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

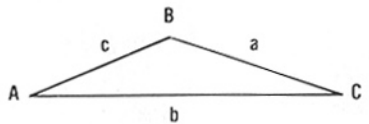
ΔE = Grid Dist × Sine of Azimuth

Linear Error of Closure (LEC)

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

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

In any triangle



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

LAW of CONSINES

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

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

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

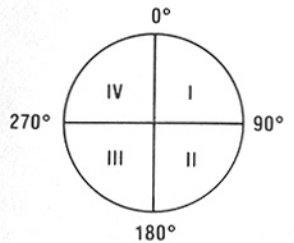
LAW of TANGENTS

$$\frac{a - b}{a + b} = \frac{\text{TAN } ½(A - B)}{\text{TAN } ½(A + B)}$$

$$\frac{b - a}{b + a} = \frac{\text{TAN } ½(B - A)}{\text{TAN } ½(B + A)}$$

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

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

ZD = Mean Observed ZD

T = Slope Distance

Sin 1″ = 0.00000485

Reciprocal Observations

$h_2 - h_1 = T \text{ Sin } ½(ZD_2 - ZD_1)$

or

$h_2 - h_1 = S \text{ Tan } ½(ZD_2 - ZD_1)$

T = Slope Distance

S = Geodetic Distance

Nonreciprocal Observations

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

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

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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

DEGREE CONVERSIONS

1 mil DEC. Degree × 17.777777

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

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

TEMPERATURE

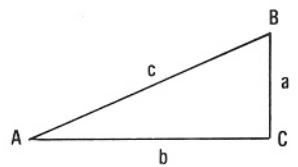
$C° = 5/9(F° - 32°)$ $\qquad$ $F° = (9/5\,C°) + 32$

WEIGHT

1 lb = 0.4536 Kg $\qquad$ 1 Kg = 2.205 lb

COMMON FORMULAS

In any right triangle



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

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

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

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

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

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

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

LEVELING (''C'' FACTOR)

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

MAXIMUM ALLOWABLE ''C'' FACTOR

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

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

$\text{BEARING } (\beta) = \text{TAN} \frac{\Delta E}{\Delta N}$

$t = \beta$ if $\Delta E+, \Delta N+$
$t = 180° - \beta$ if $\Delta E+, \Delta N-$
$t = 180° + \beta$ if $\Delta E-, \Delta N-$
$t = 360° - \beta$ if $\Delta E-, \Delta N+$

$E'_1 = E_1 = 500{,}000$

$E'_2 = E_2 = 500{,}000$

$(t - T) = (-N)(2E'_1 + E'_1)$
(XVIII) 6.8255×10
$T = t - (t - T)$

OVER →