B's facilities	(14,500)	
Net cash outflow to the company as a whole	85,500	95,000

In this case, the company as a whole will be better off if Division A buys outside and Division B's facilities are utilised elsewhere.

Alternative Solution

Using opportunity cost concept, the question can be analyzed as follows:

		1	*2*	*3*
(a)	Total purchase costs	1,00,000	92,000	1,00,000
	Total outlay costs if purchase inside	95,000	95,000	95,000
	Total opportunity costs if purchased inside	—	—	14,500
(b)	Total relevant costs	95,000	95,000	1,09,500
	Net advantage (disadvantage) to company as a whole (a – b)	5,000	(3000)	(9,500)

THEORY QUESTIONS

1. Explain the concept of responsibility accounting. What are the different types of responsibility centres.
2. Discuss the essential of responsibility performance reporting.
3. How will you measure the performance of cost and revenue division?
4. Distinguish between cost centre and profit centre. *(B.Com. (Hons), Delhi, 2002)*
5. Discuss responsibility accounting in brief. *(B.Com. (Hons), Delhi, 2004)*
6. What is responsibility centre? Discuss briefly the nature of various types of responsibility centres. *(B.Com. (Hons), Delhi, 2003)*
7. Write short notes on the following:
   Responsibility centres-cost centre and profit centre. *(B.Com. (Hons), Delhi, 2005)*
8. Describe and compare the main performance measures that have been suggested to measure the divisional performance.
9. Profit, return on investment and residual income have stood the test of time and are widely used for measuring the performance of a division. Describe the strengths and weaknesses of these measures of performance.

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10. Outline problem in defining and measuring capital employed in a division.
11. Explain the rationale of using an interest charge while measuring the performance of a division.
12. "In ROI, there is lack of consensus on the definition of numerator and denominator both." Explain the statement.
13. Explain the essential ingredients of a system of 'Responsibility Accounting'.
(B. Com. (Hons), Delhi, 1998)
14. Outline the basic principles of 'Responsibility Accounting'. *(B. Com. (Hons), Delhi, 2001)*
15. What are the financial and non-financial methods of performance measurement? Explain with examples, wherever, feasible. *(B.Com. (Hons), Delhi, 2007)*
16. What is meant by divisional performance measurement? Describe any two techniques used for this purpose.
(B.Com. (Hons). Delhi, 2007)
17. Discuss the important of market prices in transferring pricing system.
18. What do you mean by responsibility accounting?
19. Discuss the merits and demerits of ROI and RI for divisional performance measurement.
20. What are the objectives of transfer pricing system?
21. Explain the utility of cost-based prices under transfer pricing.
22. Write notes on (i) Negotiated prices and (ii) Dual prices.

PROBLEMS

1. Yonex India Ltd. is segmented into three divisions A, B and C. All were formed in the same year and now all assets have left exactly one-half of their expected life. Top management is attempting to determine which of the division is the most profitable. The following data have been prepared for your analysis:

	Division		
	A (Rs.)	*B (Rs.)*	*C (Rs.)*
Net income before taxes	78,000	90,000	96,000
Investment base-gross book value	3,90,000	5,00,000	6,00,000
Investment base-net book value	1,95,000	2,50,000	3,00,000

Prepare rankings of the three divisions using ROI and RI with a capital charge of 12.5% that each division manager might use to assert that his is the most profitable division.

Ans:

	Ranking	
ROI	RI (Gross Value)	RI (Net Value)
A	A	B
B	B	C
C	C	A

2. The operating performance of the three division of ABC company for 2003 is as follows:

	Division A (Rs.)	*Division B (Rs.)*	*Division C (Rs.)*
Sales	38,00,000	1,70,00,000	2,00,00,000
Operating Profit	2,00,000	5,00,000	10,00,000
Investment	20,00,000	62,50,000	80,00,000

(a) Using the operating profit margin percentage as the criterion, which is the most profitable division?
(b) Using the rate of return on investment as the criterion, which is the most profitable division?
(c) Which of the two measures do you think gives the better indication of overall operating performance? Explain your reasoning.

Ans: (a) Ranking Division A, Division C, Division B
(b) Ranking Division C, Division A and Division B
(c) ROI is better than operating profit margin

3. The Components Division produces a part that is used by the Goods Division. The cost of manufacturing the part is given below:

	Rs.
Direct materials	10
Direct labour	2
Variable overhead	3
Fixed overhead	5
Total cost	20

Fixed overhead is based on a practical volume at 2,00,000 parts
Other costs incurred by the Components Division are as follows:

	Rs.
Fixed selling and administrative	5,00,000
Variable Selling	Re. 1/unit

The part usually sells for between Rs. 28 and Rs. 30 in the external market. Currently, the Components Division is selling it to external customers for Rs. 29. The division is capable of producing 200,000 units of the part per year; however, because of a weak economy, only 150,000 parts are expected to be sold during the coming year. The variable selling expenses are avoidable if the part is sold internally.
The Goods division has been buying the same part from an external supplier for Rs. 28. It expects to use 50,000 units of the part during the coming year. The manager of the Goods Division has offered to buy 50000 units from the Components Division for Rs. 18 per unit.

Required:

(i) Determine the minimum transfer price that the Components Division would accept.
(ii) Determine the maximum transfer price that the manager of the goods division would pay.
(iii) Should an internal transfer take place? Why? If you were the manager of the Components Division, would you sell the 50,000 components for Rs. 18 each? Explain.
(iv) Suppose that the average operating assets of the Components Division total Rs. 100 lakhs, Compute the ROI for the coming year, assuming that the 50,000 units are transferred to the Goods Division for Rs. 21 each.

Ans. (i) Rs. 15, (ii) Rs. 28, (iii) Yes, because the opportunity cost of the transferring division is less than the opportunity cost of the buying division, (iv) 0.075 or 7.5%

4. Green World Company is a nursery products firm. It has three divisions that grow and sell plants: Western Division, Southern Division and Northern Division. Recently, the Southern Division of the company acquired a plastics factory that manufactures green plastic pots. These pots can be sold both externally and internally. Company policy permits each manager to decide whether to buy or sell internally. Each divisional manager is evaluated on the basis of return on investment.
The Western Division has bough its plastic pots in lots of 100 from a variety of ventors. The average price paid was Rs. 750 per box of 100 pots. However, the acquisition made Rohan, manager of the Western Division, wonder whether or not a more favourable price could be arranged. He decided to approach John Mathew, manager of the Southern Division, to see it he wanted to offer a better price for an internal transfer. Rohan suggested a transfer of 3,500 boxes. at Rs. 700 per box.

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John Mathew gathered the following information regarding the cost of a box of 100 pots:

	Rs.	
Direct materials	350	
Direct labour	80	
Variable overhead	100	
Fixed overhead (based on Rs. 20,00,000/20,000 boxes)	100	
Total unit cost	630	
Selling price	750	
Production capacity	20,000	boxes.

Required:

(i) Suppose that the plastics factory is producing at capacity and can sell all that it produces to outside customers. How should John Mathew respond to Rohan's request for a lower transfer price?

(ii) Now Assume that the plastics factory is currently selling 16,000 boxes. What are the minimum and maximum transfer prices? Should John Mathew consider the transfer at Rs. 700 per box?

(iii) Suppose that Green World's policy is that all transfer prices be set at full cost plus 20 percent. Would the transfer take place? Why? or why not?

Ans: (i) John Mathew should not reduce the price charged to Rohan if he can sell all he produces.
(ii) Minimum transfer price Rs. 530.
Maximum transfer price Rs. 750
(iii) The transfer price will be Rs. 756. No, the transfer will not take place.

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PART 5

SPECIALISED TOPICS

Part 5 discusses a few specialised topics which are broadly covered in cost accounting and about which managers and cost accounting practitioners should be fully aware. Uniform costing and Inter-firm comparison, cost audit are such useful areas and have been discussed in this part.

22. UNIFORM COSTING AND INTER-FIRM COMPARISON
23. COST AUDIT

22 UNIFORM COSTING AND INTER-FIRM COMPARISON

Learning Objectives

After reading this chapter, you should be able to:

1. explain uniform costing, its advantages, factors for establishing a uniform costing system, its areas of uniformity;
2. describe the contents of uniform cost manual, and
3. explain the important requirements of inter-firm comparison, its benefits and limitations.

UNIFORM COSTING

Uniform costing is defined as the use by several undertakings of the same costing principles and/or practices. Uniform or identical methods may be applied by various members of a group of similar companies under common control. Sometimes trade and business associations bring uniformity in costing principles and practices among all industries. Uniform costing in not a separate method of cost accounting like process or job costing, standard costing or marginal costing. It only points to a situation where a number of business firms are applying similar costing principles and practices.

Advantages of Uniform Costing

The advantages of uniform costing may be listed as follows:

1. Small business firms are not able to maintain a full costing system as it is costly and complicated. If the business associations and federations develop some costing principles for the benefit of all business concerns, much cost likely to be incurred on designing and establishing a costing system is likely to be saved.
2. It is always possible for management to be able to compare the cost of its own business with the average costs in the industry. Comparison helps to minimise areas of inefficiencies and weaknesses.
3. Some business associations use the costs provided by the members to prepare a standard price list, the existence of which tends to reduce destructive competition and help all members to obtain at least a fair price for their goods or services.
4. The applications of uniform costing in an industry provide the means whereby relevant information can be obtained to help in negotiations with goverment departments, trade unions, etc.

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5. When customers find that quotations are based on sound costing principles they accept them more readily, and the relationship of business enterprises with their customers is thus improved.
6. Uniform cost accounting facilitates the work of wage boards set up to fix minimum wages and fair wages for industry.
7. The benefits of research and development carried out by big firms may be made available to smaller firms also through uniform costing.
8. Uniform costing makes available cost data which are vital to goverment and regulatory authorities. In many areas, such as price control, protection or subsidy to industry, import licenses, quota for scarce materials, uniform costing provides suitable and important statistics.
9. Uniform costing is helpful in comparing the production efficiency of two units at the time of an amalgamation and merger.

Disadvantages

1. Business firms differ in nature of work, conditions and organisational characteristics. It becomes difficult to suggest a uniform costing for all business firms which widely differ from each other.
2. Uniform costing requires utmost cooperation, openness and confidence among members of the business and industry groups.
3. Uniform costing tends to suggest a single price within the industry which may create monopolistic tendencies.

ESTABLISHING A UNIFORM COSTING SYSTEM

Uniform costing may be useful to those business firms which are in the same industry, within a single management and also to industries of a similar nature, big or small. The success of uniform costing depends on the following factors:

1. Free exchange of ideas, information practices and techniques
2. Mutual trust, cooperation, confidence and a desire to share with each other.
3. Bigger enterprises should lend more cooperation and help to smaller enterprises.
4. No concealment of any information.
5. Absence of competition and hatred among participating members.

