

COGO+ Introductory Examples

[By Simple Geospatial Solutions](#)

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Setting up the Software

Create a new Job

Navigate to the **DATA** menu, select **Job Manager** and **LOAD** to display the jobs stored on the calculator:

```
Default.CPJ      COGO+ Pro 04.02
DMS QB F X,Y =D   UTM10 GRS80
15 Points
[COGO][ADJU][SURV][TOOL][DATA][GEOD]
[Job Manager]
[N] Store New Point
[R] Review Points
[Q] Delete Points
[X] Import/Export
[.....http://sgss.ca.....]EXIT LOAD
```

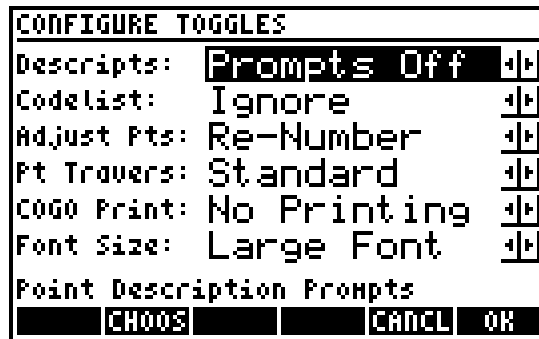
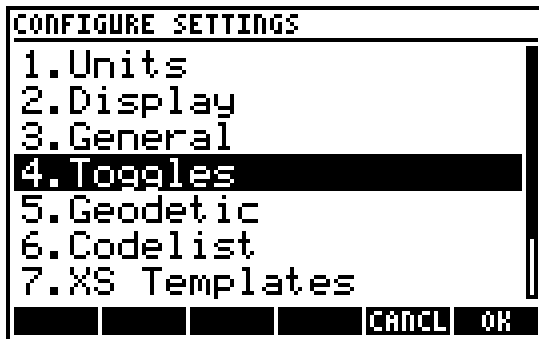
```
JOB MANAGER
Default.CPJ
WV.CPJ
NEW DEL INFO OPTS CANCL LOAD
```

Press **NEW** to create a new job, and then enter the name **EXAMPLES**, press **ENTER** to finish:

```
CREATE NEW JOB
New Job Name
EXAMPLES+
A B C D E F
```

```
JOB MANAGER
Default.CPJ
EXAMPLES.CPJ
WV.CPJ
NEW DEL INFO OPTS CANCL LOAD
```


Back to **Config. Settings**, select **4.Toggles**, then **OK** and set to match as shown, then **OK** again:



The examples will assume the basic settings are set as shown from here on.

Example 1

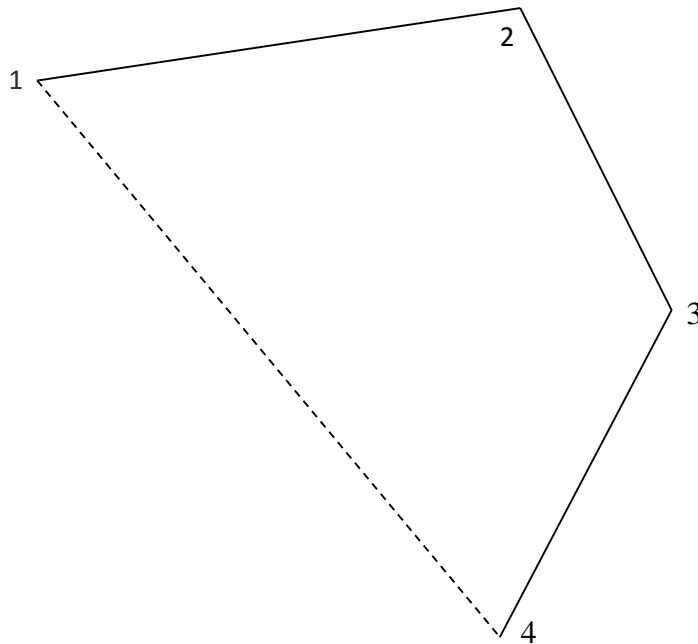
Compute the course of DA from the closed traverse than contains four courses, given the information:

COURSE	BEARING	DISTANCE
AB	N 83° 30' E	100.00'
BC	S 29° 25' E	60.00'
CD	S 24° 45' W	70.32'

