To run, type in data file name in Alpha register, then press XEQ ALPHA CGX ALPHA

* Number of pts you can store is $\frac{1}{2}$ × length of file (e.g. a file sized with 50 regs holds 25 pts.) Pt. numbering starts at 0 (zero).

Menu: EA LN RS LS (A B D E)

EA ⇒ enter & assign
LN ⇒ lines
RS ⇒ radial stakeout
LS ⇒ list

Entering Bearings: Type in Bearing Quad ENTER↑ R/S

Quad codes are
1 = NE
2 = SE
3 = SW
4 = NW
5 = NA

(Once an azimuth has been entered, the computer will always display azimuths until a bearing is entered, and vice-versa)

Sideshots: Press [f] [D] to toggle between "sideshot" & "normal" mode. You are in sideshot mode when the little "0" is on the display.

1) when you exit the lines routine, SS mode is turned off
2) when you restart at a new point, SS mode is turned off
3) In sideshot mode, curves are not computed.
4) When you execute a radial stakeout, SS mode is turned on.
5) You may sideshot intersections.

Curves: To traverse curves, enter the radius point as a negative number. (Notice the little "3" comes on). Traverse or inverse to the radius point, enter the P.O.C. then give either the Δ or length (If the curve turns left, Δ and L are negative values.)

Errors: If you make a serious mistake, or see a message like "DATA ERROR", press [f] [C] to reset the computer and return to the menu.

Abbreviations:

ST PT	starting point	NE	northeast	N	northing
B1	bearing 1	NW	northwest	E	easting
B2	bearing 2	SE	southeast	[f] [Δ]	delta
D1	distance 1	SW	southwest	L	length
D2	distance 2	AZ	azimuth	∝ PT	occupied point
CC	counterclockwise	D	distance	DP	destination point
SH	short	PT	point		

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Registers

00	Current Pt #
01	Current N
02	Current E
03	Brg 1
04	Brg 2
05	Dist 1
06	Dist 2
07	Next Pt #
08	Dest Pt #
09	Ref Az
10	Ref Dist

Flags

00	sideshot
01	Intersection Leg 1
02	Intersection Leg 2
03	Curve
04	List or Stakeout loop
05	Lines Routine
06	Short R-D or CC D-D
07	-
08	-
09	Display Azimuth
21	Printer on
22	Numeric entry
27	User mode

Keyboard

A	Enter & Assign
B	Lines
D	Radial Stakeout
E	List
b	Sideshot / Normal mode toggle
e	Error Reset

Local Labels

10	Lines Routine
11	B1 unknown
12	B1 known, D1 unknown
13	B1 known, D1 unknown, B2 unknown
50	Traverse
80	Store
20	Inverse
40	Display
09	Compute Azimuth
04	Q = NW
02	Q = SE
03	Q = SW
01	Q = NE
05	Q = NA
08	Set Data Pointer
06	Intersection Setup
90	Curve
14	Radial Brg out
07	List / Stakeout loop

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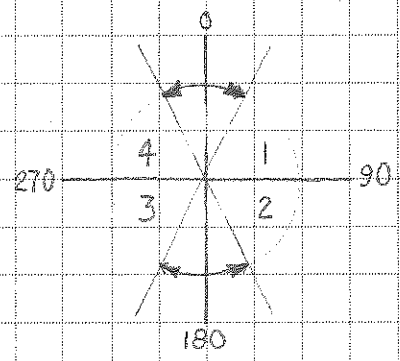
Formulas



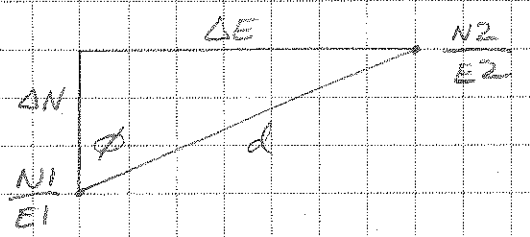
Brg → Az : Q1 : Az = Brg
Q2 : Az = 180 − Brg
Q3 : Az = 180 + Brg
Q4 : Az = 360 − Brg

Az → Brg : Brg = $|\sin^{-1}(\sin Az)|$

Quad code :

North	Cos(Az) = +	NE	cos +, sin +
South	Cos(Az) = −	SE	cos −, sin +
West	Sin(Az) = −	SW	cos −, sin −
East	Sin(Az) = +	NW	cos +, sin −

Traverse, Inverse



φ = Azimuth from 1 to 2

$\Delta N = d \cos \phi$ $\quad d = \sqrt{\Delta N^2 + \Delta E^2}$

$\Delta E = d \sin \phi$ $\quad \tan \phi = \Delta E / \Delta N$

Use HP-41 [P→R] and [R→P] functions

θ	φ	P→R	ΔE	y
r	d	R→P	ΔN	x

Traverse: N2 = N1 + ΔN
E2 = E1 + ΔE

Inverse: ΔN = N2 − N1
ΔE = E2 − E1

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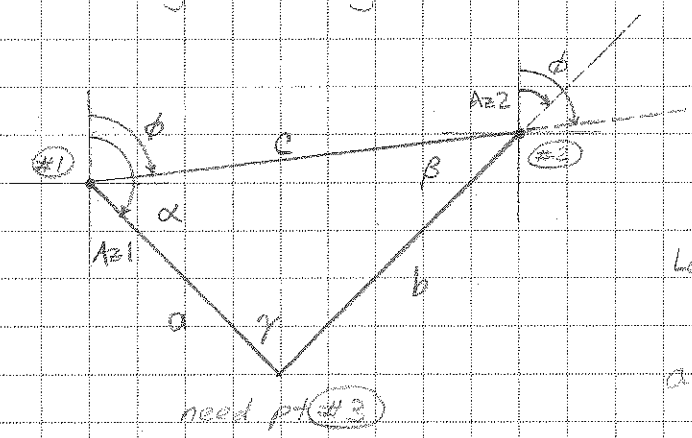
Bearing - Bearing:



need pt #2

ϕ = ref Az c = ref dist
α = Az1 − ϕ
β = ϕ − Az2
γ = 180 − α + β

Law of sines: $\frac{a}{\sin\beta} = \frac{c}{\sin\gamma}$

$a = \frac{c \sin\beta}{\sin\gamma}$

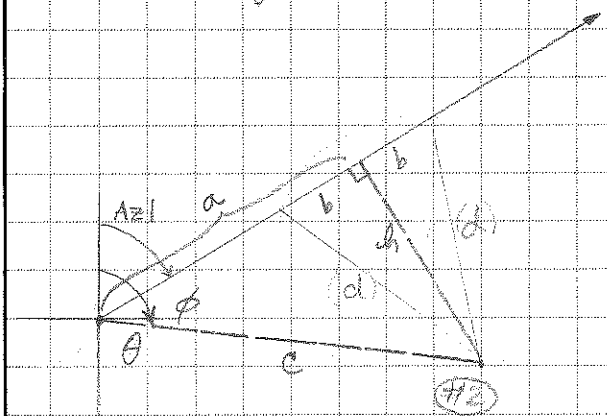
since $\sin(180-\theta) = \sin\theta$

$a = \frac{c\sin\beta}{\sin(\alpha+\beta)} = \frac{c\sin(\phi - Az2)}{\sin(Az1 - \phi + \phi - Az2)}$

$= \frac{c\sin(\phi - Az2)}{\sin(Az1 + Az2)}$

Note: You can specify Brg1 & Brg2 "forward" or "backward" since $\sin(180-\theta) = \sin\theta$

Bearing - Distance:



θ = ref Az c = ref dist
d = known second distance
$\phi = \theta - Az1$

$a = c\cos\phi$
$h = c\sin\phi$
$b = \sqrt{d^2 - h^2}$

for long solution use a+b (CF 06)
" short " " a−b (SF 06)

Note: ϕ can be specified as either θ − Az1 or Az1 − θ since the sign of ϕ is unimportant
since $a = c\cos\phi = c\cos(-\phi)$
and $h^2 = (c\sin\phi)^2 = (-c\sin(-\phi))^2$
Also, the sign of d is unimportant since it is only used as $d^2 = -d^2$

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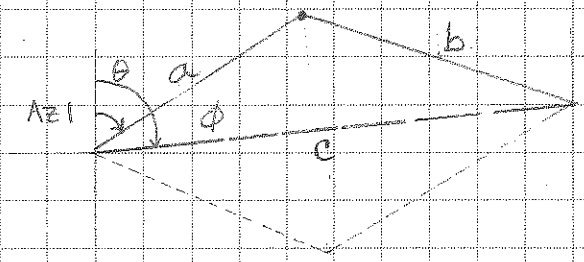
Distance - Distance:



θ = ref azimuth c = ref distance
a = known first distance
b = known second distance

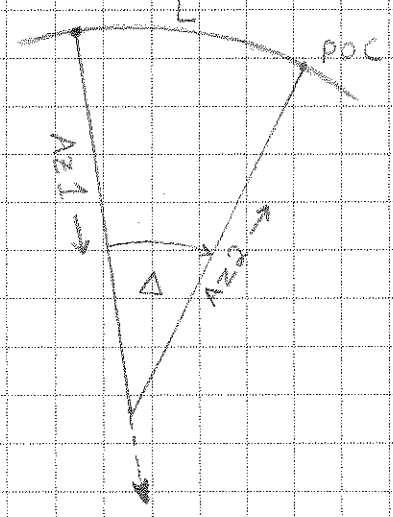
Law of cosines:

$$b^2 = a^2 + c^2 - 2ac\cos\phi$$

$$\phi = \cos^{-1}\left(\frac{a^2 + c^2 - b^2}{2ac}\right)$$

for clockwise soln (CF 06) use $Az1 = \theta - \phi$
" counterclockwise " (SF 06) " $Az1 = \phi - \theta$

Curves:



$$Az2 = \Delta + (Az1 + 180)$$

$$L = \Delta_{rad} \cdot r$$

$$\Delta_{rad} = \frac{L}{r}$$

For curves turning to the left Δ or L is specified as a negative value