In uniform costing the purpose is to establish uniformity in cost accounting principles and practices and, therefore, an attempt should be made to locate differences and remove the causes creating such differences. The differences in cost accounting practices of different firms may be due to the following reasons:

(i) *Difference in nature, size and organisational set-up of business enterprises* Managing personnel, division of labour, division of work, number and size of department, services provided, smaller firms, larger firms, salary and wage structure.

(ii) *Methods of production* Use of plant and equipment, degree of mechanisation, manufacturing process or operation, sequence in processing.

(iii) *Use of cost accounting principles and procedures* Different methods of pricing materials issues, methods of wage payment, classifications, apportionment and absorption of overheads, methods of depreciation, treatment of administrative and selling and distribution overheads.

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AREAS OF UNIFORMITY

Uniform costing requires uniformity in cost accounting principles and procedures especially in the following areas:

1. *General classifications of accounts* Uniformity in classification and codification of accounts should be maintained.
2. *Method of overhead allotment* The basis on which the various overheads should be allotted to producing and servicing departments should be followed by all members of the industry groups using uniform costing.
3. *Method of overhead absorption* Uniformity in the method of overhead absorption is most important.
4. *Scrap and losses* The general method of treatment to be accorded to scrap and losses should be specified. The method of dealing with income from the sale of waste products should also be specified.
5. *Joint costs* The treatment of joint costs is also very important and a uniform method should be followed. It should also be decided as to which costs should or should not be included in cost.

UNIFORM COST MANUAL

The designing and applications of uniform costing require that a uniform cost manual containing instructions, clarifications, rules and guidelines about cost determination, cost analysis and cost control, should be developed and circulated among the business enterprises that have decided to use uniform costing. A uniform cost manual usually contains the following materials:

1. *Introduction* The introduction of the manual describes the statement of objectives of the system, scope of the system, advantages to be achieved and its basic features.
2. *Accounting organisation* It contains a scheme of organisation for designing and operating the cost accounting system.
3. *Accounting system* It contains general principles of accounting, a coding system, terminology, classification and description of accounts.
4. *Cost accunting system* It describes methods of costing (job, process, standard costing, etc.), system of integration in accounts, relation between cost and financial accounts, items to be included or excluded in stocks, classification of departments into producing and servicing, treatment of materials cost and materials losses, pricing of materials issues, classification of materials into direct and indirect, classifictation of labour cost and treatment of labour related costs such as idle time, overtime, holidays and shift allowances, etc., classification, collection, apportionment and absorption of overhead, calculation of depreciation, treatment of under- and over-absorption.
5. *Presentation of information* This section clearly describes how the cost information should be presented. It contains forms and contents of statements to be prepared, forms of reports to management, forms of report to shareholders, detailed operation and production costs, cost ratios, financial ratios and other supplementary information.

INTER-FIRM COMPARISON

Inter-firm comparison is the technique of evaluating the performance efficiencies, costs and profits of firms in an industry. Inter-firm comparison is greatly facilitated if uniform costing has been used. Inter-firm comparison requires exchanges of information relating to costs, profits, prices, efficiency on a voluntary basis among participating firms. Trade and commerce associations usually employ accountants to collect cost information about business firms and make inter-firm comparisons.

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ESSENTIALS OF INTER-FIRM COMPARISON

Inter-firm comparison can succeed when uniform costing principles and procedures have been used among member business firms. The following are the important requirements of inter-firm comparison:

1. *Nature and extent of information to be accumulated* Inter-firm comparison requires that all relvent and detailed cost information should be collected regarding business firms. No definite list of information can be suggested for collection. However, the following are the usual information which are applicable to all industries and therefore can be collected for inter-firm comparison:
   (i) Information regarding cost and cost structure.
   (ii) Labour efficiency and labour utilisation.
   (iii) Machine efficiency and machine utilisation.
   (iv) Raw materials comsumed, wastage and stores-keeping.
   (v) Return on capital employed.
   (vi) Liquidity and liquid resources.
   (vii) Reserve and appropriation of profits.
   (viii) Debtors and creditors.
   (ix) Methods of production and technical aspects.
   (x) Inventory and inventory systems.
2. *Responsibility for collection, coordination and presentation of information* In some countries separate organisations have been established for collecting and presenting information. In India inter-firm comparison information is collected by various trade associations, chambers of commerce, the National Productivity Council, research and statistics divisions of several commerce and trade journals and periodicals and newspapers.
3. *Method of collection and presentation of information* Information for the purpose of inter-firm comparison is usually supplied by business enterprises to organisation(s) regularly. Information can be collected by field workers also. After the information is collected, it is properly compiled and arranged and finally a consolidated report is prepared for the benefit of business firms. For the information to be purposeful, it is essential that participating firms should agree about the meaning of various terms used in ratios and accounting information.

BENEFITS OF INTER-FIRM COMPARISON

Inter-firm comparison has the following advantages:

1. It makes a business firm aware of its limitations as compared to other in the industry.
2. It eliminates confusion and uncerainty and encourages business firms to take some positive steps to improve performance and increase efficiency.
3. Information about the industry and business is available which is useful to present and prospective business enterpreneurs.
4. Reporting of data on business firms is generally treated free from bias.
5. Useful data about business enterprises becomes available to government for formulating economic, commercial and other policies for the well-being of the nation.

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LIMITATIONS OF INTER-FIRM COMPARISON

1. Business firms may be afraid that disclosure of information may help competitors, and may thus be reluctant to part with facts which are detrimental to their interests.
2. Some managements are not convinced about the utility of inter-firm comparison.
3. If business firms have not established suitable cost accounting systems, the information supplied by them may not be usable for inter-firm comparsion.
4. Business firms usually do not agree about a common suitable basis for comparison.

Howerver, the above limitations are basically due to differences in the nature of participating business firms and use of accounting methods. Therefore, a uniform cost accounting system should be established in every participating firm and business firms should be educated about the advantages and uses of inter-firm comparison.

THEORY QUESTIONS

1. Explain the concept of "uniform costing". What is a uniform costing manual?

2. What principal factors should be considered in introducing a system of uniform costing in an industry? *(ICWA)*

3. What is a uniform cost accounting system? What are the items on which you would seek uniformity so far as overheads are concerned in a uniform cost accounting system? *(ICWA)*

4. "A scheme of inter-firm comparison combines the advantages of a uniform costing system and the benefits arising out of the use of ratios." Discuss. *(ICWA)*

5. Discuss the scope and applications of uniform costing methods and their usefulness especially in the context of the economy of our country. Assume that you are advising a trade association in this regard in the interest of its member firms and outline your views and suggestions. *(ICWA)*

6. Why is inter-firm comparison desirable? What are the essential points that should be considered in inter-firm comparison? What are its advantages.

7. What are the purpose of uniform costing when it is introduced in an industry under a federation? What are the basic requirements of uniform costing? *(ICWA Inter Dec)*

8. Explain in brief, the advantages and limitations of uniform costing. *(CA, PE, Exam II, Group II, Nov. 1999, May 2001, 2004)*

9. State the essential requirements for the installation of uniform costing system in an industry. *(CA, PE, Exam II, Group II, Nov. 2002)*

COST AUDIT

23

Learning Objectives

After reading this chapter, you should be able to:

1. discuss meaning and advantages of cost audit, its preparation, scope,
2. distinguish between financial and cost audit, efficiency and cost audit;
3. explain concept and scope of management audit;
4. list some important areas requiring cost reduction within the management audit;
5. describe areas of activity for which accounting records are to be maintained under Cost Accounting Record Rules, and
6. explain the concept, advantages and procedure of value analysis.

MEANING OF COST AUDIT

The Institute of Cost and Management Accountants (UK) defines cost audit "as the verification of cost accounts and a check on the adherence to the cost accounting plan." Cost audit is verifying the correctness of cost accounts, cost reports, cost data and costing methods.

ADVANTAGES OF COST AUDIT

Cost audit is useful to many parties such as (i) management (ii) shareholder (iii) statutory auditor, (iv) government and consumers.

(i) *Management* Cost audit adds reliability to cost statements and cost data. It helps in detection of errors, frauds and irregularities. Management can make sound decisions on the basis of correct and reliable cost data.

(ii) *Shareholders* Cost audit increases the reliability of many cost data which are used by shareholders to analyse the financial position of a business firm.

(iii) *Statutory Auditor* Statutory auditor is also benefitted if cost system has been set up in an organisation. The statutory auditor can determine scope of his audit and make audit programme after evaluating cost accounting system used in organisation.

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(iv) *Government and Consumers* Government needs cost data for many purposes such as fixation of prices, cost plus contract, productivity measurement, evaluation of management efficiency, week points of management and organisation. All these activities require that cost data should be correct and reliable which is possible if a good costing system has been followed in an organisation.

FINANCIAL AUDIT AND COST AUDIT

Financial audit is the audit of financial accounts whereas cost audit is the audit of cost accounts. Financial audit aims to know whether the financial statements, namely, profit and loss account and balance sheet present a true and fair view of the business result and state of affairs of a business enterprise or not. On the other hand, cost audit aims to determine the correctness of cost figures of each activity after proper analysis. Cost audit focuses on propriety of expenditure and efficiency of performance.

Financial audit is related with only historical figures and data after the expenditures have been incurred and accounts have been prepared. Cost audit is performed with the help of budgets and therefore has a futuristic focus.

EFFICIENCY AUDIT AND COST AUDIT

Efficiency audit ensures that the resources flow into the most remunerative channels, namely. (a) every rupee invested in capital or in other fields gives optimum return; and (b) the planning of investment between the different functions and aspects is designed to give optimum results. The financial auditor does not comment on the performance efficiency of the company.

Since an appraisal of the extent of efficiency of utilization of factors of production is done in cost audit, it is rightly called "efficiency audit".

The following are the evidences to prove that Cost audit is efficiency audit:

(i) The Cost Auditor has to report in para (3) of the annexure*, the financial position of the company, giving inter alia—financial ratios like profit as % of capital, profit as % of net sales, current assets expressed as % of current liabilities, cost of production as % of capital employed, and working capital as % of cost of production. These ratios are useful for assessment of operational efficiency and comparing the financial health of one undertaking with another as well as for measurement of internal efficiency.

(ii) The Cost Audit Report under Para 4 of the annexure reflects the installed capacity and actual capacity utilised as well as analysis of the reasons for shortfall in actual capacity utilised as compared to installed capacity.

(iii) Under Para 6 of the annexure to Cost Audit Report, an analytical study of the consumption of raw materials per unit of production both in quantity and in value is made.

(iv) Under Para 7, the cost auditor is expected to comment on the consumption of power and fuel in total as well as per unit of output.

(v) The Cost Auditor has to report on the direct labour cost per unit of output of the product under cost audit alongwith brief explanation for variation in the cost, as compared to two preceding years.

(vi) The details of expenditure under overheads, with reasons for significant variation in expenditure as compared to preceding two years, particularly increase in overhead expenditure without corresponding increase in turnover or output of the product under Cost Audit has to be commented upon in Para 11 of Annexure to Cost Audit Report;

*The Department of Company Affairs, Government of India has framed Cost Accounting Record Rules which contains format of Cost Audit Report and an Annexure containing the guidelines for preparing Cost Audit Report by the cost auditor.