NOTE: COGO+ does not allow alpha-numeric point identifiers, so for this example we will make:

A=1, B=2, C=3, and D=4

Step 1: Draw a rough sketch



Step 2: Start Calculations

From the **COGO** menu, select **Point Traverse**:

```
EXAMPLES.CPJ          COGO+ Pro 04.02
DMS DE F N,Y LD      UTM10 GRS80
0 Points              USB
COGO ADJU|SURV|TOOL|DATA|GEOD
[P] Point Traverse
[I] Inverse
[O] Intersections
[K] Area by Points
[W] Fit Points
[.....http://sgss.ca.....] EXIT LOAD
```

From *Point*, enter 1:

```
POINT TRAVERSE Standard
.....
From Point
1
[330] [CURVE] [FAC] [STAS] [CADCL] [OK]
```

Point 1 does not exist, so we are prompted to enter some coordinates for the point, enter arbitrary coordinates as shown:

```
ENTER COORDINATES
Pt #: 1
X: 5000.000ft
Y: 5000.000ft
Z: 0.000ft
Z Coordinate
[EDIT] [ ] [ ] [COPY] [CADCL] [STORE]
```

Enter Quadrant Bearing N83°30'E as shown, *Bearing 1* 183.3:

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown

Bearing 1.....
183.3*
R->B LAST CANCL OK
```

Enter the distance as shown, *Distance 1* 100:

```
Enter the Distance to the
NEW Point you are calculating
Leave blank if unknown

Distance 1.....
100*
R->F *USE /USE LAST CANCL OK
```

The solution, store as Point 2:

```
STORE POINT
n: 5011.320ft
e: 5099.357ft
z: 0.000ft

Point Number.....
2*
LOH NEXT CANCL OK
```

Back to *From Point*, enter 2 if not already suggested:

```
POINT TRAVERSE Standard

From Point.....
2*
BRON CURVE: FFB: STR: CANCL OK
```


Enter Quadrant Bearing S29°25'E as shown, *Bearing 1* 229.25:

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown

Bearing 1
229.25
[←] [→] [LAST] [CANCEL] [OK]
```

Enter the distance as shown, *Distance 1* 60:

```
Enter the Distance to the
NEW Point you are calculating
Leave blank if unknown

Distance 1
60
[←] [→] [USE] [NOUSE] [LAST] [CANCEL] [OK]
```

The solution, store as Point 3:

```
STORE POINT
n: 4959.056ft
e: 5128.827ft
z: 0.000ft

Point Number
3
[OK] [NEXT] [CANCEL] [OK]
```

Back to *From Point*, enter 3 if not already suggested:

```
POINT TRAVERSE Standard

From Point
3
[OK] [CURVE] [FREE] [STR] [CANCEL] [OK]
```

Enter Quadrant Bearing S24°45'E as shown, *Bearing 1* 324.45:

```
Enter the Bearing to the  
NEW Point you are calculating  
Leave blank if unknown  
  
Bearing 1.....  
324.45 $\blacktriangleleft$   
[R->B] [LAST] [CANCE] [OK]
```

Enter the distance as shown, *Distance 1* 70.32:

```
Enter the Distance to the  
NEW Point you are calculating  
Leave blank if unknown  
  
Distance 1.....  
70.32 $\blacktriangleleft$   
[R->F] [RUSF] [LUSF] [LAST] [CANCE] [OK]
```

The solution, store as Point 4:

```
STORE POINT  
-----  
n: 4895.195ft  
e: 5099.386ft  
z: 0.000ft  
  
Point Number.....  
4 $\blacktriangleleft$   
[L04] [NEXT] [CANCE] [OK]
```

Step 3: Compute the course from Point 4 to Point 1

Method 1: From within the Point Traverse routine.

