TRAVERSE COMPUTATION

Scale Factor (Geodetic Distance) = K

$K = Ko\{1 + (XVIII)q^2 + 0.00003q^4\}$

Ko = 0.09996

$q = 0.000001 \times E'$

Scale Factor (Horizontal Distance) = K*

$K^* = K \times SLC$

$$SLC = 1 - \frac{\text{MEAN ELEVATION}}{\text{MEAN RADIUS OF EARTH}}$$

Mean Radius of Earth = 6,372,000 m or 20,906,000 ft

ΔN = Grid Dist × Cosine of Azimuth

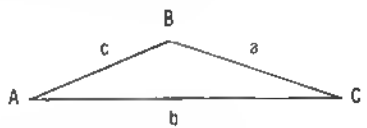
ΔE = Grid Dist × Sine of Azimuth

Linear Error of Closure (LEC)

$LEC = \sqrt{\text{Error } \Delta N^2 + \text{Error } \Delta E^2}$

$$\text{Closure Ratio} = 1: \frac{\text{LENGTH (M)}}{LEC}$$

In any triangle



LAW of SINES $\frac{a}{SinA} = \frac{b}{SinB} = \frac{c}{SinC}$

LAW of CONSINES

$a^2 = b^2 + c^2 - 2bc \text{ Cos } A$

$b^2 = a^2 + c^2 - 2ac \text{ Cos } B$

$c^2 = a^2 + b^2 - 2ab \text{ Cos } C$

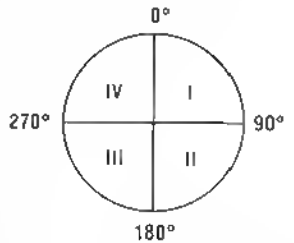
LAW of TANGENTS

$$\frac{a - b}{a + b} = \frac{\text{TAN } \frac{1}{2}(A - B)}{\text{TAN } \frac{1}{2}(A + B)}$$

$$\frac{b - a}{b + a} = \frac{\text{TAN } \frac{1}{2}(B - A)}{\text{TAN } \frac{1}{2}(B + A)}$$

Algebraic signs of trig functions by QUADRANT

Quad I All Pos
Quad II Sin (+), Cos (−), Tan (−)
Quad III Sin (−), Cos (−), Tan (+)
Quad IV Sin (−), Cos (+), Tan (−)



Trigonometric Elevation Computation
Reduction of Reciprocal zenith distance observations

$$\text{Correction (SECS)} = -\frac{(1 - o)\text{ Sin ZO}}{T - \text{Sin } 1''} \text{ or } -\frac{206265\ (1 - o)\text{ Sin ZD}}{T}$$

ZO = Mean Observed ZO
T = Slope Distance
Sin 1" = 0.00000485

Reciprocal Observations

$h_2 - h_1 = T \text{ Sin } \frac{1}{2}(ZO_2 - ZO_1)$
or
$h_2 - h_1 = S \text{ Tan } \frac{1}{2}(ZO_2 - ZD_1)$

T = Slope Distance
S = Geodetic Distance

Nonreciprocal Observations

$h_2 - h_1 = T \text{ Sin } (90° - ZO, + k)$
$h_2 - h_1 = S \text{ Tan } (90° - ZO, + k)$

GPO : 1994 O - 152-168

GTA 05-02-029
AUGUST 1987

CONVERSION FACTORS and COMMON FORMULAS

DISTRIBUTION: US Army Training and Audiovisual Support Centers (TASCs)
Approved for public release, distribution is unlimited
HEADQUARTERS, DEPARTMENT OF THE ARMY

CONVERSION FACTORS

LENGTH

1 mm = 0.1 cm = 0.001 m
10 mm = 1 cm = 0.010 m
100 mm = 10 cm = 0.100 m
1000 mm = 100 cm = 1.000 m
10 m = 0.010 km
100 m = 0.100 km
1000 m = 1.000 km

1 in = 2.54 cm
1 cm = 0.3937 in
1 ft = 30.48 cm = 0.3048 m
1 m = 39.37 in = 3.28083 ft
1 mile = 1609.344 m = 1.6093 km
1 km = 0.62137 mile

DECREE CONVERSIONS

1 mil OEC. Oegree × 17.777777

1 Degree = $\frac{\pi}{180}$ Radians

1 Radian = $\frac{180}{\pi}$ Degrees

TEMPERATURE

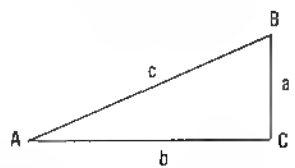
$C° = 5/9(F° - 32°)$ $F° = (9/5\,C°) + 32$

WEICHT

1 lb = 0.4536 Kg 1 Kg = 2.205 lb

COMMON FORMULAS

In any right triangle



SINE = $\frac{\text{OPPOSITE LEG}}{\text{HYPOTENUSE}}$ COSECANT = $\frac{1}{\text{SINE}}$

COSINE = $\frac{\text{AOJACENT LEG}}{\text{HYPOTENUSE}}$ SECANT = $\frac{1}{\text{COSINE}}$

TANGENT = $\frac{\text{OPPOSITE LEG}}{\text{AOJACENT LEG}}$ COTANGENT = $\frac{1}{\text{TAN}}$

SIN $A = \frac{a}{c}$ CSC = $\frac{1}{a/c} = \frac{c}{a}$

COS $A = \frac{b}{c}$ SEC = $\frac{1}{b/c} = \frac{c}{b}$

TAN $A = \frac{a}{b}$ CTN = $\frac{1}{a/b} = \frac{b}{a}$

$c = \sqrt{a^2 + b^2}$ $a = \sqrt{c^2 - b^2}$ $b = \sqrt{c^2 - a^2}$

LEVELING (''C'' FACTOR)

''C'' Factor = $\frac{\text{Near Rod Readings - Ear Rod Readings}}{\text{Far Intervals - Near Intervals}}$

MAXIMUM ALLOWABLE ''C'' EACTOR

SIF	C	SIF	C	SIF	C
1:100	0.004	1:200	0.007	1:333	0.010

Correct Rod Reading = ''C'' × Last FS Intervals
+ Last FS Mean Reading

INVERSE COMPUTATION

OIST = $\sqrt{\Delta N^2 + \Delta E^2}$ $E'_1 = E_1 = 500{,}000$

BEARING (β) = TAN $\frac{\Delta E}{\Delta N}$ $E'_2 = F_2 = 500{,}000$

$t = \beta$ if $\Delta E+$, $\Delta N+$ $(t - T) = (-N)(2E'_1 + E'_1)$

$t = 180° - \beta$ if $\Delta E+$, $\Delta N-$ (XVIII) 6.8255×10

$I = 180° + \beta$ if $\Delta E-$, $\Delta N-$ $T = t - (t-T)$

$t = 360° - \beta$ il $\Delta E-$, $\Delta N+$