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(vii) The Cost Audit Report, under Para 9, contains information regarding consumption of stores and spares parts per unit of output which serves as a good indicator of upkeep of machines;
(viii) The Cost Audit Report contains information regarding the extent of non-moving items of stores as compared to the total inventory (vide Para 9 of Annexure to the report).
(ix) In Para 13 of Annexure to the Cost Audit Report the profitability of other exports from the company has to be commented upon;
(x) A cost auditor is expected to offer comments on various matters like rectification of imbalances in production facilities, fuller utilisation of installed capacities, increased productivity, limiting factors causing production bottlenecks and improved inventory policies.
(xi) A cost auditor is also expected to offer comments on the budgetory control systems and internal audit systems, prevailing in the organisation.

Thus, it can be established that no other audit except cost audit is so well designed to bring about the efficiency aspect of operations of a manufacturing unit in such elaborate detail.

MANAGEMENT AUDIT

Management audit is a detailed and critical review of all aspects of the management. Management audit encompasses all facets of managerial operations, including internal controls, and ascertaining the extent of compliance with established policies, plans and procedures within an organisation. Management audit is sometimes known as operational audit. The basic objectives of a management audit are to:

(i) help management to manage better;
(ii) improve organisational profitability; and
(iii) ensure that management objectives are being met.

The management audit covers a very vast and broad scope and extends beyond the scrutiny of books of accounts to areas such as production, maintenance, materials management, consumption of inputs, marketing, personnel matters, etc. Technical aspects are also involved.

Scope of Management Audit

Some important areas which management audit should probe to evaluate the performance efficiency to ascertain the drawbacks in the systems and procedures and to make suggestions to the management for remedial action and better control, could be the following:

(i) Production performance; (ii) sales performance; (iii) capacity utilisation; (iv) inventory holdings; (v) liquidity position; (vi) consumption efficiencies; (vii) costs of production; (viii) preventive maintenance; (ix) idle capacity; (x) purchases; (xi) receivables; (xii) overtime; and (xiii) controllable expenses.

Potent Tool for Managerial Control

Management audit as the eyes and ears of the management can bring to focus the weak areas of the operation and bring the improvement in the operational efficiency by interaction with the functionaries and highlighting these areas to the top management for improvement in the systems, procedures and methods of internal control. It is, thus a potent tool for managerial control.

Cost Reduction through Improvement in the Performance Efficiency

Cost of production is directly related with the operational efficiency and continuous efforts to improve operational efficiency. It will result in the reduction of costs and increase in the profitability. Some important areas needing a probe and suggestions towards reduction of costs by management audit could be:

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(i) Input mix and cheaper substitues; (ii) consumption efficiencies; (iii) preventive maintenance to reduce idle capacity; (iv) utilisation and performance of plant and machinery; (v) control in inventory holdings; (vi) economic purchases; (vii) improvement of sales turnover of products having high P/V Ratio; (viii) control over recoverables; (ix) control over overtime; (x) improvement of industrial relations.

PREPARATION OF COST AUDIT

Before starting the cost audit, an auditor should acquaint himself with several factors such as the following:

1. Cost accounting system used in organisation.
2. Production methods and manufacturing processes.
3. Information about raw materials and components used in production.
4. Concessions received from government, if any.
5. Memorandum and Articles of Association and important point mentioned therein about the costing requirements.
6. Information about cost records and documents.
7. Cost Accounting Rules or Cost Accounting Manual used in the organisation.

SCOPE OF THE COST AUDIT

Cost audit covers the following important areas:

1. *Materials:* The cost auditor generally varifies the following items relating to materials:
   - (i) Goods inward procedure
   - (ii) Store-keeping arrangement.
   - (iii) Accounting for scrap, wastage, materials transfers.
   - (iv) Perpetual inventory system.
   - (v) Materials pricing methods used.
   - (vi) Adequacy of stock checking methods.
2. *Wages:*
   - (i) Documents used in preparation of payroll.
   - (ii) Wage rate changes authorisation for wage payments and overtime payments.
   - (iii) Time recording.
   - (iv) Internal check system.
3. *Overhead:*
   - (i) Classification of overhead.
   - (ii) Overhead budgets.
   - (iii) Apportionment and allocation of overhead.
   - (iv) Methods of absorption.
   - (v) Policy regarding inclusion of overhead in work-in-progress.
   - (vi) Accounting treatment of under- or over-absorption.
4. *General:*
   - (i) Methods of establishing standards, revision of standards.
   - (ii) Methods of calculating standards cost variances.
   - (iii) Accounting codes and instructions.

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Areas of activity for which accounting records are to be maintained under Cost Accounting Record Rules

Costing Accounting Record Rules The Government of India had issued "Cost Accounting Record Rules" in respect of number of products/industries (as listed under Section 209 (1) (d) of Companies Act). Before the imposition of Statutory Cost Audit it was expected from all such concerns to observe these rules. Such an audit is imposed in respect of those products/industries which are consumer oriented and earners of high profit margin. According to these rules, all companies engaged in activities of production or manufacturing, etc. (for which cost account records have been prescribed) should maintain accounting records ralating to the utilisation of materials, labour and other items of cost. Such books of account should facilitate the calculation and disclosure of cost of production and cost of sales of the products at a periodical intervals. Each books of account and the proforma prescribed by the rules should be completed within the prescribed time limit after the end of the relevant financial year of the company. Following records are to be maintained under Cost Accounting (Records) Rules generally applicable to various industries in India.

1. Records for raw materials, components, stores and spare parts.
2. Records for labour.
3. Records for overheads.
4. Records for utilities/services.
5. Records for fixed assets.
6. Records for packing.
7. Records for research and development expenses.
8. Records for conversion cost.
9. Records for by-products.
10. Records for work-in-progress and finished goods.
11. Records for cost of production and marketing.
12. Reconciliation of cost records with financial books.
13. Computation of variances.
14. Physical verification.
15. Statistical data.

VALUE ANALYSIS

Value analysis or value engineering is a technique applied to analyse all aspects of an existing product or component to determine the minimum cost necessary for specific function requirements. This may result in various alterations being made to the product with object of reducing costs.

Advantages of Value Analysis

The primary advantage of value analysis is reduction in product cost. Some other advantages are the following:

1. Value analysis improves sale and customer satisfaction since it determines the exact requirements of customers and product designing is done accordingly.
2. The quality of the product is improved.
3. The latest methods of production and technology are used in product manufacture.
4. By simplification and standardisation of design and method, problems and complexities in production methods are eliminated.
5. It coordinates all managerial functions and builds up a spirit of cooperation and team work.
6. It helps in accomplishing effective utilisation of production resources like capital, employees, materials, time, etc.

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Procedure of Value Analysis

Value analysis basically centres around determining the essential characteristics of a product that the customer requires and determining the most economical method of producing it by balancing cost with the utility of the product. The following are the steps involved in value analysis:

1. *Collecting relevant information* All necessary information about a product is first gathered, such as physichal characteristics, materials specification, product costs like materials, labour and overhead, market, competitive products, production methods, etc.
2. *Deciding alternatives* All alternatives are to be developed and the most appropriate alternative is to be decided upon in terms of suitability of method and costs involved. That alternative is considered best which gives the best satisfication to customers and reduces the cost.
3. *Approval for the accepted alternative* Management should approve the best alternative and give authority for the development of the modified or revised product.
4. *Execution* Production drawings and models are developed and production is done accordingly.
5. *Follow-up* Finally, the extent of cost reduction that has been achieved should be investigated.

THEORY QUESTIONS

1. What are the areas of activity which a cost audit programme is expected to cover?

(ICWA Inter, June)

2. 'The statutory cost audit under the provisions of the Indian Companies Act is also intended to subserve social interests.' Comment.

(ICWA June)

3. Distinguish between:
(i) Cost audit and financial audit
(ii) Cost audit and management audit.

4. 'Cost audit is a necessity and not a luxury and is viewed as a barometer to measure the operational performance, the effectiveness of utilisation and working results.' Illustrate.

5. Explain the advantages of cost audit.

6. Is it correct to say that cost audit is efficiency audit. Give arguments.

7. Discuss the aspects usually covered in management audit.

8. What areas are covered in cost audit?

9. Explain the concept of value analysis as a technique of cost reduction.

10. Discuss the purpose of cost audit and circumstances under which a cost audit is desirable.

(CA, PE, Exam II, Group II, Nov. 2003)

11. What as a cost auditor will you verify in the area of work-in-progress?

(CA, PE, Exam II, Group II, May 2002)

12. Define cost audit. How is it useful to:
(i) Management
(ii) Society
(iii) Share holders
(iv) Government?

13. What are the areas of activity which a cost audit programme is expected to cover?

(CA, PE, Exam II, Group II, Nov. 2000)

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APPENDIX

OBJECTIVE -TYPE QUESTIONS

SECTION I: TRUE/FALSE STATEMENTS
SECTION II: FILL-IN-THE BLANKS
SECTION III: MATCHING STATEMENTS
SECTION IV: MULTIPLE CHOICE QUESTIONS

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SECTION I: TRUE/FALSE STATEMENTS

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1. Do you agree with the following statements? If not, why?
   (a) Valuation of closing stock is same under FIFO and LIFO method.
   (b) Abnormal idle time wages is included in cost of production.
   (c) Fixed cost per unit remains constant.
   (d) A firm earns profit when contribution is equal to fixed costs under variable costing.
   (e) Bin card is same as stores ledger. *(B.Com. Delhi)*

Ans:

   (a) This is a **False** statement because valuation of closing stock under FIFO and LIFO is not the same. When prices are rising, the value of closing stock will be higher in FIFO method as compared to LIFO and vice-versa.
   (b) This is also a **False** statement because abnormal idle time wages is not included in cost rather it is transferred to Costing Profit and Loss Account.
   (c) This is also a **False** statement because total fixed cost remains constant but fixed cost per unit will change with any change in the volume of output.
   (d) This is also a **False** statement because when contribution is equal to fixed cost there will be no loss and no profit.
   (e) This is also a **False** statement. Bin card is not the same as stores ledger.

2. Are the following statements **True** or **False**?
   (i) Purchase order is an order to stores department to issue materials.
   (ii) Fixed costs are costs which vary with variation in input.
   (iii) Abnormal idle time wages are excluded from the cost of production.
   (iv) Manufacturing and administrative overheads are different.
   (v) Margin of safety implies 'Break-even point'. (*B.Com. Delhi)*

Ans:

   (i) **False** (ii) **False** (iii) **True** (iv) **True** (v) **False**

3. Are the following statements **True** or **False**? Give briefly reasons also.
   (i) The adoption of 'LIFO' method does not result in inflation of profits during periods of rising materials prices.
   (ii) Variable cost per unit does not remain constant.
   (iii) Sales above break-even point indicate profits.
   (iv) Underabsorption of overheads decreases profit in costing books. *(B.Com. Delhi)*

Ans:

   (i) This statement is **True** because in LIFO methods, prices of materials charged to production are the latest prices. Therefore, under periods of rising prices, prices charged will be high and profit disclosed will be lower.
   (ii) This statement is **False** because Variable cost in total varies in direct proportion to the volume of output but remains constant per unit.
   (iii) This statement is **True** because Break-even point indicates a position of no profit and no loss. It is also the point of sales after which profit begins. Thus, any sales above break-even point will indicate profit.
   (iv) This statement is **False** because under absorption of overhead has the effect of under-statement of cost and this will increase the amount of profit in costing books.

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4. Are the following statements **True** or **False**?
   (i) Contribution is always equal to fixed costs.
   (ii) Good units do not bear the normal loss arising in Process Costing.
   (iii) Job Card is meant to record the attendance of workers.
   (iv) Labour Cost Card is the same thing as Job Card. *(B.Com. Delhi, 1990)*

Ans:

(i) **False** (ii) **True** (iii) **False** (iv) **False**

5. Are the following statements **True** or **False**?
   (i) On the Bin Card, number of units and their value is recorded.
   (ii) Fixed costs are costs which do not vary with variation in output.
   (iii) Job card is same as Time card.
   (iv) Good units do not bear the normal loss arising is Process Costing. *(B.Com. Delhi, 1992)*

Ans:

(i) No (ii) Yes (iii) No (iv) Yes

6. Are the following statements **True** or **False**? Give reasons for your answer.
   (i) Contribution Margin = Sales × P/V Ratio.
   (ii) The object of preparing Cost Sheet and Production statement is the same.
   (iii) Abnormal Loss is the excess of actual material loss over the pre-determined rate of loss of material.
   (iv) FIFO method of pricing material issue results in higher profits.
   (v) Preventive Costs and Replacement Costs have inverse relationship. *(B.Com. Delhi, 1995)*

Ans:

(i) This statement is **True**. P/V ratio indicates the share of contribution in the sales.
(ii) **True**: Cost sheet and Production statement are more or less one and the samething.
(iii) This statement is **True**.
(iv) This statement in **True** in the situation of rising price.
(v) **True**: When more costs are incurred to prevent labour turnover, lesser will be the rate of labour turnover.

7. State whether the following statements are **True** or **False**. Give reasons.
   (a) Total fixed cost remains unaffected by changes in the volume of output.
   (b) B.E.P. is the point at which total revenue is equal to total cost.
   (c) Abnormal loss is charged to Costing Profit and Loss Account.
   (d) Fringe benefits are charged to Costing Profit and Loss Account.
   (e) EOQ is that quantity which is most economical to order. *(B.Com. Delhi, 1996)*

Ans:

(a) **True**: Total fixed cost remains unaffected by change in the volume of output. But the fixed cost 'per unit' increases when the volume of output decreases, and fixed cost 'per unit' decreases when the volume of production increases.
(b) **True:** B.E.P. is the point at which total revenue is equal to total cost. This is that level of sales where there is no profit and no loss.
(c) **True:** Abnormal loss is charged to Costing Profit and Loss Account.
(d) **False:** Fringe benefits are indirect forms of employee compensation. The cost of such benefits should be treated as production overheads which are allocated to various departments.
(e) **True:** EOQ is defined as the economical purchase order size taking into account inventory carrying costs and ordering costs.

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8. State whether the following statements are **True** or **False.** Give reasons.
   (i) All the variable expenses are indirect expenses.
   (ii) Salaries paid to salesmen come under direct cost and are included for the calculation of prime cost.
   (iii) Bincard shows the money value of material received, issued and the balance at any point of time.
   (iv) Loss of material due to fire is treated as overhead and included for calculating cost of production.
   (v) Break-even point is the point at which total revenue is equal to total cost.
   (B.Com. Delhi 1998, 2003)

Ans:

   (i) **False:** Variable expenses vary proportionately with the output. Direct Material, direct wage; direct expenses, consumable stores, power, etc. are items of variable expenses. Indirect expenses, on the other hand, do not vary in direct proportion to output. It is wrong to say that all the variable expenses are indirect expenses.
   (ii) **False:** They are a part of selling and distribution overheads.
   (iii) **False:** Bin card is a record maintained in respect of each item of material to show the quantity in, the quantity out and the quantity in stock after each transaction. It does not show the money value of material received, issued and the balance at any point of time.
   (iv) **False:** It is abnormal loss and taken to the Costing Profit and Loss Account.
   (v) **True:** Break-even point is the point at which total revenue is equal to total cost, it is the point of no profit no loss.

9. State whether the following statements are **True** or **False**. Given reasons.
   (i) Financial accounts provide information for income determination.
   (ii) Variable cost per unit remains fixed.
   (iii) High Labour Turnover Ratio denotes good human relations.
   (iv) Perpetual inventory system and continuous stock taking are synonymous.
   (v) Margin of safety = Break-even sale minus Fixed cost. *(B.Com. Delhi, 1999)*

Ans:

   (i) **True:** Financial accounts provide information for income determination. From the information provided by the financial account, profit and loss account is prepared at the end of accounting period. It shows the income of the business during the accounting period.
   (ii) **True:** Variable cost per unit remains fixed because total variable cost increases proportionately with the increase in the output.
   (iii) **False:** High Labour Turnover Ratio denotes bad labour–management relation. It is a sign of unrest among workers.
   (iv) **False:** 'Perpetual Inventory' and 'Continuous Stock Taking' should not be considered synonymous. Perpetual inventory means the system of records, whereas continuous stock taking means the physical checking of those records with actual stocks.
   (v) **False:** Margin of safety = Actual sales – Break-even sales

10. Are the following statements **True** or **False**? Support your answer with proper reasoning.
   (a) Cost unit and cost centre have the same meaning.
   (b) The economic order quantity is the same as reorder level.
   (c) Cost of abnormal idle time is charged to costing profit and loss account.

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(d) Machine hour rate method of absorption of overheads can be applied in those organisations where work is done mainly on machines.

(e) Break-even point is the point at which total revenue is equal to total cost. *(B.Com. Delhi, 2001)*

Ans:

(a) **False:** A cost unit is a unit of quantity of product, service or time (or a combination of these) in relation to which cost may be ascertained or expressed while cost centre means a location, person or item of equipment (or group of these) for which cost may be ascertained and used for the purposes of cost control.

(b) **False:** The quantity of material to be ordered at one time is known as economic ordering quantity. This quantity is fixed in such a manner as to minimise the cost of ordering and carrying the stock. Whereas re-ordering level is the point at which if stock of a particular material in store approaches, the storekeeper should initiate the purchase requisition for fresh supplies of that material.

(c) **True:** It is a principle of costing that all abnormal expenses and losses should not be included in costs and as such wages paid for abnormal idle time should not form part of the cost of production. Cost of abnormal idle time is charged to costing profit and loss account.

(d) **True:** Machine hour rate is the cost of running a machine per hour. It is one of the methods of absorbing factory expenses to production. It is used in those industries and departments where machinery is predominant and there is little or practically no manual labour.

(e) **True:** A business is said to break-even when its total sales are equal to its total costs. It is a point of no profit and no loss. At this point, contribution is equal to fixed cost.

11. Indicate whether the following statements are **True** or **False,** giving reasons in one or two lines.

(i) Fixed costs does not change in the same proportion in which output changes.

(ii) According to LIFO method pricing, issues are close to current economic values.

(iii) Perpetual inventory system means continuous stock taking.

(iv) Waste can be realised but scrap cannot be realised.

(v) Under the ABC analysis of materials control, A stands for the highest number of items.

(B.Com. (Hons), Delhi 1998)

Ans:

(i) **True:** Fixed cost are commonly described as those which remain fixed in total amount with increase or decrease in the volume of output for a given period of time. Thus, we can say that fixed cost does not change in the same proportion in which output charges.

(ii) **True:** According to LIFO method goods are issued on the principle of last in first out. It is **True** to say that issues are close to current economic values.

(iii) **False:** Perpetual inventory is a system of records which reflects the physical movements of stock on the receipt and issues of material and also reflects the balance in stores. It is not a continuous stock taking system.

(iv) **False:** It is incorrect to say that wastage can be realised and scrap cannot be realised. Scrap can also be realised.

(v) **False:** Under the ABC analysis of material control, 'A' stands for the high value item but not for the highest number of items.

12. Indicate whether the following statements are **True** or **False**:

(i) The rental of a car which includes a fixed daily rate plus an extra fee for each kilometre driven is an example of a step cost.

(ii) Assuming inflation, if a company wants to maximise net income, it would select FIFO as the method of pricing raw materials.

(iii) Overtime premium paid to all factory workers is usually considered direct labour.
(iv) Period costs are invariable and are expended out as and when the inventory is sold.
(v) Idle facility and idle time are the same. *(B.Com. (Hons), Delhi, 1999)*

Ans:

(i) **False:** Rental of a car which includes a fixed daily rate plus an extra fee for each kilometre driven is not an example of step cost. It is the example of one type of semi-variable cost.
(ii) **True:** Profit can be maximised if a company select FIFO as the method of pricing raw material during inflation.
(iii) **False:** Generally speaking, payment for ordinary hours of overtime work is a part of direct labour cost. It is only the extra payment of overtime premium that needs a separate treatment in cost accounting. Hence overtime premium paid to all factory workers are not usually considered direct labour.
(iv) **True:** It is true that period costs are invariable and are expensed out as and when the inventory is sold.
(v) **False:** Idle facility and idle time are not the same. Idle facility is related to the unused production potentiality whereas idle time is related to the time not utilised on production.

13. Indicate whether the following statements are **True** or **False** giving reasons in one or two lines:

(i) A favourable variance will arise when actual revenues are less than expected.
(ii) A fixed cost is fixed per unit.
(iii) Variable costing is more widely used than Absorption costing for external reporting.
(iv) Cost-volume-profit relationship is a more comprehensive term than Break-even Analysis.
(v) All manufacturing costs are assigned to products under variable costing.

(B.Com. (Hons), Delhi, 2001)

Ans:

(i) **True:** When actual revenues are less than the standard or expected then there will be unfavourable variance.
(ii) **False:** Fixed cost represents the cost which is incurred for a period, and which, within certain output and turnover limits tend to be unaffected by fluctuation in the levels of output or turnover. Fixed cost per unit changes with changes in output.
(iii) **True:** Absorption costing is more widely used for external reporting.
(iv) **True:** Cost-Valume-Profit relationship is a more comprehensive term.
(v) **False:** In variable costing only variable production cost are assigned to products.

14. Which of the following are **True** or **False**:

(a) Only direct costs are relevant costs.
(b) Contribution is fixed cost plus profit.
(c) Variable cost of an output is always greater than its differential cost.
(d) Standard cost is always an ideal cost.
(e) At break-even point fixed cost is always equal to total contribution.

(B.Com. (Hons), Delhi, 2005)

Ans:

(a) **False**, (b) **True,** (c) **False,** (d) **False,** (e) **True.**

15. State whether the following are **True** or **False**:

(i) Time recording is not necessary for piece rate workers.
(ii) Centralsed purchasing is always advisable in a multi-unit company.
(iii) Cost reduction is a never ending process while cost control has a definite goal.

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(iv) In decision making management should consider only future costs.

(ICWA (Inter), Stage I, June 2007)

Ans:

(i) **False** (ii) **False** (iii) **True** (iv) **True**

16. State whether the following are **True** or **False**.

(i) Notional expenses are not included for ascertaining cost.
(ii) Merit rating is same as Job evaluation.
(iii) A firm which has a very high current ratio and very low liquid ratio, has a low level of inventory.
(iv) Units that do not meet production standards and must be processed further in order to be salable as good units or irregulars are called Spoiled units.
(v) Labour cost may be viewed as a Committed cost rather than Discretionary cost.

(ICWA, Inter, Stage 1, June 2006)

Ans:

(i) **True** (ii) **False** (iii) **False** (iv) **False** (v) **True**

17. State whether the following are **True** or **False**:

(i) Standard costing can be introduced in all types of manufacturing industries.
(ii) Defective and spoilage mean the same for cost accounting purposes and require the same treatment.
(iii) When a factory operates at full capacity, fixed cost also become relevant for 'Make or Buy' decisions.
(iv) Net profit will be the same under Marginal costing and Absorption costing if no inventory exists.
(v) Principal Budget Factor is a factor controllable by the Manager of the Budget Centre.

(ICWA, Inter, Stage 1, Dec. 2006)

Ans:

(i) **False** (ii) **False** (iii) **True** (iv) **True** (v) **False**

18. State whether the following statements are **True** or **False**:

(i) If an expense can be identified with a specific cost unit, it is treated as direct expense.
(ii) Time and motion study, which is a function of the engineering department, is useless for the determination of wages.
(iii) Fixed costs vary with volume rather than time.
(iv) The relationship of value function and cost can be expressed as:

$$\text{Cost} = \frac{\text{Value}}{\text{Function}}$$

(v) Future costs are not relevant while making management decisions.
(vi) In break-even analysis it is assumed that variable costs fluctuate inversely with volume.

(ICWA, Inter, Stage I, June 2005)

Ans:

(i) **True** (ii) **False** (iii) **False** (iv) **False** (v) **False** (vi) **False**

19. State whether the following are **True** or **False**.

(i) Variable Cost varies with time.
(ii) ABC analysis is based on the unit price of materials.
(iii) Cenvat credit is allowed on the basis of Central Excise Gate Pass.

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(iv) Differential Costing and Marginal Costing mean the same thing.
(v) Integral accounts merge financial and cost accounts in one set of accounts.

(ICWA, Inter, Stage 1, Dec. 2005)

Ans:

(i) **False** (ii) **False** (iii) **True** (iv) **False** (v) **True**.

20. State whether the following statements are **True** or **False**.

(i) Marginal costing is useful for long term planning.
(ii) Standards are arrived at based on past performance.
(iii) Cost of floppy disc used for office computer is administration overhead.
(iv) Opportunity cost is the value of benefit sacrificed in favour of an alternative course of action.
(v) Bin cards show quantity and value of stores.
(vi) A production order is an order received from a customer.
(vii) LIFO method of pricing issues is useful during periods of inflation.
(viii) Obsolete stocks can be determined by the frequency of issues.

(ICWA, Inter, Stage 1, Dec. 2003)

Ans:

(i) **False** (ii) **False** (iii) **True** (iv) **True** (v) **False** (vi) **False** (vii) **True** (viii) **False**

21. State whether the following statements are **True** or **False**. Give reasons for your answer.

(i) Depreciation is an out of pocket cost.
(ii) Labour cost can be reduced by recruiting cheap labour.
(iii) Factory overhead costs are always indirect manufacturing cost.
(iv) A process costing system would be more appropriate than job order costing for an oil refinery.

(B.Com. Delhi, 2007)

Ans:

(i) **False:** Out-of-pocket costs means the present or future cash expenditure regarding a certain decision which will vary depending upon the nature of decision made. Depreciation is not a cash expenditure hence it is not out of pocket cost.
(ii) **False:** Labour cost can not be reduced by recruiting cheap labour. The Labour cost can be reduced by successful utilisation of Labour force. Skill of Labour helps in lowering down the cost besides raising the Quantity and quality of the output.
(iii) **True:** Factory overhead means indirect material, indirect Labour and indirect expenses used in manufacturing the product.
(iv) **True:** Job costing is used where the production is not highly repetitive and, in addition, consist of different jobs or lots so that material and labour cost can be identified by order number. But in case of oil refinery the oil passes through different stages, each distinct and well-defined and it is desired to know the cost of production at each stage and hence process costing is more suitable.

SECTION II : FILL IN THE BLANKS

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1. Complete the following statements:
   (a) If sales are Rs. 50,000 and P/V Ratio is 30%, Variable cost would be _____.
   (b) Fuel and Power is an item of _____ overhead.
   (c) Variable cost per unit remains _____ with changes in the level of output.
   (d) If the rate of labour turnover high, this is sign of _____ of labour.
   (e) ABC analysis is a technique of _____.

(B.Com. Delhi, 1991)

Ans:

(a) Rs. 35,000
(b) Fuel and power is fixed overhead. It is an indirect expenses.
(c) Changing
(d) Instability
(e) Material Control.

2. Fill in the blanks:
   (i) The technique and process of ascertaining cost is termed as _____.
   (ii) Opportunity cost helps in _____.
   (iii) _____ is used for issuing materials to the production department.
   (iv) Direct material is a _____ cost.
   (v) LIFO method of pricing material issues is suitable for _____ materials.
   (vi) Material losses may be normal or _____.
   (vii) Spoilage involves besides loss of materials, loss of _____.
   (viii) Taylor's differential plan provides for _____ rates.
   (ix) Charging to a cost centre those overheads that result only from the existence of the cost centre is known as _____.
   (x) Abnormal loss is charged to _____. *(B.Com. Delhi, 2004)*

Ans:

(i) Costing. (ii) Decision making. (iii) Material requisition note (iv) Direct or Variable (v) Rising price (vi) Abnormal (vii) Labour and manufacturing/Factory overheads (viii) two piece. (ix) Allocation of overheads (x) Costing Profit and Loss Account.

3. Complete the following statements:
   (i) Total fixed cost remains constant in _____.
   (ii) Unit variable cost remains constant _____.
   (iii) If the rate of labour turnover is high, this is a sign of _____.
   (iv) When the amount of overhead absorbed is less than the actual amount of overheads it is known as _____ of overheads.

(B.Com, Delhi 2007)

Ans:

(i) change in volume of output upto certain extent
(ii) with the change in the level of output
(iii) Instability
(iv) underabsorption

4. Fill in the blanks correctly.
   (i) Work study consists of _____ and _____.
   (ii) Two methods used for calculation of equivalent production are _____ and _____.

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(iii) Two ratios used to assess the liquidity of a firm are _____ and _____.
(iv) Economic Batch Quantity depends on _____ and _____ costs.
(v) Normal idle time cost should be charged to _____ while that due to abnormal reasons should be charged as _____.
(vi) Flexible budget recognises the difference between _____ and _____.

(ICWA, Inter, Stage 1, June 2004)

Ans:

(i) method study, time and motion study
(ii) FIFO, average method
(iii) current ratio, liquidity ratio
(iv) set up costs, storage
(v) production overhead, Costing Profit and Loss Account
(vi) variable, fixed costs

5. Fill in the blanks suitably:

(i) Two broad methods of costing are _____ and _____.
(ii) A cost, which does not involve any cash out flow is called _____ or _____.
(iii) Reorder level is _____ multiplied by _____.
(iv) The normal value of current ratio is _____ and that of quick ratio is _____.
(v) Margin of safety is _____ or _____.
(vi) Material usage variance is the sum of _____ and _____.

(ICWA, Stage 1, Dec. 2004)

Ans:

(i) Specific order Costing, Operation Costing
(ii) Notional Cost, Imputed Cost
(iii) Maximum usage, Maximum lead period
(iv) 2, 1
(v) Sales minus B.E. sales, $\frac{\text{Profit}}{\text{C/S}}$
(vi) Mix variance, Yield variance

6. Fill in the blanks correctly:

(i) _____ cost is the difference in total cost that results from two alternative courses of action.
(ii) The most powerful tool used to analyse and interpret the health of an enterprise is _____.
(iii) Under _____ plan employees receive a constant portion of value added.
(iv) Idle time variance is always _____.
(v) Generally an item of expense, when identified with a specific cost until is treated as _____.
(vi) Contribution earned after reaching BEP is _____ of the firm.
(vii) In 'make or buy' decisions, it is profitable to buy from outside only when the suppliers price is below the firm's own _____.

(ICWA, Inter, Stage 1, Dec. 2003)

Ans:

(i) Differential
(ii) ratio analysis
(iii) Ruckev
(iv) Adverse
(v) Direct expense
(vi) Profit
(vii) Variable cost

SECTION III : MATCHING STATEMENTS

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1. Match the following correctly.

(i)	Perpetual Inventory System	:	Continuous physical vertification
(ii)	Standard Costing	:	Cost ascertainment
(iii)	Value Engineering	:	Recording stock balance after every transaction
(iv)	Blanket rate	:	Analysing the contribution of each part
(v)	Margin of safety	:	Management by exception
		:	Profit made above break-even level
		:	Analysing the role of every part at the design stage
		:	Overhead recovery rate
		:	Sales minus break-even sales

(ICWA, Inter, Stage 1, June 2007)

Ans:

(i)	Perpetual Inventory System	:	Recording stock balance after every transaction
(ii)	Standard Costing	:	Management by exception
(iii)	Value Engineering	:	Analysing the role of every part at the design stage
(iv)	Blanket rate	:	Overhead recovery rate
(v)	Margin of safety	:	Sales minus break-even sales

2. Match the following correctly.

'Make or buy' decision	Overhead absorption
Brick making	Process costing
Motion Study	Work study
Supplementary rate	Gilbreth
Split-off point	Single output costing
	Differential cost analysis
	Joint Cost

(ICWA, Inter, Stage 1, June 2006)

Ans:

'Make or buy' decision	Differential Cost analysis
Brick making	Single output costing
Motion study	Gilbreth
Supplementary rate	Overhead absorption
Split-off point	Joint cost

3. Match the following correctly.

(i)	Opportunity Cost	:	Financial forecasting and planning
(ii)	Variance Analysis	:	Standard measure of work to be done in one hour.
(iii)	Ratio Analysis	:	Decision making
(iv)	Relevant Cost	:	Value of benefit lost by choosing alternative course of action
(v)	Standard hour	:	Management by exception
			Measure of time taken for work done.
			Cost of alternative course of action.
			Flow of funds.

(ICWA, Inter, Stage 1, Dec. 2006)

Ans:

(i)	Opportunity Cost	:	Value of benefit lost by choosing alternative course of action.

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(ii)	Variance Analysis	:	Management by exception
(iii)	Ratio Analysis	:	Financial forecasting and planning.
(iv)	Relevant Cost	:	Decision making
(v)	Standard hour	:	Standard measure of work to be done in one hour.

4. Match the following correctly with what it relates.

Uniform costing	Supervisor's salaries
Variance analysis	Decision making
Point rating	Design of the product
Liquidity	Technique to assist inter-firm comparison
Value engineering	Job evaluation
Stepped cost	Engineered cost
	Management by exception
	Quick ratio
	Method of costing

(ICWA, Inter, Stage 1, June 2005)

Ans:

Uniform Costing	Technique to assist-inter-firm comparison
Variance Analysis	Management by exception
Point Rating	Job evaluation
Liquidity	Quick ratio
Value Engineering	Design of the product
Stepped Cost	Supervisor's salaries

5. Match the following correctly.

Scatter Diagram	Production Order
Escalator Clause	Reverse Cost Method
Perpetual Inventory	Splitting of Semi-variable Costs
Material Requisition	Contract Costing
By-product Cost accounting	Method of maintaining Store records
	Purchase Order

(ICWA, Inter, Stage 1, Dec. 2005)

Ans:

Scatter Diagram	Splitting of Semi-variable costs
Escalator Clause	Contract Costing
Perpetual Inventory	Method of maintaining store records
Material Requisition	Production order
By-product Cost Accounting	Reverse cost method

6. Match the following correctly.

Relevant costs	Helps in financial forecasting and planning
Primary packing materials	Practical capacity
Subsidised canteen facility	Indirect materials
Normal capacity	Control of inventory
Ratio analysis	Long-term average capacity based on sales expectancy
JIT system	Value analysis

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Future costs affected by decisions taken
Direct materials
Non-monetary incentive

(ICWA, Inter, Stage 1, June 2004)

Ans:

Relevant costs	Future costs affected by decisions taken
Primary packing materials	Direct materials
Subsidised canteen facility	Non-monetary incentive
Normal capacity	Long-term average capacity based on sales expectancy
Ratio analysis	Helps in financial forecasting and planning
JIT system	Control of inventory.

7. Match the following correctly.

Pareto distribution	Cost reduction
Angle of incidence	Semi-variable cost
Standard costing	Engineered cost
Electricity undertaking	Profit earning capacity
Direct materials	Cost control
Telephone charges	Operating costing
	Margin of safety
	ABC analysis
	Relevant cost

(ICWA, Stage 1, Dec. 2004)

Ans:

Pareto distribution	ABC analysis
Angle of incidence	Profit earning capacity
Standard costing	Cost control
Electricity undertaking	Operating costing
Direct materials	Engineered cost
Telephone charges	Semi-variable cost

8. Match the following.

(i)	Total fixed cost	What cost should be
(ii)	Total variable cost	Incurred cost
(iii)	Unit variable cost	Increases with output
(iv)	Unit fixed cost	Cost of conversion
(v)	Standerd cost	What cost are expected to be
(vi)	Period cost	Decreases with rise in output
(vii)	Actul cost	Remains constant in total
(viii)	Labour and overhead	Remains contant per unit
(ix)	Incremental cost	Cost not assigned to product
(x)	Budgeted cost	Added value of a new product

(B.Com. (Hans), Delhi.2003)

Ans:

(i)	Total fixed cost	Remains constant in total
(ii)	Total variable cost	Increases with output

(iii)	Unit variable cost	Remains contant per unit
(iv)	Unit fixed cost	Decreases with rise in output
(v)	Standard cost	What cost should be
(vi)	Period cost	Cost not assigned to product
(vii)	Actul cost	Incurred cost
(viii)	Labour and overhead	Cost of conversion
(ix)	Incremental cost	Added value of a new product
(x)	Budgeted cost	What cost are expected to be

SECTION IV : MULTIPLE CHOICE QUESTIONS

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Select the correct answer from the following multiple choice questions.

1. (i) Which costing method is currently widely used for internal reporting?

(a) Full or Absorption costing
(b) Marginal costing
(c) Direct costing
(d) Standard costing

(ii) Cost-volume-profit analysis is based on several assumptions. Which of the following is not one of these assumptions?

(a) The sales-mix of the products is constant;
(b) Inventory quantities change during the year;
(c) The behaviour of both revenues and cost is linear throughout the relevant range;
(d) Factor prices, for example, material prices and wage rates remain unchanged.

(iii) Which of the following should not be considered in a make or buy decision?

(a) Potential use of manufacturing capacity;
(b) Variable costs of production;
(c) Potential rental income from space occupied by production area;
(d) Unchanged fixed cost.

(iv) A company uses several types of materials to manufacture its product. The result of combining these materials in proportions different from standard proportions is the

(a) Material price variance;
(b) Material usage variance;
(c) Material mix variance;
(d) Material yield variance.

(v) Managers who are concerned not only with cost management but also with revenue generation and with investment decisions in a responsibility centre level called of an

(a) profit centre
(b) investment centre
(c) expense centre

(B.Com. (Hons), Delhi, 2004)

Ans:

(i) Standard costing
(ii) Inventory quantities change during the year
(iii) Unchanged fixed costs
(iv) Material mix variance
(v) Investment centre

2. Choose the correct answer from the answer given for each of the following. Indicate workings briefly:

(i) The set up cost of a machine is Rs. 120. A certain order requires 9000 components to be made in the machine for execution of the order. Cost of production of the component is Rs. 40 each at it requires 15% of the cost for storing it for a year. Then the Economic Batch quantity is _____ units.

(a) 300
(b) 250
(c) 400
(d) 600

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(ii) The cost per unit of a product manufactured in a factory amounts to Rs. 160 (75% variable) when production is 10000 units, when production increases by 25% the cost of production will be Rs. _____ per unit.

(a) 145
(b) 152
(c) 150
(d) 140

(iii) The budgeted standard hours of a factory is 12000. The capacity utilisation ratio for April 2007, stood at 90% while the efficiency ratio for the month came to 120%. The actual production in standard hours for April, 2007 was _____.

(a) 10800
(b) 12960
(c) 14400
(d) 12800

(iv) In a mill number of employees at the beginning and end of a period where 2486 and 2334 respectively. During the period, 320 workers left the mills while 168 persons joined in service. Labour turnover rate as per Flux method will be _____.

(a) 8.22%
(b) 9.46%
(c) 10.12%
(d) none of the above.

(v) In two consecutive periods, sales and profit were Rs. 1,60,000 and Rs. 8,000 respectively in the first period and Rs. 1,80,000 and Rs. 14,000 respectively during the second period. If there is no change in fixed cost between the two periods then P/V ratio must be _____.

(a) 20%
(b) 25%
(c) 30%
(d) 40%

(ICWA, Inter, Stage 1, June 2007)

Ans:

(i) 600 units

$$\text{EOQ} = \sqrt{\frac{2 \times \text{Setup cost per batch} \times \text{Annual demand}}{\text{Annual storage cost of one unit}}}$$

$$= \sqrt{\frac{2 \times 120 \times 9000}{40 \times 15\%}} = 600$$

(ii) Rs. 152

Variable cost per unit = (Rs. 160 × 75%) = Rs. 120
Fixed cost per unit = (Rs. 160 – Rs. 120) = Rs. 40
Hence, total fixed cost = 10,000 × Rs. 40 = Rs. 4,00,000

$\therefore$ Total cost when production is 12500 units is Rs. $120 + \dfrac{4,00,000}{12500}$

$= \text{Rs. } 120 + 32 = \text{Rs. } 152$

(iii) 12,960

$$\text{Efficiency ratio} = \frac{\text{Actul production in standard hours}}{\text{Actual hours taken}}$$

$$\text{Capacity utilisation ratio} = \frac{\text{Actual hours}}{\text{Budgeted hours}} = \frac{\text{Actual hours}}{12000} = 0.9$$

$\therefore$ Actual hours $= 10800$

$$\text{Efficiency ratio} = \frac{\text{Actul production in standard hours}}{10800} = 1.2$$

$\therefore$ Actual production $= 10800 \times 1.2 = 12960$

(iv) 10.12%

$$\text{Labour turn over} = \frac{\frac{1}{2}(\text{No. of separations} + \text{repacements})}{\text{Average No. of empoyees}}$$

$$= \frac{\frac{1}{2}(320 + 168)}{2410} \times 100 = 10.12\%$$

(v) 30%

$$\text{Sales} = \frac{\text{Fixed cost} + \text{Profit}}{\frac{\text{Contribution}}{\text{Sales}}} \left(\begin{array}{l} \text{where, P/V Ratio} = \dfrac{\text{Sales} - \text{Variable Cost}}{\text{Sale}} \\ \text{Sales} - \text{Variable Cost} = \text{Contribution} \end{array} \right)$$

$$\text{For Period I, } \frac{F + 8,000}{\frac{C}{S}} = 1,60,000$$

$$\text{For Period II, } \frac{F + 14,000}{\frac{C}{S}} = 1,80,000 \qquad \frac{\text{Change in Profit}}{\text{Change in Sales}} = \text{P/V Ratio}$$

Subtracting, $\qquad \text{P/V Ratio} = \dfrac{14,000 - 8,000}{1,80,000 - 1,60,000} = \dfrac{6,000}{20,000}$

$$\frac{6000}{\frac{C}{S}} = 20,000 \qquad = 0.30 \text{ is } 30\%$$

$$\therefore \frac{C}{S} = 30\%$$

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3. In the following cases one of the answers is correct. Choose the correct answer and give your working/ reasons briefly.

(i) Tom Company Ltd. has Sales of Rs. 200,000 with variable expenses of Rs. 150,000.Would Tom Company have to increase its Sales in order to achieve an operating income of 10% of Sales?

(a) Rs. 4,00,000
(b) Rs. 2,51,000
(c) Rs. 2,31,000
(d) Rs. 2,00,000

(ii) Warfield Company having net working Capital of Rs. 3 lakh has the current ratio of 1.8 and liquid ratio of 1.6. Its value of Stock is

(a) Rs. 55,000
(b) Rs. 65,000
(c) Rs. 75,000
(d) Rs. 85,000

(iii) In a factory of ZB Ltd. operating standard cost system, 2,000 kg of a material @ Rs. 12 per kg were used for a product, resulting in price variance of Rs. 6,000 (FAV) and usage variance of Rs. 3,000 (Adv.) Then standard material cost of actual production was

(a) Rs. 24,000
(b) Rs. 27,000
(c) Rs. 30,000
(d) Rs. 33,000

(iv) The standard time required per unit of a product is 20 minutes. In a day of 8 working hours a worker gives an output of 30 units. If he gets a time rate of Rs. 20 his earnings under Halsey scheme is

(a) Rs. 200
(b) Rs. 192
(c) Rs. 180
(d) Rs. 160

(v) A manufacturer used 400 units of a Component every month and he buys them entirely from an outside supplier @ Rs. 40 per unit. The order placing and receiving cost is Rs. 100 and storage and carrying cost is 15% of the value of Stock. EOQ will be

(a) 300 Units
(b) 400 Units
(c) 450 Units
(d) 500 Units

(ICWA, Inter, Stage 1, June 2006)

Ans:

(i) (d) Rs. 2,00,000 Let S be the proposed Sales

$$\text{So, } S \times \frac{5}{20} = \text{Rs. } 6{,}00{,}000 + 0.10\ S$$

$$\text{or} \quad 0.25\ S - 0.10\ S = 60{,}000$$

$$\therefore \quad S = 60{,}000 \div 0.15 = 4{,}00{,}000$$

Hence Increase in Sales:

$$(4{,}00{,}000 - 2{,}00{,}000) = \text{Rs. } 2{,}00{,}000$$

(ii) (c) Rs. 75,000

$$\frac{CA}{CL} = 1.8 \quad CA = 1.8\ CL$$

$$CA - CL = \text{Working Capital} = \text{Rs. 3 lakh}$$

$$1.8\ CL - CL = 3 \text{ or } CL = \text{Rs. } 3.75 \text{ lakh}$$

$$CA = 1.8 \times 3.75 = \text{Rs. } 6.75 \text{ lakh}$$

$$\text{Liquid ratio} = \frac{LA}{CL} = \frac{CA - \text{Stock}}{CL} = 1.6$$

$$\text{Hence, stock} = 6.75 - 1.6 \times 3.75 = 0.75 \text{ lakh}$$

$$= \text{Rs. } 75{,}000$$

(iii) (b) Rs. 27,000

Total Material Cost Variance:

= Material price variance + Material usage variance

= 6,000 (FAV) + 3,000 (ADV) = Rs. 3,000 (FAV)

Actual material cost = 2,000 × 12 = Rs. 2,4000

Hence, the standard material cost of Actual production

24,000 + 3,000 (F) = Rs. 27,000.

(iv) (c) Rs. 180

Total earnings under Halsey scheme:

Time allowed for 30 units [30 × 20 minutes] = 10 hrs.

Time taken	8 hrs.
Time saved	2 hrs.
Normal wages for 8 hrs. [8 × 20]	Rs. 160.00
Bonus (50% of 2 hrs. × Rs. 20)	Rs. 20.00
Total	Rs. 180.00

(v) (b) 400 units (EOQ)

Economic order quantity (EOQ)

$$\sqrt{\frac{2 \times \text{Annual demand} \times \text{Ordering cost}}{\text{Storage Cost}}}$$

$$= \sqrt{\frac{2 \times 400 \times 12 \times 100}{15\% \text{ of Rs. } 40}} = \sqrt{\frac{9{,}60{,}000}{6}} = 400 \text{ units}$$

4. Choose the correct answer from the answers given for each of the following questions. Indicate workings briefly.

   (i) A company has margin of safety of Rs. 40 lakhs and earns an annual profit of Rs. 10 lakhs. If the fixed costs amount of Rs. 20 lakhs, annual sales will be _____.

   (a) Rs. 160 lakhs (b) 140 lakhs (c) Rs. 120 lakhs (d) Rs. 200 lakhs

(ii) A chemical is manufactured by combining two standard item of input A (standard price Rs. 60/kg.) and B (Rs. 45/kg.) in the ratio 60% : 40%. Ten per cent of input is lost during processing. If during a month 1200 kg. of the chemical is produced incurring a total cost of Rs. 69,600, the total material cost variance will be_____.

(a) Rs. 2,400 (Adv.) (b) Rs. 2,400 (Fav.) (c) Rs. 3,000 (Adv.) (d) Rs. 2,000 (Fav.)

(iii) A factory makes use of component purchased from the market for assembling its final product, Current usage varies between 300 and 450 units per week and replenishment time is normally two weeks but can go up to five weeks. The minimum stock level of the component is _____ units.

(a) 1,500 (b)1,600 (c) 2,000 (d) 2,400

(iv) In a factory where piece work system is followed with guaranteed minimum wages of Rs. 120 (for eight hours), incentive payments are made according to Rowan Bonus Scheme. The standard time per unit is 10 minutes. If in a five-day week of 40 working hours the actual production is 300 units, the total earnings of the worker is _____.

(a) Rs. 640 (b) 720 (c) Rs. 750 (d) Rs. 800

(v) A company has an annual sales of Rs. 120 lakhs entirely on credit. It keeps an average inventory sufficient to meet sales demand for half a month and gives its customers one month credit. Its current liabilities average Rs. 9 lakhs. The company must maintain cash (including bank balance) to have a current ratio of 2. Its cash balance will be _____.

(a) Rs. 1 lakh (b) Rs. 2 lakhs (c) Rs. 3 lakhs (d) Rs. 4 lakhs

(ICWA, Inter, Stage 1, Dec. 2006)

Ans:

(i) (c) $M/S = \frac{P}{C/S} = \frac{10}{C/S} = 40$, or $C/S = 1/4$

B.E. Sales $= \frac{F}{C/S} = \frac{20}{1/4} = 80$ Sales = 80 + 40 = 120

(ii) (b) A: 60 kg. @ Rs. 60 Rs. 3,600

B: $\frac{40}{100}$ kg. @ Rs. 45 $\frac{\text{Rs. } 1,800}{\text{Rs. } 5,400}$

Less: $\frac{10}{90}$

∴ Std. cost of output

$\frac{\text{Rs. } 5,400}{90}$ = Rs. 60/kg.

Material cost variance = Rs. 1,200 × 60 – 69,600
= Rs. 2,400 (F)

(iii) (a) Reorder level = Max. usage × Max. reorder period

= 450 × 5 = Rs. 2,250 units

Min. Level = Reorder level – (Normal usage × Av. Lead time)

= 2,250 – (2 × 375) = 1,500 units

(iv) (b) $$\text{Rowan bonus} = \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time worked} \times \text{Rate}$$

$$= \left(\frac{300 \times 10}{60} - 40\right) / 50 \times 40 \times 15 = \text{Rs. } 120$$

Total earning (Rs. 120 × 5) + Rs. 120 = Rs. 720

(v) (c) $$\text{Inventory} = \frac{120}{12 \times 2} = \text{Rs. 5 lakhs}$$

Average Collection Period (month) = that is, 1

∴ Debtors = 120/12 = Rs. 10 lakhs

CL = 9; $$\text{Current ratio} = \frac{\text{C.A}}{\text{CL}} = \frac{\text{CA}}{9}$$

Total current Assets = 18 lakhs Cash = Rs. 3 lakhs (bal) [18–5–10]

5. In the following cases one of the answers is correct. Choose the correct answer and give your working/ reasons briefly:

(i) The current ratio of BM Ltd. is 2 : 1 while quick ratio is 1.80 : 1. If the current liabilities are Rs. 40,000, the value of stock will be

(a) Rs. 6,400
(b) Rs. 8,000
(c) Rs. 10,000
(d) Rs. 12,000

(ii) A company maintains a margin of safety of 25% on its current sales and earns a profit of Rs. 30 lakhs per annum. If the company has a profit volume (P/V) ratio of 40%, its current sales amount to

(a) Rs. 200 lakhs
(b) Rs. 300 lakhs
(c) Rs. 325 lakhs
(d) None of the above.

(iii) In a factory of PEE Ltd. where standard costing is followed, the budgeted fixed overheads for a budgeted production of 4800 units is Rs. 24,000. For a certain period actual expenditure incurred was Rs. 22,000 resulting in a fixed overhead volume variance of Rs. 3,000 (Adv). Then actual production for the period was

(a) 5400 units
(b) 4200 units
(c) 3000 units
(d) None of the above.

(iv) ZEE Ltd. uses material—A for the production of product—M, the safety stock of material—A is 300 units; the supplier quotes a delivery delay of two or three weeks. If the company uses 500 to 800 units a week according to the activity levels, the re-order level of material—A will be

(a) 2300 units
(b) 2400 units

(c) 2700 units
(d) 2800 units

(ICWA, Inter, Stage 1, June 2005)

Ans:

(i) (b) Rs. 8000: Current ratio being 2 : 1 and current liabilities (CL) being Rs. 40,000

Current Assets = 2 × Rs. 40,000 = Rs. 80,000.
Now, Quick ratio = (Current Assets – Stock) / CL
1.80 = (80,000 – Stock) / 40,000
Stock = Rs. 8,000

(ii) (b) Rs. 300 lakhs: Margin of safety = Profit / P/V Ratio
= 30 / 0.40 = Rs. 75 Lakhs
0.25 of sales = Rs. 75 lakhs
Hence, Sales = 75 / 0.25 = Rs. 300 Lakhs.

(iii) (b) 4200 units: FOH Volume variance:
= Budgeted Fixed OH – (Actual Prodn × Std. rate)
= 24000 – (Actual Prodn × 24000 / 4,800)
Hence, 3000 (Adv) = 24000 – 5. Actual Prodn
or, Actual Production = (24000 – 3,000)/5 = 4200 units.

(iv) (c) 2700 units: Maximum delivery period = 3 weeks
Maximum usage = 800 units
Safety Stock = 300 units.
Re-order level = Safety stock + (Maximum delivery period × Max. usage)
= 300 + (3 × 800) = 2700 units.

Ans:

(i) Labour turnover (Flux method) is: 9.08%

$$\frac{\frac{1}{2}(\text{Separation} + \text{Replacement})}{\text{Average No. of Employees}} = \frac{\frac{1}{2}(120+96)}{\frac{1}{2}(1200+1180)} \times 100 = \frac{108}{1190} \times 100 = 9.08\%$$

(ii) Remains the same: $\frac{\text{Contribution}}{\text{Sales}} = \frac{\text{Sales} - \text{Variale cost}}{\text{Sales}}$ = Remains the same.

(iii) Rs. 100,000
Total Material Cost Variance = Material price variance + Material usage variance = 4,800 (A) + 4,000 (F) = Rs. 800 (Adv.)
Actual Material cost = 9,600 × 10.50 = Rs. 100,800
Standard Cost of Actual production = Rs. 100,800 – 800 = Rs. 1,00,000.

(iv) 8 and 45 days.
Debtors's turnover = Sales/Debtors = 12,80,000 / 1,60,000 = 8
Average collection period = 360 / 8 = 45 days.

6. If actual output is lower than budgeted output, which of the following costs would you expect to be lower than the original budget?
   (a) Total variable costs
   (b) Total fixed costs
   (c) Variable costs per unit
   (d) Fixed costs per unit

Ans: (a)

7. Prime cost is
   (a) All costs incurred in manufacturing a product
   (b) Total of direct costs
   (c) Material cost of product
   (d) Cost of operating a department

Ans: (b)

8. A direct cost is a cost which
   (a) incurred as a direct consequence of a decision
   (b) can be economically identified with the item being costed
   (c) cannot be economically identified with the item being costed
   (d) is immediately controllable
   (e) is the responsibility of the board of directors

Ans: (b)

9. Fixed costs are conveniently deemed to be
   (a) constant per unit of output
   (b) constant in total when production volume changes
   (c) outside the control of management
   (d) those unaffected by inflation

Ans: (b)

10. Which of the following is most likely to be a variable cost?
    (a) Depreciation
    (b) Cost of material used in production
    (c) Rent
    (d) Advertising

Ans: (b)

11. Which of the following is most likely to be a fixed cost?
    (a) Cost of material used in production
    (b) Rent
    (c) Assembly labour cost
    (d) Commissions

Ans: (b)

12. Costs incurred in the part are
    (a) Opportunity cost
    (b) Direct cost
    (c) Sunk costs
    (d) Variable costs

Ans: (c)

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13. The salary a student foregoes while in college is an example of
    (a) Opportunity cost
    (b) Direct costs
    (c) Sunk costs
    (d) Variable costs

Ans: (a)

14. An operation costing system is
    (a) identical to a process costing system except that actual cost is used for manufacturing overhead.
    (b) the same as a process costing system except that materials are allocated on the basis of batches of production.
    (c) the same as a job order costing system except that materials are accounted for in the same way as they are in a process costing system.
    (d) the same as a job order costing system except that no overhead allocations are made as actual costs are used throughout.
    (e) a system in which manufacturing activities are finely divided into individual, discrete steps or operations.

Ans: (b)

15. Costs are accumulated by responsibility center for control purposes when using

	Job order costing	*Process costing*
(a)	Yes	Yes
(b)	Yes	No
(c)	No	No
(d)	No	Yes

Ans: (a)

16. In a job cost system, manufacturing overhead is

	An indirect cost of jobs	*A necessary element in production*
(a)	No	Yes
(b)	No	No
(c)	Yes	Yes
(d)	Yes	No

Ans: (c)

17. A direct manufacturing labour overtime premium should be charged to a specific job when the overtime is caused by the
    (a) Increased overall level of activity.
    (b) Customer's requirement for early completion of job.
    (c) Management's failure to include the job in the production schedule.
    (d) Management's requirement that the job be completed before the annual factory vacation closure.

Ans: (b)

18. In developing a predetermined factory overhead application rate for use in a process costing system, which of the following could be used in the numerator and denominator?

	Numerator	*Denominator*
(a)	Actual factory overhead	Actual machine hours
(b)	Actual factory overhead	Estimated machine hours
(c)	Estimated factory overhead	Actual machine hours
(d)	Estimated factory overhead	Estimated machine hours

Ans: (d)

19. A job order cost system uses a predetermined factory overhead rate based on expected volume and expected fixed cost. At the end of the year, underapplied overhead might be explained by which of the following situations?

	Actual volume	*Actual fixed costs*
(a)	Greater than expected	Greater than expected
(b)	Greater than expected	Less than expected
(c)	Less than expected	Greater than expected
(d)	Less than expected	Less than expected

Ans: (c)

20. Companies characterised by the production of heterogeneous products will most likely use which of the following methods for the purpose of averaging costs and providing management with unit cost data?

(a) Process costing.
(b) Job-order costing.
(c) Direct costing.
(d) Absorption costing.

Ans: (b)

21. Units of production is an appropriate method of assigning overhead when

(a) Several well-differentiated products are manufactured.
(b) Direct labour costs are low.
(d) Only one product is manufactured.
(d) The manufacturing process is complex.

Ans: (c)

22. Which of the following items is not included in (charged to) factory overhead?

(a) Factory depreciation and supplies.
(b) Costs of service departments.
(c) Costs of marketing departments.
(d) Costs of maintenance departments.

Ans: (c)

23. Many companies recognise three major categories of costs of manufacturing a product. These are direct materials, direct labour and overhead. Which of the following is an overhead cost in the production of an automobile?

(a) The cost of small tools used in mounting tires on each automobile.
(b) The cost of the tires on each automobile.
(c) The cost of the labourers who place tires on each automobile.
(d) The delivery costs for the tires on each automobile.

Ans: (a)

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24. Practical capacity as a plant capacity concept
    (a) Assumes all personnel and equipment will operates at peak efficiency and total plant capacity will be used.
    (b) Does not consider idle time caused by inadequate sales demand.
    (c) Includes consideration of idle time caused by both limited sales orders and human and equipment inefficiencies.
    (d) Is the production volume that is necessary to meet sales demand for the next year.

Ans: (b)

25. What are the transferred-in costs in process costing system?
    (a) Labour costs incurred for transferring employees from another department within the same plant instead of hiring temporary workers from the outside.
    (b) Costs of the product of a previous internal process that is subsequently used in a succeeding internal process.
    (c) Supervisory salaries that are transferred from an overhead cost centre to a production cost centre.
    (d) Ending work-in-process inventory of a previous process that will be used in a succeeding process.

Ans: (b)

26. The units transferred in from the first department to the second department should be included in the computation of the equivalent units for the second department under which of the following methods of process costing?

	FIFO	*Weighted-Average*
(a)	Yes	Yes
(b)	Yes	No
(c)	No	Yes
(d)	No	No

Ans: (a)

27. Spoilage from a manufacturing process was discovered during an inspection of work-in-process. In a process costing system, the cost of the spoilage is added to the cost of the good units produced if the spoilage is

	Abnormal	*Normal*
(a)	No	Yes
(b)	No	No
(c)	Yes	Yes
(d)	Yes	No

Ans: (a)

28. During the month of June Hindustan Ltd Co. experienced scrap, normal spoilage and abnormal spoilage in its manufacturing process. The cost of units produced includes
    (a) Scrap, but not spoilage.
    (b) Normal spoilage, but neither scrap nor abnormal spoilage.
    (c) Scrap and normal spoilage, but not abnormal spoilage.
    (d) Scrap, normal spoilage, and abnormal spoilage

Ans: (c)

29. Lucky Sportswear manufactures a specially line of T-shirts using a job order cost system. During March, the following costs were incurred in completing Job 2: direct materials Rs. 13,700; direct labour Rs. 4,800; administrative Rs. 1,400; and selling Rs. 5,600. Factory overhead was applied at the rate of Rs. 25 per machine hour, and Job Rs. 2 required 800 machine hours. If job Rs. 2 resulted in 7000 good shirts, the cost of good sold per unit would be

    (a) Rs. 6.50 (b) Rs. 6.30
    (c) Rs. 6.00 (d) Rs. 5.70
    (e) Rs. 5.50

Ans: (e)

30. A true process costing system could make use of each of the following except

    (a) Standard costs
    (b) Individual lots
    (c) Variable costing
    (d) Responsibility accounting.

Ans: (b)

31. An equivalent unit of direct materials or conversion cost is equal to

    (a) The amount of direct materials or conversion cost necessary to complete one unit of production.
    (b) A unit of work-in-process inventory.
    (c) The amount of direct materials or conversion cost necessary to start a unit of production in work-in-process.
    (d) Fifty percent of the direct materials or conversion cost of a unit of finished goods inventory (assuming a linear production pattern).

Ans: (a)

32. In the computation of manufacturing cost per equivalent unit, the weighted-average method of process costing considers

(a) Current costs only.
(b) Current costs plus cost of beginning work-in-process inventory.
(c) Currents cost plus cost of ending work-in-process inventory.
(d) Current costs minus cost of beginning work-in-process inventory.

Ans: (b)

33. Which of the following components of production are allocable as joint costs when a single manufacturing process produces several salable products?

    (a) Direct materials, direct labour, and overhead.
    (b) Direct materials and direct labour only.
    (c) Direct labour and overhead only.
    (d) Overhead and direct materials only.

Ans: (a)

34. Which of the following is/are often subject to further processing in order to be salable?

	By-Products	*Scrap*
(a)	No	No
(b)	No	Yes
(c)	Yes	Yes
(d)	Yes	No

Ans: (d)

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35. A Co. manufactures one product with a standard direct manufacturing labour cost of four hours at Rs. 12.00 per hour. During June, 1000 units were produced using 4100 hours at Rs. 12.20 per hour. The unfavourable direct labour efficiency variance was

    (a) Rs. 1,220
    (b) Rs. 1,200
    (c) Rs. 820
    (d) Rs. 400

Ans: (b)

36. One of the purposes of standard costs is to

    (a) Simplify costing procedures and expendite cost reports.
    (b) Replace budgets and budgeting.
    (c) Serve as a basis for product costing for external reporting purposes.
    (d) Eliminate accounting for under or overapplied factory overhead at the end of the period.

Ans: (a)

37. In an income statement prepared as an internal report using the variance costing method, fixed factory overhead would

    (a) Not be used.
    (b) Be used in the computation of operating income but not in the computation of the contribution margin.
    (c) Be used in the computation of contribution margin.
    (d) Be treated the same as variable factory overhead.

Ans: (b)

38. Cost-volume-profit relationships that are curvilinear may be analysed linearly by considering only

    (a) Fixed and semi-variable costs.
    (b) Relevant fixed costs.
    (c) Relevant variable costs.
    (d) A relevant range of volume

Ans: (d)

39. Cost-volume-profit analysis assumes over the relevant range that

    (a) Total costs are linear.
    (b) Fixed costs are nonlinear.
    (c) Variable costs are nonlinear.
    (d) Selling prices are nonlinear.

Ans: (a)

40. The contribution margin increases when revenues remain the same and

    (a) Variable cost per unit decreases.
    (b) Variable cost per unit increases.
    (c) Fixed costs decreases.
    (d) Fixed costs increase.

Ans: (a)

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41. Production of a special order will increase gross profit when the additional revenue from the special order is greater than
    (a) The direct materials and labour costs in producing the order.
    (b) The fixed costs incurred in producing the order.
    (c) The indirect costs of producing the order.
    (d) The marginal cost of producing the order.

Ans: (d)

42. Which of the following is true concerning standard cost?
    (a) Standard costs are estimates of costs attainable only under the most ideal conditions, but rarely practicable.
    (b) Standard costs are difficult to use with a process costing system.
    (c) If properly used, standards can help motivate employees.
    (d) Unfavourable variances, material in amount, should be investigated, but large favourable variances need not be investigated.

Ans: (c)

43. Which department is customarily held responsible for an unfavourable materials usage variance?
    (a) Quality control.
    (b) Purchasing.
    (c) Engineering.
    (d) Production.

Ans: (d)

44. Which of the following is normally included in the financial budget of a firm?
    (a) Direct materials budget.
    (b) Selling expense budget.
    (c) Budgeted balance sheet.
    (d) Sales budget.

Ans: (c)

45. A company has fixed manufacturing overhead costs totaled Rs. 1,00,000 and variable selling costs totaled Rs. 80,000. Under variable costing, how should these costs be classified?

	Period Costs	*Product Costs*
(a)	Re. 0	Rs. 180,000
(b)	Rs. 80,000	Rs. 100,000
(c)	Rs. 100,000	Rs. 80,000
(d)	Rs. 180,000	Re. 0

Ans: (d)

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