From Point, enter 4..1:

```
POINT TRAVERSE Standard
.....
From Point
4..1
[BRON] [CURVE] [FF] [E] [STR] [CANCL] [OK]
```

The result:

```
INVERSE POINTS 4-1
.....
Bearing: N43°28'48"W
Hz Dist: 144.436ft
Sl Dist: 144.436ft
Grade: 0.000 %
.....
*North: 104.805ft
*East: -99.386ft
*Elev: 0.000ft
[IN] [OP] [E] [B] [O] [O] [COORD] [STACK] [LOOP] [OK]
```

Method 2: From the Inverse Program

From the **COGO** menu select **Inverse**, then select **Points**:

```
EXAMPLES.CPJ      COGO+ Pro 04.02
DMS QB F N,E _D   UTM10 GRS80
4 Points          USB
COGO |ADJU|SURV|TOOL|DATA|GEOD|
[P] Point Traverse
[Q] Inverse
[L] Intersections
[K] Area by Points
[W] Fit Points
[.....http://sgss.ca.....] EXIT LOAD
```

```
INVERSE
1. Points
2. Curve
3. Angle
4. Point to Line
5. Point to Curve
6. Point to Alignment
[.....] [.....] [.....] CANCEL OK
```

Enter From and To Points as shown:

```
INVERSE POINTS
From Point:  4
To Point:    1

Inverse from point..
EXIT RESET [.....] CANCEL OK
```

The result:

```
INVERSE POINTS 4-1
.....
Bearing: N43°28'48"W
Hz Dist: 144.436ft
Sl Dist: 144.436ft
Grade: 0.000 %
.....
eNorth: 104.805ft
eEast:  -99.386ft
eElev:  0.000ft
[<>] [F] [B] [A] COORD STACK LOOP OK
```

Bonus Step: Compute the area contained within the perimeter

From the **COGO** menu, select **Area by Points**:

```
EXAMPLES.CPJ          COGO+ Pro 04.02
DMS QB F N,E LD      UTM10 GRS80
4 Points              USB
COGO ADJU SURV TOOL DATA GEOD
[P] Point Traverse
[I] Inverse
[O] Intersections
[A] Area by Points
[W] Fit Points
[.....http://sgss.ca.....] EXIT LOAD
```

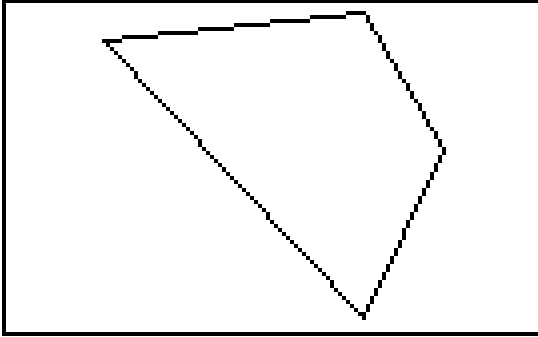
Enter *Points*, 1 2 3 4: (Entering 1..4 is also valid to specify a range from 1 to 4)

```
AREA BY POINTS
.....
Points
1 2 3 4
[BACK] ALL HELP SUB CANCEL OK
```

The result:

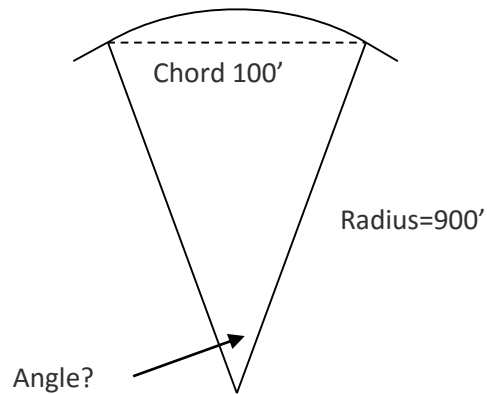
```
AREA BY POINTS
.....
Area: 7479.389ft²
      0.172 Ac
Perim: 374.756ft
[BACK] PLOT EXPRT [ ] OK
```

Press **F2** **PLOT** for a graphical view:



Example 2

A circular curve with the following information:



From the **TOOL** menu, select **Hz Curve Solver**:

```

EXAMPLES.CPJ      COGO+ Prg 04.02
DMS QB F N,E _D  UTM10 GRS80
4 Points          USB
[COGO][ADJU][SURV] [TOOL] [DATA][GEOD]
[G] Triangle Solver
[H] Hz Curve Solver
[V] Vt Curve Solver
[B] Bearing $\leftrightarrow$ Azimuth
[Y] Config. Settings
[.....http://sgss.ca.....] [EXIT] [LOAD]
  
```

Enter the known radius and chord length as shown:

```

HORIZONTAL CURVE SOLVER
R: 900.000ft
a:
L:
C: 100.000ft
T: ██████████
Tangent
[EDIT] [RESET] [MORE] [CANCEL] [SOLVE]
  
```

The diagram shows a circular arc with a dashed horizontal chord. Two solid lines represent radii of length R. The arc length is L, the chord length is C, the tangent length from the center to the chord is H, and the tangent length from the vertex to the chord is T.

The results, use the \uparrow and \downarrow cursor keys to toggle results screen:

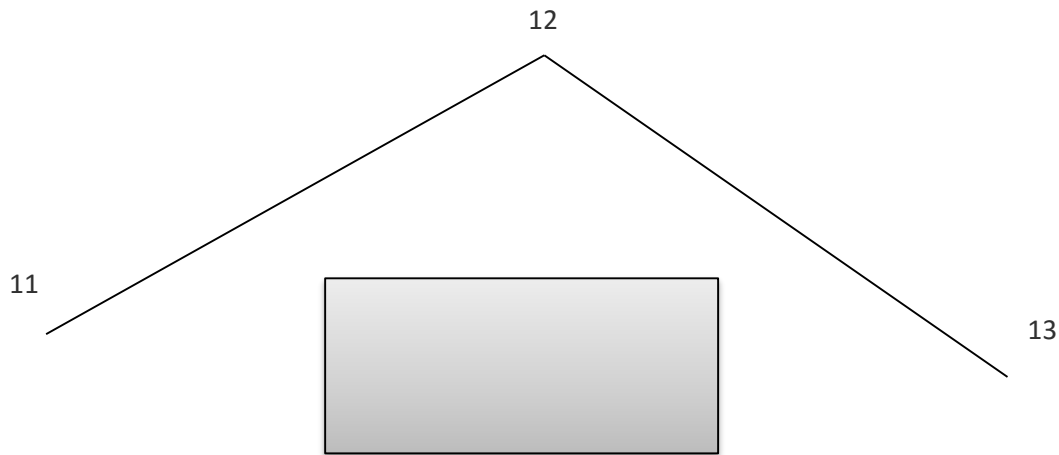
```
HORIZONTAL CURVE SOLUTION 1/2  $\nabla$   $\blacktriangle$ 
-----
Radius: 900.000ft
Defl.  $\alpha$ : 6 $^{\circ}$ 22'10"
Arc: 100.052ft
Chord: 100.000ft
Tangent: 50.077ft
Mid-Ord: 1.390ft
External: 1.392ft
-----
[OK] [F3] [COORD] [EXIT] [OK]
```

```
HORIZONTAL CURVE SOLUTION 2/2  $\nabla$   $\blacktriangle$ 
-----
Sec.Area: 45023.180ft $^2$ 
Seg.Area: 92.678ft $^2$ 
Fil.Area: 46.425ft $^2$ 
-----
[OK] [F3] [COORD] [EXIT] [OK]
```


Example 3

A building blocks the sightline between points 11 and 13, calculate the course from the information provided.

Step 1: Draw a rough sketch



Course	Distance	Azimuth
11-12	151.84'	43°16'00"
12-13	145.22'	111°29'00"

Step 2: Start Calculations

From the **COGO** menu, select **Point Traverse**:

```
EXAMPLES.CPJ      COGO+ Pro 04.02
DMS QB F N,E _D   UTM10 GRS80
4 Points          USE
COGO ADJU SURV TOOL DATA GEOD
[P] Point Traverse
[I] Inverse
[O] Intersections
[K] Area by Points
[W] Fit Points
[.....http://sgs.ca.....] EXIT LOAD
```

From Point, enter 11:

```
POINT TRAVERSE Standard
.....
From Point
11
[BRONS] [CURVE] [F??] [STR] [CANCL] [OK]
```

Point 11 does not exist, so we are prompted to enter some coordinates for the point, enter arbitrary coordinates as shown:

```
ENTER COORDINATES
Ft #: 11
North: 10000.000ft
East: 10000.000ft
Elev: 0.000ft
.....
Elevation Coordinate
[EDIT] [ ] [ ] [COPY] [CANCL] [STORE]
```

Next we are prompted to enter *Bearing 1* (the software is set to Quadrant Bearings) but we need to enter the azimuth. Simply enter the azimuth 48.16, then press **A->B** to convert the azimuth to a quadrant bearing input:

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown
.....
Bearing 1
48.16
[A->B] [ ] [ ] [LAST] [CANCL] [OK]
```

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown
.....
Bearing 1
143.16
[A->B] [ ] [ ] [LAST] [CANCL] [OK]
```

Enter the distance as shown, *Distance 1* 151.84:

```
Enter the Distance to the
NEW Point you are calculating
Leave blank if unknown

Distance 1
151.84
N->F  *USF  <USF  LAST  CANCEL  OK
```

The solution, store as Point 12:

```
STORE POINT
n: 10110.566ft
E: 10104.070ft
z: 0.000ft

Point Number
12
LOW  NEXT  CANCEL  OK
```

Back to *From Point*, enter 12 if not already suggested:

```
POINT TRAVERSE Standard

From Point
12
BRONS CURVE:???:<TR>: CANCEL  OK
```

Again we are prompted to enter *Bearing 1* (the software is set to Quadrant Bearings) but we need to enter the azimuth. Simply enter the azimuth 111.29, then press **FI** **A->B** to convert the azimuth to a quadrant bearing input:

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown

Bearing 1
111.29
A->B LAST CANCEL OK
```

```
Enter the Bearing to the
NEW Point you are calculating
Leave blank if unknown

Bearing 1
268.31000000001
A->B LAST CANCEL OK
```

Enter the distance as shown, *Distance 1* 145.22:

```
Enter the Distance to the
NEW Point you are calculating
Leave blank if unknown

Distance 1
145.22
M->F *USF /USF LAST CANCEL OK
```

The solution, store as Point 13:

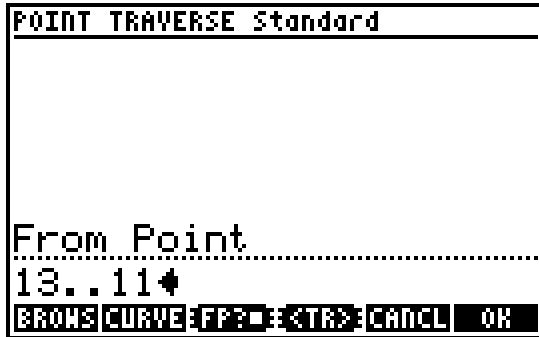
```
STORE POINT
n: 10057.382ft
E: 10239.201ft
z: 0.000ft

Point Number
13
LON NEXT CANCEL OK
```

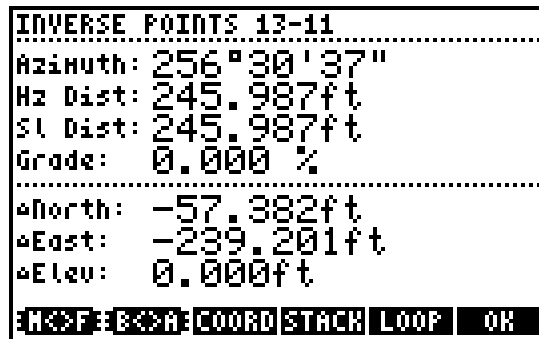
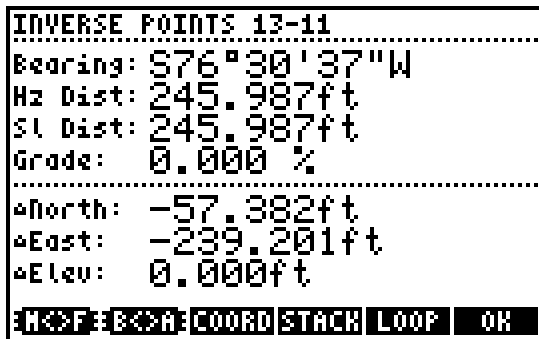
Step 3: Compute the course from Point 13 to Point 11

Method 1: From within the Point Traverse routine.

From Point, enter 13..11:



The result, to display the azimuth press **F2** **B->A** :



Method 2: From the Inverse Program

From the **COGO** menu select **Inverse**, then select **Points**:

```

EXAMPLES.CPJ      COGO+ Pro 04.02
DMS QB F N,E _D   UTM10 GRS80
7 Points          USB
COGO |ADJU|SURV|TOOL|DATA|GEOD|
[P] Point Traverse
[I] Inverse
[L] Intersections
[K] Area by Points
[W] Fit Points
[.....http://sgss.ca.....] EXIT LOAD
  
```

```

INVERSE
1. Points
2. Curve
3. Angle
4. Point to Line
5. Point to Curve
6. Point to Alignment
      CANCEL OK
  
```

Enter From and To Points as shown:

```

INVERSE POINTS
From Point:  13
To Point:    11
            11

Inverse from point..
EXIT RESET CANCEL OK
  
```

The result, to display the azimuth press **[F2] B->A** :

```

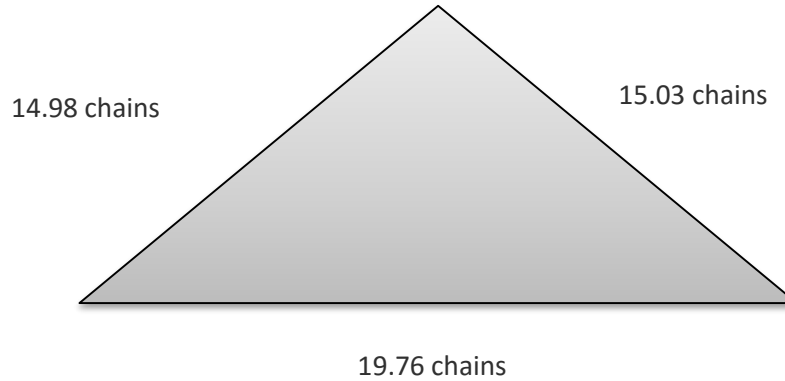
INVERSE POINTS 13-11
-----
Bearing: S76°30'37"W
Hz Dist: 245.987ft
Sl Dist: 245.987ft
Grade: 0.000 %
-----
eNorth: -57.382ft
eEast: -239.201ft
eElev: 0.000ft
INVERSE BETA COORD STACK LOOP OK
  
```

```

INVERSE POINTS 13-11
-----
Azimuth: 256°30'37"
Hz Dist: 245.987ft
Sl Dist: 245.987ft
Grade: 0.000 %
-----
eNorth: -57.382ft
eEast: -239.201ft
eElev: 0.000ft
INVERSE BETA COORD STACK LOOP OK
  
```

Example 4

A triangle has side of dimensions as shown, calculate the area.



Let's consider this a triangle with known sides, a, b and c.

a=14.98 chains, b=15.03 chains and c=19.76 chains

From the **TOOL** menu, select **Triangle Solver**:

```

EXAMPLES.CPJ      COGO+ Pro 04.02
DMS QB F N,E LD   UTM10 GRS80
7 Points          USB
COGO|ADJU|SURV|TOOL|DATA|GEOD
[0] Triangle Solver
[H] Hz Curve Solver
[V] Vt Curve Solver
[B] Bearing+Azimuth
[Y] Config. Settings
[.....http://sgss.ca.....]EXIT LOAD
    
```

Enter Side c as 19.76*66 to get:

```

TRIANGLE SOLVER
A:
c: ████████████████████
E:
a:
C:
b:
19.76*66+
M->F  *USF  /USF  CANCL OK
    
```

```

TRIANGLE SOLVER
A:
c: 1304.160ft
E: ████████████████████
a:
C:
b:
Angle B
EDIT RESET SPHER INV CANCL SOLVE
    
```

Enter Side a as 14.98*66 to get:

TRIANGLE SOLVER

A:

c: 1304.160ft


E:

a: [REDACTED]

C:

b:

14.76*66



M->F [REDACTED] [REDACTED] [REDACTED] CANCEL OK

TRIANGLE SOLVER

A:

c: 1304.160ft


E:

a: 974.160ft

C: [REDACTED]

b:

Angle C



EDIT RESET SPHER INV CANCEL SOLVE

Enter Side b as 15.03*66 to get:

TRIANGLE SOLVER

A:

c: 1304.160ft


E:

a: 974.160ft

C:

b: [REDACTED]

15.03*66



M->F [REDACTED] [REDACTED] [REDACTED] CANCEL OK

TRIANGLE SOLVER

A: [REDACTED]

c: 1304.160ft

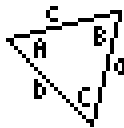
E:

a: 974.160ft

C:

b: 991.980ft

Angle A



EDIT RESET SPHER INV CANCEL SOLVE

The results, use the \uparrow and \downarrow cursor keys to toggle results screen

TRIANGLE SOLUTION 1/2

A: 47°51'50"

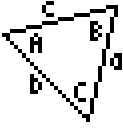
c: 1304.160ft

E: 49°02'09"

a: 974.160ft

C: 83°06'01"

b: 991.980ft



M->F EXPRT [REDACTED] [REDACTED] OK

TRIANGLE SOLUTION 2/2

Area: 479674.432ft²

Perim: 3270.300ft



M->F EXPRT [REDACTED] [REDACTED] OK

Example 5

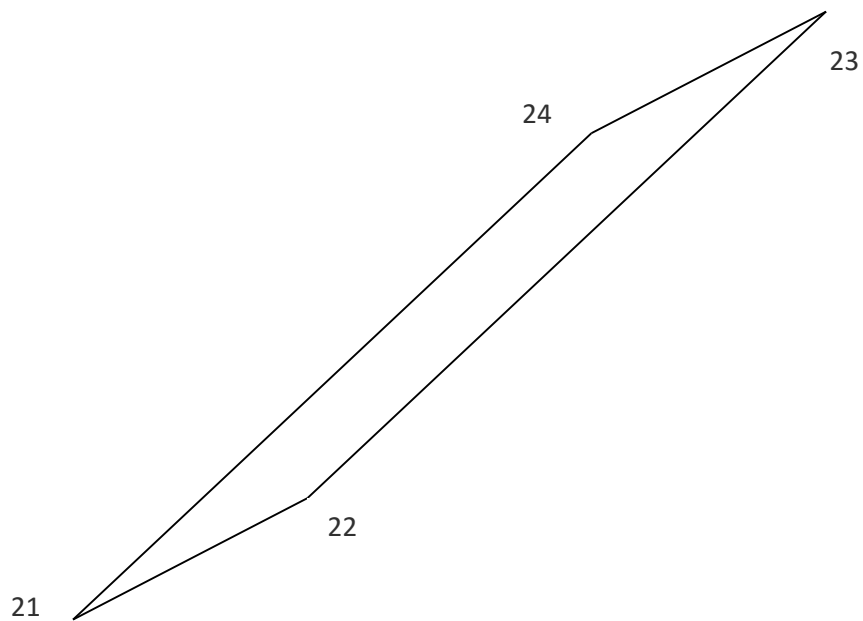
Determine the area of the polygon from the following information:

COURSE	DEPARTURE	LATITUDE
AB	E200	N100
BC	E600	N400
CD	W200	S100
DA	W600	S400

NOTE: COGO+ does not allow alpha-numeric point identifiers, so for this example we will make:

A=21, B=22, C=23, and D=24

Step 1: Draw a rough sketch



Step 2: Start Calculations

For this example, because course information is presented as departure and latitude values, we'll simply use the Store/Edit Points routine to store some coordinates that we can use for the calculations.

From the **DATA** menu, select **Store New Point**:

```
EXAMPLES.CPJ          COGO+ Pro 04.02
DMS QB F N,E LD      UTM10 GRS80
? Points              USB
[COGO] [ADJU] [SURV] [TOOL] [DATA] [GEOD]
[J] Job Manager
[N] Store New Point
[R] Review Points
[Q] Delete Points
[X] Import/Export
[.....http://sgss.ca.....] [EXIT] [LOAD]
```

For Point 21, let's just assign 0,0,0 as the coordinates, this will simplify the process a little:

```
STORE/EDIT POINTS
Pt #: 21
North: 0.000ft
East: 0.000ft
Elev: 0.000ft

Northing Coordinate
[EDIT] [ ] [ ] [COPY] [CANCL] [STORE]
```

For Point 22, because we stored Point 21 as 0,0,0 and we know the Latitude from 21 to 22 is N100, we can do the math easily without a calculator and derive that the Northing value for Point 22 will be 100, and since the Departure from 21 to 22 is E200, the Easting value for Point 22 will be 200:

```
STORE/EDIT POINTS
Pt #: 22
North: 100.000ft
East: 200.000ft
Elev: 0.000ft

Elevation Coordinate
[EDIT] [ ] [ ] [COPY] [CANCL] [STORE]
```

For Point 23, knowing the Latitude and Departure from 22 to 23, we simply need to apply the values to the coordinates of Point 22. First, we can use the **F4** **COPY** option to copy coordinates of Point 22:

```

COPY POINT
-----
Point
22*
[BRWS] [ ] [ ] [CANCL] [OK]
  
```

This has now inserted the coordinates from Point 22 into the form, and we can use the **F1** **EDIT** option to edit the coordinate value and simply add the Latitude and Departure values as shown:

```

STORE/EDIT POINTS
-----
Ft #: 23
North: 100.000ft
East: 200.000ft
Elev: 0.000ft

100. +400*
[←] [→] [↑] [↓] [CANCL] [OK]
  
```

```

STORE/EDIT POINTS
-----
Ft #: 23
North: 500.000ft
East: 200.000ft
Elev: 0.000ft

200. +600*
[←] [→] [↑] [↓] [CANCL] [OK]
  
```

With final coordinates being:

```

STORE/EDIT POINTS
-----
Ft #: 23
North: 500.000ft
East: 800.000ft
Elev: 0.000ft

Elevation Coordinate
[EDIT] [ ] [ ] [COPY] [CANCL] [STORE]
  
```

For Point 24, same procedure, copy Point 23:

```
COPY POINT
-----
Point
23
-----
[BACK] [F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8] [F9] [F10] [F11] [F12]
[DEL] [CANCL] [OK]
```

Apply Latitude and Departure values:

```
STORE/EDIT POINTS
-----
Ft #: 24
North: 500.000ft
East: 800.000ft
Elev: 0.000ft

500.-100
-----
[BACK] [F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8] [F9] [F10] [F11] [F12]
[DEL] [CANCL] [OK]
```

```
STORE/EDIT POINTS
-----
Ft #: 24
North: 400.000ft
East: 800.000ft
Elev: 0.000ft

800.-200
-----
[BACK] [F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8] [F9] [F10] [F11] [F12]
[DEL] [CANCL] [OK]
```

And end up with:

```
STORE/EDIT POINTS
-----
Ft #: 24
North: 400.000ft
East: 600.000ft
Elev: 0.000ft

Elevation Coordinate
[EDIT] [CANCL] [COPY] [STORE]
```

Step 3: Check closing course

From the **COGO** menu select **Inverse**, then select **Points**:

```
EXAMPLES.CPJ      COGO+ Prc 04.02
DMS QB F N,E LD   UTM10 GR80
4 Points          USB
COGO ADJU|SURV|TOOL|DATA|GEOD
[P] Point Traverse
[0] Inverse
[O] Intersections
[K] Area by Points
[W] Fit Points
[.....http://www.sgs.ca.....] EXIT LOAD
```

```
INVERSE
1.Points
2.Curve
3.Angle
4.Point to Line
5.Point to Curve
6.Point to Alignment
          CANCEL OK
```

Enter From and To Points as shown:

```
INVERSE POINTS
From Point: 24
To Point: 21
Inverse from point..
EXIT RESET CANCEL OK
```

Confirm the Latitude (S400) and Departure (W600) match the calculation:

```
INVERSE POINTS 24-21
.....
Bearing: S56°18'36"W
Hz Dist: 721.110ft
Sl Dist: 721.110ft
Grade: 0.000 %
.....
ΔNorth: -400.000ft
ΔEast: -600.000ft
ΔElev: 0.000ft
F1:COORD F2:COORD STACK LOOP OK
```

Step 4: Calculate the Area

From the **COGO** menu, select **Area by Points**:

```
EXAMPLES.CPJ          COGO+ Pro 04.02
DMS QB F N,E LD      UTM10 GRS80
4 Points              USB
COGO |ADJU|SURV|TOOL|DATA|GEOD|
[F] Point Traverse
[I] Inverse
[O] Intersections
[A] Area by Points
[W] Fit Points
[.....http://sgss.ca.....] EXIT LOAD
```

Enter *Points*, 21 22 23 24: (Entering 21..24 is also valid to specify a range from 21 to 24)

```
AREA BY POINTS
.....
Points
21 22 23 24
[BACK] [ALL] [HELP] [SUB] [CACL] [OK]
```

The result:

```
AREA BY POINTS
.....
Area: 20000.000ft²
      0.459 Ac
Perim: 1889.434ft
[BACK] [PLOT] [EXIT] [OK]
```

Press **F2** **PLOT** for a graphical view:

