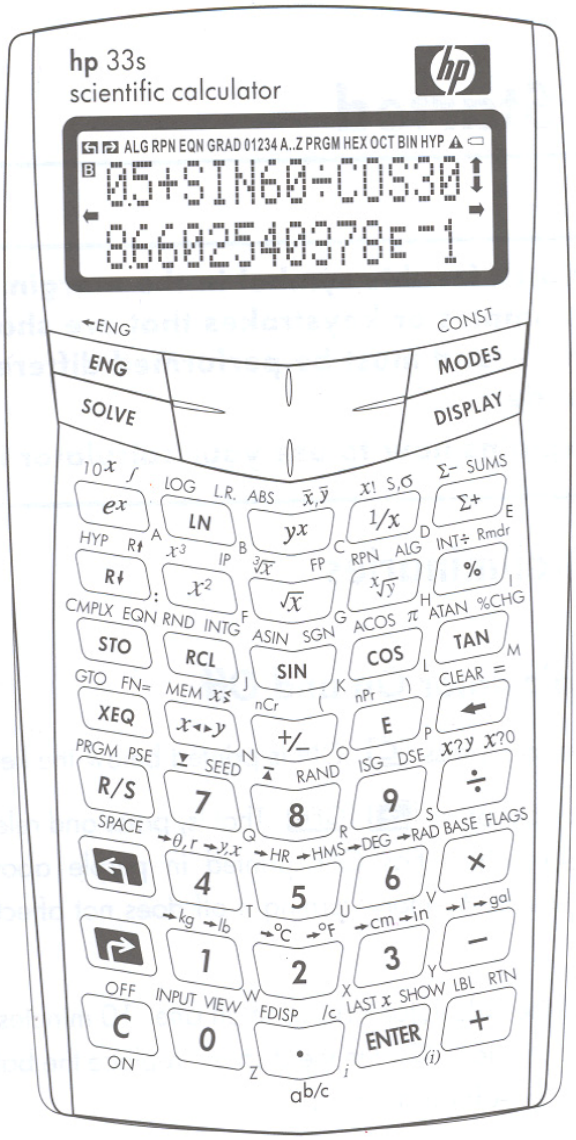
# CENTRAL VALLEY CHAPTER
# CLSA

## PROGRAMING THE HP 33S

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by Rich Brown October 12, 2012

# PROGRAMS FOR HP 33s

You must place your calculator in program mode before entering these. Do this by pressing the **"shift left"** key and then **"PRGM"**. When you are done entering the programs you must exit the program mode by pressing the **"shift left"** key and then **"PRGM"** again or "**C**".

**Input an equation**

| | |
|---|---|
| RCL | Input Variable |
| ↱ = | Equal sign |
| ↱ ( ) | Parenthesis |
| AB | Enter as A x B |
| a(bc) | Enter as A x (B x C) |
| 2sin α | Enter as 2 x sin α |
| ↱ HR RCL | Decimal to Degrees |
| ↰ HMS RCL | Degrees to Decimal |
| ← | Deletes character farthest to the right |
| ENTER | Completes the equation entry |
| C | Ends Equation Mode |

**Solving an equation**

| | |
|---|---|
| Use the ↓↑ | to select the equation at the bottom of the display |
| SOLVE | Solves for any variable in the equation |
| ENTER | For first variable |
| R/S | For next variable |

**Input a program**

| | |
|---|---|
| ↰ LBL | First line containing program label |
| ↰ INPUT | Input a variable |
| Display 1.FIX | Fixes the decimal places |
| STO | Stores a variable |
| RCL | Recall a variable |
| ↱ EQN | See Equation Solver to input an equation |
| ↱ X ? 0 | Compares a variable to 0 |
| ↰ X ? Y | Compares two variables |
| ↱ VIEW | Displays a stored variable |
| ↱ RTN | Ends program |
| ↰ GTO | Pointer goes to a beginning label of a program |
| C | Ends program mode |
| ← | Deletes program line |

**Execute a program**

| | |
|---|---|
| XEQ | Starts a program |
| R/S | For next input or next answer |

**To save/recall a variable from a program**

ENTER
STO
RCL

**To go to the beginning of all the programs or any program**

| | |
|---|---|
| C | Ends Program Mode |
| ↰ GTO... | Resets to PRGM Top |

or

| | |
|---|---|
| ↰ GTO | Resets to any program label (LBL) |

Then

| | |
|---|---|
| ↰ PRGM | Starts program mode |

**Clearing all variables**

↰ CLEAR
2.VARS

**!!!!! DO NOT SELECT 3. ALL, WHY, THIS WILL ERASE ALL VARIABLES, EQUATIONS, AND PROGRAMS!!!!!**

**Clearing individual variables or programs**

↰ MEM
2.VARS

or

2.PGM

Use the ↓↑ to select label

↰ CLEAR

# PROGRAMS FOR HP 33s


| Page | Function | Labels |
|---|---|---|
| 5-6 | Angle-1 (by 3 Coordinates) | 1 |
| | Enter 3 Coordinates - Solve Angle | |
| 7-8 | Area-1 (by Coordinates) | 2 |
| | Enter Coordinates | |
| | Solve for Perimeter Length & Area | |
| 9 | HMS-1 (Addition/Subtraction of Angles) | 1 |
| 10-11 | Horizontal Curve-1 | 4 |
| | Enter 2 of 3 - Included Angle, Curve Radius & Length of Curve | |
| | Solve for Long Chord, Degree of Curvature, Tangent, Midordinate, External, Area of Sector, Area of Segment & Area of Fillet | |
| 12 | Horizontal Curve-2 | 2 |
| | Enter 2 of 3 – Curve Radius, Offset Distance from Tangent & Distance along Tangent | |
| | Solve for Missing data of Curve Radius, Offset Distance from Tangent & Distance along Tangent | |
| 13-14 | Intersection-1 (Bearing – Bearing) | 1 |
| | Enter Coordinates of 2 Points & Azimuths to and from I. P. | |
| | Solve for Coordinate of I. P., Internal Angle & Distances to and from I. P. | |
| 15-16 | Intersection-2 (Bearing – Distance) | 1 |
| | Enter Coordinates of 2 Points, Azimuth to I. P. & Distance from I. P. | |
| | Solve for Coordinate of I. P., Internal Angle, Distance to I. P. & Azimuth from Intersection Point | |
| 17-18 | Intersection-3 (Distance – Distance) | 1 |
| | Enter Coordinates of 2 Points & Distances to and from Intersection Point | |
| | Solve for Coordinate of I. P., Internal Angle & Azimuths to and from I. P. | |
| 19-20 | Inverse-1 | 7 |
| | Enter Coordinates of 2 Points | |
| | Solve for Azimuth, Bearing & Distance | |
| 21 | Metric Conversion | 1 |
| | Enter metric number | |
| | Solve for U.S. Survey Foot | |

# PROGRAMS FOR HP 33s


| | | |
|---|---|---|
| **22** | **Photogrammetry-1** | **1** |
| | **Enter Contour Interval, C-Factor, Focal Length & Film Dimension** | |
| | **Solve for Flying Height, Photo Scale, NM Width, NM Length, Width of Target & Length of Target** | |
| **23** | **Quadratic-1** | **1** |
| **24-25** | **Slope Staking-1** | **2** |
| | **Enter Hinge Point Elevation, Half Base Distance, Elevation at Instrument, Instrument Height, Vertical Distance, Rod Height, Cut/Fill Slope & Horizontal Distance** | |
| | **Solve for Grade Rod or Rod Elevation, Elevation Difference, Calculated Distance & Difference in Distance** | |
| **26** | **Traverse-1** | **2** |
| **27** | **Triangle-1 (S1, S2, S3)** | **1** |
| **28** | **Triangle-2 (S1, S2, A3)** | **1** |
| **29** | **Triangle-3 (A1, A2, S3)** | **1** |
| **30** | **Triangle-4 (A1, A3, S3)** | **1** |
| **31-32** | **Triangle-5 (S1, S2, A1)** | **1** |
| **33-36** | **Utilities-1 (Geodetic to State Planes)** | **2** |
| | **(When used with Utilities-2 only takes 3 Labels total)** | |
| **37-39** | **Utilities-2 (State Planes to Geodetic)** | **2** |
| | **(When used with Utilities-1 only takes 3 Labels total)** | |
| **40-41** | **Vertical Curve-1** | **3** |
| | **Enter Grade In, Grade Out, PVC Station, PVC Elevation & PVT Station** | |
| | **Solve for High/Low Station & High/Low Elevation & Continuing Station Elevation** | |
| **42-43** | **Vertical Curve-2** | **1** |
| | **Enter P.I. Station, P.I. Elevation, Grade In, Grade Out & Curve Length** | |
| | **Solve for High/Low Elevation, PVC Station, PVC Elevation, PVT Station & PVT Elevation** | |
| **44** | **XYZ-1 (Lat/Long to XYZ)** | **1** |
| **45-46** | **XYZ-2 (XYZ to Lat/Long)** | **1** |

## Angle-1 (1 Label)

**XEQ A** (Angle Between 3 Coordinates)

**XEQ A** to start the program.
At the prompt, enter a value for the following and press **R/S**

**N?** Northing A (Y)
**E?** Easting A (X)

**N?** Northing B (Y)
**E?** Easting B (X)

**N?** Northing C (Y)
**E?** Easting C (X)

Press **R/S** and the angle formed by points A, B & C will be displayed.

**A01. LBL A**
**A02. CLRVARS**
**A03. FIX 4**
**A04. SF 10**
**A05. "ANGLE - 3 COORDS"**
**A06. PSE**
**A07. "ENTR NORTH 1(Y)"**
**A08. PSE**
**A09. INPUT N**
**A10. STO L**
**A11. "ENTR EAST 1(X)"**
**A12. PSE**
**A13. INPUT E**
**A14. STO C**
**A15. 0**
**A16. STO N**
**A17. STO E**
**A18. "ENTR NORTH 2(Y)"**
**A19. PSE**
**A20. INPUT N**
**A21. STO M**
**A22. "ENTR EAST 2(X)"**
**A23. PSE**
**A24. INPUT E**
**A25. STO D**
**A26. 0**
**A27. STO N**
**A28. STO E**
**A29. "ENTR NORTH 3(Y)"**
**A30. PSE**
**A31. INPUT N**
**A32. "ENTR EAST 3(X)"**
**A33. PSE**
**A34. INPUT E**
**A35. RCL L**
**A36. RCL M**
**A37. –**
**A38. STO O**
**A39. RCL C**
**A40. RCL D**
**A41. –**
**A42. STO F**
**A43. RCL N**
**A44. RCL M**
**A45. –**
**A46. STO P**
**A47. RCL E**
**A48. RCL D**
**A49. –**
**A50. STO G**
**A51. RCL O**
**A52. RCL P**
**A53. x**
**A54. STO A**
**A55. RCL F**
**A56. RCL G**
**A57. x**
**A58. STO B**
**A59. RCL A**
**A60. RCL B**
**A61. +**
**A62. STO Q**
**A63. RCL O**
**A64. $X^2$**
**A65. RCL F**
**A66. $X^2$**
**A67. +**
**A68. $\sqrt{X}$**
**A69. STO R**
**A70. RCL P**
**A71. $X^2$**
**A72. RCL G**
**A73. $X^2$**
**A74. +**

**A75.** **√X**

**A76.** **STO S**
**A77.** **RCL R**
**A78.** **RCL S**
**A79.** **x**
**A80.** **STO H**
**A81.** **RCL Q**
**A82.** **RCL H**
**A83.** **÷**
**A84.** **STO T**
**A85.** **RCL T**
**A86.** **ACOS**
**A87.** **⇨HMS**
**A88.** **STO Z**
**A89.** **"ANGLE(DDMMSS)="**
**A90.** **PSE**
**A91.** **VIEW Z**
**A92.** **RTN**

**CHECK 1**

**1st Point** **N=7358.66**
**E=8653.29**

**2nd Point** **N=5000.00**
**E=5000.00**

**3rd Point** **N=6384.28**
**E=11286.91**

**A=20°25'47"**

**CHECK 2**

**1st Point** **N=2435.86**
**E=2158.37**

**2nd Point** **N=5000.00**
**E=5000.00**

**3rd Point** **N=5375.84**
**E=10285.41**

**A=142°00'21"**

## Area-1 (2 Labels)

**XEQ A** (Area by Coordinates)

**XEQ A** to start the program.
At the prompts, enter a value for the following and press **R/S**

**N?** Northing (Y)
**E?** Easting (X)

The following unknowns will be displayed after completing all coordinates:

**P?** Perimeter Length
**F?** Area in Square Feet
**A?** Area in Acres

**A01. LBL A**
**A02. CLVARS**
**A03. FIX 4**
**A04. SF 10**
**A05. "AREA BY COORDINATES"**
**A06. PSE**
**A07. "ENTR NORTH(Y)"**
**A08. PSE**
**A09. INPUT N**
**A10. STO Y**
**A11. STO C**
**A12. "ENTR EAST(X)"**
**A13. PSE**
**A14. INPUT E**
**A15. STO X**
**A16. STO D**

**B01. LBL B**
**B02. "ENTR NORTH (Y)"**
**B03. PSE**
**B04. INPUT N**
**B05. "ENTR EAST (X)"**
**B06. PSE**
**B07. INPUT E**
**B08. RCL Y**
**B09. x**
**B10. RCL N**
**B11. RCL X**
**B12. x**
**B13. –**
**B14. RCL F**
**B15. +**
**B16. STO F**
**B17. RCL E**
**B18. RCL X**
**B19. –**
**B20. RCL N**
**B21. RCL Y**
**B22. –**
**B23. y,x⇨0,r**
**B24. RCL P**
**B25. +**
**B26. STO P**
**B27. RCL N**
**B28. STO Y**
**B29. RCL E**
**B30. STO X**
**B31. RCL D**

**B32. x≠y**

**B33. GTO B**
**B34. RCL N**
**B35. RCL C**

**B36. x≠y**

**B37. GTO B**
**B38. RCL P**
**B39. "PERIM LENGTH="**
**B40. PSE**
**B41. VIEW P**
**B42. RCL F**
**B43. 2**
**B44. ÷**
**B45. STO F**
**B46. "AREA IN SF="**
**B47. PSE**
**B48. VIEW F**
**B49. 43560**
**B50. ÷**
**B51. STO A**
**B52. "AREA IN AC="**
**B53. PSE**
**B54. VIEW A**
**B55. RTN**

**Check 1**

| | |
|---|---|
| **1st Point** | **N=5000** |
| | **E=10000** |
| **2nd Point** | **N=5255.912** |
| | **E=10125.751** |
| **3rd Point** | **N=4700** |
| | **E=10500** |
| | **P=1538.3838** |
| | **S=82840.6500** |
| | **A=1.9018** |

**Check 2**

| | |
|---|---|
| **1st Point** | **N=5000** |
| | **E=10000** |
| **2nd Point** | **N=5255.912** |
| | **E=10125.751** |
| **3rd Point** | **N=4700** |
| | **E=10500** |
| **4th Point** | **N=2500** |
| | **E=10300** |
| | **P=5682.2965** |
| | **S=662840.6500** |
| | **A=15.2167** |

## HMS(+/-) -1 (1 Label)

**XEQ Y** (HMS + "addition by degrees, minutes and seconds")

**XEQ Y** to start the program
At the prompts, enter a value for the following and press **R/S**

**X?** First Angle
**Y?** Second Angle

After you have entered the value for **B** (Second Angle) and pressed **R/S**, you will be prompted to enter the function: 0 = - (subtraction) or 1 = + (addition). After you have entered the value for your function the sum or difference will be displayed:

```
Y01.  LBL Y
Y02.  FIX 4
Y03.  SF 10
Y04.  "HMS+-"
Y05.  PSE
Y06.  "ENTR ANGLE1"
Y07.  PSE
Y08.  "(DDMMSS)"
Y09.  PSE
Y10.  INPUT X
Y11.  "ENTR ANGLE2"
Y12.  PSE
Y13.  "(DDMMSS)"
Y14.  PSE
Y15.  INPUT Y
Y16.  0
Y17.  "ENTR FUNCTION"
Y18.  PSE
Y19.  "0=- 1=+"
Y20.  PSE
Y21.  STO F
Y22.  INPUT F
Y23.  CF 10
Y24.  ⇨HMS(⇨HR(X)+ ⇨HR(Y))
Y25.  STO A
Y26.  ⇨HMS(⇨HR(X)- ⇨HR(Y))
Y27.  STO S
Y28.  RCL F
Y29.  x=0?
Y30.  VIEW A
Y31.  x>0?
Y32.  VIEW S
Y33.  GTO Y
```

**CHECK**

**X = 1st Angle 158°02'26"**
**Y = 2nd Angle 88°32'27"**

**A = Addition of Angles = 246°34'53"**
**S = Subtraction of Angles = 69°29'59"**

## Horizontal Curve-1 (4 Labels)

**XEQ H** (Horizontal Curve Data)

**XEQ H** to start the program.
At the prompts, enter a value for the following and press **R/S**

**I?** Included Angle
**R?** Curve Radius

Note! If either of these two are unknown, enter a value of 0 (zero) and you will be prompted for:

**L?** Length of Curve

The following unknowns will be displayed after pressing **R/S**

**C?** Long Chord
**T?** Tangent
**M?** Midordinate
**E?** External
**D?** Degree of Curvature-Arc definition
N? Degree of curvature-Chord definition
(if radius is under 50 ft., the Chord definition will not be displayed)
**A?** Area of the sector
**S?** Area of the segment
**F?** Area of the fillet

```
H01.  LBL H
H02.  FIX 4
H03.  SF 10
H04.  "HORIZ CURVE1"
H05.  PSE
H06.  "ENTR CENTER ANG"
H07.  PSE
H08.  CF 10
H09.  INPUT I
H10.  X=0?
H11.  GTO G
H12.  ⇨HR (I) ÷2
H13.  STO H
H14.  SF 10
H15.  "ENTR CURVE RAD"
H16.  PSE
H17.  CF 10
H18.  INPUT R
H19.  X=0?
H20.  GTO F
H21.  (⇨HR(I)xπxR) ÷180
H22.  STO L
H23.  FIX 3
H24.  SF 10
H25.  "CURVE LEN=
H26.  PSE
H27.  CF 10
H28.  VIEW L
H29.  GTO E

G01.  LBL G
G02.  SF 10
G03.  "ENTR CURVE RAD"
G04.  PSE
G05.  INPUT R
G06.  "ENTR CURVE LEN"
G07.  PSE
G08.  CF 10
G09.  INPUT L
G10.  (⇨HMS((Lx180)÷(Rxπ))
G11.  STO I
G12.  FIX 4
G13.  ⇨HR(I) ÷2
G14.  STO H
G15.  SF 10
G16.  "CENTER ANG="
G17.  PSE
G18.  CF 10
G19.  VIEW I
G20.  GTO E

F01.  LBL F
F02.  SF 10
F03.  "ENTR CURVE LEN"
F04.  PSE
F05.  CF 10
```

```
F06.   INPUT L
F07.   (Lx180) ÷(⇨HR (I)xπ)
F08.   STO R
F09.   FIX 3
F10.   SF 10
F11.   "CURVE RAD="
F12.   PSE
F13.   CF 10
F14.   VIEW R

E01.   LBL E
E02.   2xRxSIN(H)
E03.   STO C
E04.   FIX 3
E05.   SF 10
E06.   "LONG CHORD="
E07.   PSE
E08.   CF 10
E09.   VIEW C
E10.   RxTAN(H)
E11.   STO T
E12.   FIX 3
E13.   SF 10
E14.   "TANGENT="
E15.   PSE
E16.   CF 10
E17.   VIEW T
E18.   Rx(1-COS(H))
E19.   STO M
E20.   SF 10
E21.   "MIDORDINATE="
E22.   PSE
E23.   CF10
E24.   VIEW M
E25.   Rx((1÷COS(H))-1)
E26.   STO E
E27.   SF 10
E28.   "EXTERNAL="
E29.   PSE
E30.   CF 10
E31.   VIEW E
E32.   ⇨HMS(18000÷(πxR))
E33.   STO D
E34.   FIX 4
E35.   SF 10
CHECK
I = Δ = 45°32'18"
R=200
L=158.95877051

E36.   "DEG CURV ARC="
E37.   PSE
E38.   CF 10
E39.   VIEW D
E40.   RCL R
E41.   50

E42.   X≦Y?

E43.   ⇨HMS(2XASIN(50÷R))
E44.   STO N
E45.   RCL R
E46.   50

E47.   X≦Y?

E48.   SF 10
E49.   "DEG CURV ARC="
E50.   PSE
E51.   CF 10
E52.   VIEW N
E53.   (πXR²x⇨HR(I)) ÷360
E54.   STO A
E55.   FIX 2
E56.   SF 10
E57.   "AREA SECTOR="
E58.   PSE
E59.   CF 10
E60.   VIEW A
E61.   A-(RxCOS(H)x(C÷2))
E62.   STO S
E63.   SF 10
E64.   "AREA SEGMENT="
E65.   PSE
E66.   CF 10
E67.   VIEW S
E68.   (RxT)-A
E69.   STO F
E70.   SF 10
E71.   "AREA FILLET="
E72.   PSE
E73.   CF 10
E74.   VIEW F
E75.   RTN


C=154.8077744
T=83.94564024
M=15.58568861
E=16.90290573
D=28.38524031
N=28.57180877
A=15,895.8770508
S=1621.492494
F=893.2509975
```

## Horizontal Curve-2 (2 Labels)

**XEQ B** (Tangent Offset of a Horizontal Curve)

**XEQ B** to start the program.
At the prompts, enter a value for the following and press **R/S**

**R?** Curve Radius
**X?** Offset distance from tangent to point on curve

Note! If **X** value is unknown, enter a value of 0 (zero) and you will be prompted for **Y** value.

The following unknown will be displayed after pressing **R/S**

**Y?** Distance along tangent perpendicular to offset.

**B01.** **LBL B**
**B02.** **FIX 4**
**B03.** **SF 10**
**B04.** **"TANGENT OFFSET"**
**B05.** **PSE**
**B06.** **"OF HORZ CURVE"**
**B07.** **PSE**
**B08.** **"ENTER RADIUS"**
**B09.** **PSE**
**B10.** **INPUT R**
**B11.** **0**
**B12.** **STO X**
**B13.** **"ENTR OFFSET"**
**B14.** **PSE**
**B15.** **"0 IF UNKNOWN"**
**B16.** **PSE**
**B17.** **INPUT X**
**B18.** **STO A**
**B19.** **X=0?**
**B20.** **GTO C**
**B21.** **2**
**B22.** **RCL R**
**B23.** **x**
**B24.** **RCL X**
**B25.** **x**
**B26.** **STO C**
**B27.** **RCL C**
**B28.** **RCL X**
**B29.** **$X^2$**
**B30.** **–**
**B31.** **STO F**
**B32.** **RCL F**
**B33.** **√X**
**B34.** **STO Y**
**B35.** **"DIST ALONG TAN="**
**B36.** **PSE**
**B37.** **VIEW Y**
**B38.** **RTN**
**B39.** **X=0?**
**B40.** **"OFFSET DISTANCE="**
**B41.** **PSE**
**B42.** **VIEW X**
**B43.** **RTN**

**C01.** **LBL C**
**C02.** **"ENTR DISTANCE"**
**C03.** **PSE**
**C04.** **"ALONG TANGENT"**
**C05.** **PSE**
**C06.** **INPUT Y**
**C07.** **STO B**
**C08.** **RCL R**
**C09.** **$X^2$**
**C10.** **RCL B**
**C11.** **$X^2$**
**C12.** **–**
**C13.** **STO D**
**C14.** **RCL D**
**C15.** **√X**
**C16.** **STO E**
**C17.** **RCL R**
**C18.** **RCL E**
**C19.** **–**
**C20.** **STO X**
**C21.** **"OFFSET DIST="**
**C22.** **PSE**
**C23.** **VIEW X**
**C24.** **GTO B**

## Intersection-1 (1 Label)

**XEQ-B** (Bearing - Bearing Intersection)

**XEQ B** to start the program
At the prompts, enter a value for the following and press **R/S**

**N?** Northing of first point
**E?** Easting of first point
**A?** Azimuth from first point to intersection point
**A?** Azimuth from intersection point to second point

**N?** Northing of second point
**E?** Easting of second point

After you have entered the second **E** value and pressed **R/S**, the following results will be displayed:

**Y?** Northing of intersection point
**X?** Easting of intersection point
**F?** Internal angle of azimuths

**D?** Distance from first point to intersection point
**D?** Distance from intersection point to second point

**B01. LBL B**
**B02. FIX 4**
**B03. SF 10**
**B04. "BEAR-BEAR INTER"**
**B05. PSE**
**B06. "ENTR NORTH 1(Y)"**
**B07. PSE**
**B08. INPUT N**
**B09. STO Y**
**B10. "ENTR EAST 1(X)"**
**B11. PSE**
**B12. INPUT E**
**B13. STO X**
**B14. "ENTR AZ TO IP"**
**B15. PSE**
**B16. "(DDMMSS)"**
**B17. PSE**
**B18. INPUT A**
**B19. ⇨HR**
**B20. STO B**
**B21. 0**
**B22. STO A**
**B23. "ENTR AZ FROM IP"**
**B24. PSE**
**B25. "(DDMMSS)"**
**B26. PSE**
**B27. INPUT A**
**B28. ⇨HR**
**B29. STO A**
**B30. 0**
**B31. STO N**
**B32. STO E**
**B33. "ENTR NORTH 2(Y)"**
**B34. PSE**
**B35. INPUT N**
**B36. "ENTR EAST 2(X)"**
**B37. PSE**
**B38. INPUT E**
**B39. RCL N**
**B40. RCL Y**
**B41. –**
**B42. ST0 Y**
**B43. RCL E**
**B44. RCL X**
**B45. –**
**B46. STO X**
**B47. RCL B**
**B48. RCL A**
**B49. –**
**B50. ABS**
**B51. STO C**
**B52. ⇨HMS**
**B53. STO F**
**B54. FIX 2**
**B55. "IP NORTH="**
**B56. PSE**
**B57. VIEW Y**
**B58. IP EAST=**
**B59. PSE**
**B60. VIEW X**
**B61. FIX 4**
**B62. "INTERNAL ANG="**
**B63. PSE**
**B64. "(DDMMSS)"**

**B65. PSE**
**B66. VIEW F**
**B67. FIX 2**
**B68. RCL C**
**B69. SIN**
**B70. STO I**
**B71. RCL A**
**B72. SIN**
**B73. STO G**
**B74. RCL Y**
**B75. RCL G**
**B76. x**
**B77. STO H**
**B78. RCL A**
**B79. COS**
**B80. STO J**
**B81. RCL X**
**B82. RCL J**
**B83. x**
**B84. RCL H**
**B85. –**
**B86. RCL I**
**B87. ÷**
**B88. STO L**
**B89. RCL L**
**B90. ABS**
**B91. STO D**
**B92. FIX 8**
**B93. "DIST TO IP="**
**B94. PSE**
**B95. VIEW D**
**B96. RCL B**
**B97. SIN**
**B98. STO M**
**B99. RCL Y**
**B100. RCL M**
**B101. x**
**B102. STO N**
**B103. RCL B**
**B104. COS**
**B105. STO O**
**B106. RCL X**
**B107. RCL O**
**B108. x**
**B109. STO P**
**B110. RCL P**
**B111. RCL N**
**B112. –**
**B113. RCL I**
**B114. ÷**
**B115. STO Q**
**B116. RCL Q**
**B117. ABS**
**B118. STO D**
**B119. "DIST FROM IP="**
**B120. PSE**
**B121. VIEW D**
**B122. RTN**

**CHECK**

**1st Point** **N = 10000**
**E = 10000**
**A = $AZ_1$ = 92°08'23"**
**A = $AZ_2$ = 3°28'18"**

**2nd Point** **N = 10188.87**
**E = 10300.13**

**Y = Θ4700**
**E = X = 10500**

**D = $D_1$ = 288.22008436**
**D = $D_2$ = 199.99815783**

## Intersection-2 (1 Label)

**XEQ-C** (Bearing - Distance Intersection)

**XEQ C** to start the program
At the prompts, enter a value for the following and press **R/S**

**N?** Northing of first point
**E?** Easting of first point
**A?** Azimuth from first point to intersection point
**D?** Distance from intersection point to second point

**N?** Northing of second point
**E?** Easting of second point

After you have entered the second **E** value and pressed **R/S**, the following results will be displayed:

**Y?** Northing of intersection point
**X?** Easting of intersection point
**F?** Internal angle of azimuths
**A?** Azimuth from intersection point to second point
**D?** Distance from first point to intersection point

**C01. LBL C**
**C02. FIX 4**
**C03. SF 10**
**C04. "BEAR-DIST INTER"**
**C05. PSE**
**C06. "ENTR NORTH 1(Y)"**
**C07. PSE**
**C08. INPUT N**
**C09. STO Y**
**C10. "ENTR EAST 1(X)"**
**C11. PSE**
**C12. INPUT E**
**C13. STO X**
**C14. "ENTR AZ TO IP"**
**C15. PSE**
**C16. "(DDMMSS)"**
**C17. PSE**
**C18. INPUT A**
**C19. ⇨HR**
**C20. STO B**
**C21. "ENTR DIST FROM IP"**
**C22. PSE**
**C23. INPUT D**
**C24. 0**
**C25. STO N**
**C26. STO E**
**C27. "ENTR NORTH2(Y)"**
**C28. PSE**
**C29. INPUT N**
**C30. "ENTR EAST2(X)**
**C31. PSE**
**C32. INPUT E**
**C33. RCL N**
**C34. RCL Y**
**C35. –**
**C36. STO Y**
**C37. RCL E**
**C38. RCL X**
**C39. –**
**C40. STO X**
**C41. RCL B**
**C42. SIN**
**C43. STO H**
**C44. RCL Y**
**C45. RCL H**
**C46. x**
**C47. STO L**
**C48. RCL B**
**C49. COS**
**C50. STO I**
**C51. RCL X**
**C52. RCL I**
**C53. x**
**C54. STO J**
**C55. RCL J**
**C56. RCL L**
**C57. –**
**C58. STO K**
**C59. RCL K**
**C60. RCL D**
**C61. ÷**
**C62. STO U**
**C63. RCL U**
**C64. ASIN**
**C65. STO C**
**C66. ABS**

**C67.** **⇨HMS**
**C68.** **STO F**
**C69.** **RCL B**
**C70.** **RCL C**
**C71.** **+**
**C72.** **STO G**
**C73.** **⇨HMS**
**C74.** **STO A**
**C75.** **RCL C**
**C76.** **SIN**
**C77.** **STO N**
**C78.** **RCL G**
**C79.** **SIN**
**C80.** **STO O**
**C81.** **RCL Y**
**C82.** **RCL O**
**C83.** **x**
**C84.** **STO P**
**C85.** **RCL G**
**C86.** **COS**
**C87.** **STO Q**
**C88.** **RCL X**
**C89.** **RCL Q**
**C90.** **x**
**C91.** **STO R**
**C92.** **RCL R**
**C93.** **RCL P**
**C94.** **–**
**C95.** **STO S**
**C96.** **RCL S**
**C97.** **RCL N**
**C98.** **÷**
**C99.** **STO T**
**C100.** **RCL T**
**C101.** **ABS**
**C102.** **STO D**
**C103.** **FIX 2**
**C104.** **“IP NORTH(Y)=”**
**C105.** **PSE**
**C106.** **VIEW Y**
**C107.** **“IP EAST(X)=”**
**C108.** **PSE**
**C109.** **VIEW X**
**C110.** **“INTERNAL ANG=”**
**C111.** **PSE**
**C112.** **FIX 4**
**C113.** **VIEW F**
**C114.** **“AZ FROM IP=”**
**C115.** **PSE**
**C116.** **“(DDMMSS)”**
**C117.** **PSE**
**C118.** **VIEW A**
**C119.** **FIX 8**
**C120.** **“DIST TO IP=”**
**C121.** **PSE**
**C122.** **VIEW D**
**C123.** **RTN**

## Intersection-3 (1 Label)

**XEQ-D** (Distance - Distance Intersection)

**XEQ D** to start the program
At the prompts, enter a value for the following and press **R/S**

**N?** Northing of first point
**E?** Easting of first point
**D?** Distance from first point to intersection point
**D?** Distance from intersection point to second point

**N?** Northing of second point
**E?** Easting of second point

After you have entered the second **E** value and pressed **R/S**, the following results will be displayed:

**Y?** Northing of intersection point
**X?** Easting of intersection point
**D?** $D^3$ = Distance from Point #1 to Point #2
**S?** Semiperimeter

**A?** Angle A (Displayed as DD.MMSS)
**B?** Angle B (Displayed as DD.MMSS)
**C?** Angle C (Displayed as DD.MMSS)

**D01. LBL D**
**D02. FIX 4**
**D03. SF 10**
**D04. "DIST-DIST INTER"**
**D05. PSE**
**D06. "ENTR NORTH1(Y)"**
**D07. PSE**
**D08. INPUT N**
**D09. STO Y**
**D10. "ENTR EAST1(X)"**
**D11. PSE**
**D12. INPUT E**
**D13. STO X**
**D14. FIX 2**
**D15. "ENTR DIST TO IP"**
**D16. PSE**
**D17. INPUT D**
**D18. STO F**
**D19. 0**
**D20. STO D**
**D21. "ENTR DIST FROM IP"**
**D22. PSE**
**D23. INPUT D**
**D24. STO G**
**D25. FIX 4**
**D26. 0**
**D27. STO N**
**D28. STO E**
**D29. "ENTR NORTH2(Y)"**
**D30. PSE**
**D31. INPUT N**
**D32. "ENTR EAST2(X)"**
**D33. PSE**
**D34. INPUT E**
**D35. RCL N**
**D36. RCL Y**
**D37. –**
**D38. STO Y**
**D39. RCL E**
**D40. RCL X**
**D41. –**
**D42. STO X**
**D43. RCL X**
**D44. $X^2$**
**D45. RCL Y**
**D46. $X^2$**
**D47. +**
**D48. √X**
**D49. STO D**
**D50. RCL F**
**D51. RCL G**
**D52. +**
**D53. RCL D**
**D54. +**
**D55. STO J**
**D56. RCL J**
**D57. 2**
**D58. ÷**

```
D59.   STO S
D60.   RCL D
D61.   RCL F
D62.   x
D63.   STO K
D64.   RCL S
D65.   RCL G
D66.   –
D67.   STO L
D68.   RCL S
D69.   RCL L
D70.   x
D71.   STO M
D72.   RCL M
D73.   RCL K
D74.   ÷
D75.   STO O
D76.   RCL O
D77.   √X
D78.   STO O
D79.   RCL O
D80.   ACOS
D81.   STO O
D82.   2
D83.   RCL O
D84.   x
D85.   STO H
D86.   ⇨HMS
D87.   STO A
D88.   RCL D
D89.   RCL G
D90.   x
D91.   STO P
D92.   RCL S
D93.   RCL F
D94.   –
D95.   STO Q
D96.   RCL S
D97.   RCL Q
D98.   x
D99.   RCL P
D100.  ÷
D101.  STO Q
D102.  RCL Q
D103.  √X
D104.  STO R
D105.  RCL R
D106.  ACOS
D107.  STO U
D108.  2
D109.  RCL U
D110.  x
D111.  STO I
D112.  RCL I
D113.  ⇨HMS
D114.  STO B
D115.  RCL H
D116.  RCL I
D117.  +
D118.  STO Z
D119.  180
D120.  RCL Z
D121.  –
D122.  ⇨HMS
D123.  STO C
D124.  FIX 4
D125.  "IP NORTH(Y)="
D126.  PSE
D127.  VIEW Y
D128.  "IP EAST(X)="
D129.  PSE
D130.  VIEW X
D131.  "DIST PT1-PT2="
D132.  PSE
D133.  VIEW D
D134.  "SEMIPERIMETER="
D135.  PSE
D136.  VIEW S
D137.  "ANGLE A="
D138.  PSE
D139.  "(DDMMSS)="
D140.  PSE
D141.  VIEW A
D142.  "ANGLE B="
D143.  PSE
D144.  "(DDMMSS)="
D145.  PSE
D146.  VIEW B
D147.  "ANGLE C="
D148.  PSE
D149.  "(DDMMSS)="
D150.  PSE
D151.  VIEW C
D152.  RTN
```

## Inverse-1 (7 Labels)

**XEQ I** (Inverse Coordinates)

**XEQ I** to start the program.
At the prompts, enter a value for the following and press **R/S**

**N?** Northing
**E?** Easting

After you have entered the second **E** value and pressed **R/S**, the following results will be displayed:

**A= azimuth from the first point to the second point**
**B= bearing from first point to the second point**
**D= distance between points in feet**
**C= distance between points in chains**

**Bearing format is: Quadrant – Degrees – Minutes - Seconds**

| | |
|---|---|
| **Bearing N20°30'40"E** | **Displayed as 120-30-40** |
| **Bearing S20°30'40"E** | **Displayed as 220-30-40** |
| **Bearing S20°30'40"W** | **Displayed as 320-30-40** |
| **Bearing N20°30'40"W** | **Displayed as 420-30-40** |

```
I01. LBL I
I02. FIX 4
I03. CLVARS
I04. SF 10
I05. "INVERSE COORD"
I06. PSE
I07. "ENTR NORTH1(Y)"
I08. PSE
I09. INPUT N
I10. STO Y
I11. SF 10
I12. "ENTR EAST1(X)"
I13. PSE
I14. INPUT E
I15. STO X
I16. 0
I17. STO N
I18. STO E

F01.  LBL F
F02.  SF 10
F03.  "ENTR NORTH2(Y)"
F04.  PSE
F05.  INPUT N
F06.  SF 10
F07.  "ENTR EAST2(X)"
F08.  PSE
F09.  INPUT E
F10.  RCL X
F11.  -
F12.  RCL N
F13.  RCL Y
F14.  -
F15.  y,x⇨0,r
F16.  STO D
F17.  X<>Y
F18.  X>0?
F19.  GTO G
F20.  360
F21.  +

G01.  LBL G
G02.  STO R
G03.  ⇨HMS
G04.  STO A
G05.  FIX 4
G06.  SF 10
G07.  "AZIMUTH="
G08.  PSE
G09.  VIEW A
G10.  90
G11.  RCL R
G12.  X>Y?
G13.  GTO J
G14.  100
G15.  +
G16.  GTO M

J01.  LBL J
J02.  180
J03.  RCL R
J04.  X>Y?
```

```
J05.  GTO K
J06.  -
J07.  200
J08.  +
J09.  GTO M

K01.  LBL K
K02.  270
K03.  RCL R
K04.  X>Y?
K05.  GTO L
K06.  180
K07.  -
K08.  300
K09.  +
K10.  GTO M

L01.  LBL L
L02.  360
L03.  RCL R
L04.  -
L05.  400
L06.  +
```

```
M01.  LBL M
M02.  ⇨HMS
M03.  STO B
M04.  SF 10
M05.  "BEARING="
M06.  PSE
M07.  VIEW B
M08.  FIX 3
M09.  SF 10
M10.  "DISTANCE="
M11.  PSE
M12.  VIEW D
M13.  RCL D
M14.  66
M15.  ÷
M16.  STO C
M17.  SF10
M18.  "CHAINS="
M19.  PSE
M20.  CF10
M21.  VIEW C
M22.  GTO F
```

**Check**

**1st Point** N=5000
E=10000

**2nd Point** N=5255.912
E=10125.751

A=26°10'08"
B=126°10'08" = S 26°10'08" E
D=285.1390288
C=4.32

## Metric Conversion (1 Label)

**XEQ M** (Metric Conversion)

**XEQ M** to start the program.
At the prompts, enter a value for the following and press **R/S**

**M?** Metric Number

After you have entered the **M** value and pressed **R/S**, the following result will be displayed:

**F =** Number conversion for U.S. Survey Foot

```
M01.  LBL M
M02.  CLVARS
M03.  SF 10
M04.  "ENTR METRIC"
M05.  PSE
M06.  INPUT M
M07.  3.28083333
M08.  x
M09.  STO F
M10.  VIEW F
M11.  GTO M
```

## Phogrammetry-1 (1 Label)

**XEQ P** (Photogrammetry)

**XEQ P** to start the program.
At the prompts, enter a value for the following and press **R/S**

**I?** Contour Interval
**C?** C-Factor
**F?** Focal Length = 6”
**D?** Film Dimension 9”X9”

After you have entered the **D** value and pressed **R/S**, the following results will be displayed:

**H?** Flying Height
**P?** Photo Scale
**N?** NM Width
**M?** NM Length
**W?** Width of Target
**L?** Length of Target

**P01. LBL P**
**P02. FIX 2**
**P03. SF 10**
**P04. “PHOTOGRAMMETRY”**
**P05. PSE**
**P06. “CONTOUR INTERVAL”**
**P07. PSE**
**P08. INPUT I**
**P09. “C FACTOR”**
**P10. PSE**
**P11. INPUT C**
**P12. “FOCAL LENGTH”**
**P13. PSE**
**P14. INPUT F**
**P15. “FILM DIMENTION”**
**P16. PSE**
**P17. INPUT D**
**P18. RCL C**
**P19. RCL I**
**P20. x**
**P21. STO H**
**P22. RCL H**
**P23. RCL F**
**P24. ÷**
**P25. STO P**
**P26. RCL D**
**P27. 0.4**
**P28. x**
**P29. RCL P**
**P30. x**
**P31. STO N**
**P32. RCL D**
**P33. 0.7**
**P34. x**
**P35. RCL P**
**P36. x**
**P37. STO M**
**P38. 1**
**P39. 60**
**P40. ÷**
**P41. RCL P**
**P42. x**
**P43. STO W**
**P44. 1**
**P45. 50**
**P46. ÷**
**P47. RCL P**
**P48. x**
**P49. STO L**
**P50. “FLY HEIGTH=”**
**P51. PSE**
**P52. VIEW H**
**P53. “PHOTO SCALE=”**
**P54. PSE**
**P55. VIEW P**
**P56. “NM WIDTH=”**
**P57. PSE**
**P58. VIEW N**
**P59. “NM LENGTH=”**
**P60. PSE**
**P61. VIEW M**
**P62. “TARGET WIDTH=”**
**P63. PSE**
**P64. VIEW W**
**P65. “TARGET LENGTH=”**
**P66. PSE**
**P67. CF 10**
**P68. VIEW L**
**P69. RTN**

## Quadratic-1 (1 Label)

**XEQ Q** (Quadratic Equation)

**XEQ Q** to start the program.

**Q01. LBL Q**
**Q02. CLVARS**
**Q03. SF 10**
**Q04. "QUAD ROOTS"**
**Q05. PSE**
**Q06. "ENTR VALUE A"**
**Q07. PSE**
**Q08. INPUT A**
**Q09. "ENTR VALUE B"**
**Q10. PSE**
**Q11. INPUT B**
**Q12. "ENTR VALUE C"**
**Q13. PSE**
**Q14. INPUT C**
**Q15. RCL B**
**Q16. $X^2$**
**Q17. RCL A**
**Q18. RCL C**
**Q19. x**
**Q20. 4**
**Q21. x**
**Q22. -**
**Q23. STO D**
**Q24. X<0?**
**Q25. VIEW D**

**Q26. √X**

**Q27. RCL-B**
**Q28. RCL ÷ A**
**Q29. 2**
**Q30. ÷**
**Q31. STO P**
**Q32. FIX 8**
**Q33. "1ST ROOT="**
**Q34. PSE**
**Q35. VIEW P**
**Q36. RCL D**
**Q37. X=0?**
**Q38. RTN**

**Q39. √X**

**Q40. RCL+B**
**Q41. RCL ÷ A**
**Q42. 2**
**Q43. ÷**
**Q44. +/-**
**Q45. STO Q**
**Q46. "2ND ROOT="**
**Q47. PSE**
**Q48. VIEW Q**
**Q49. CF 10**
**Q50. RTN**

**CHECK**

**SOLVE: A=4 B=8 C=-6 ANSWER: $1^{ST}$ ROOT =0.581139**
**$2^{ND}$ ROOT=-2.581139**

**SOLVE: A=4 B=1 C=8 ANSWER: $1^{ST}$ ROOT =-127.0000**

**SOLVE: A=1 B=2 C=1 ANSWER: $1^{ST}$ ROOT =-1.0000**

## Staking-1 (2 Labels)

**XEQ S** (Slope Staking)

**XEQ S** to start the program.
At the prompts, enter a value for the following and press **R/S**

**H?** Hinge Point Elevation
**B?** Half Base Distance
**E?** Elevation at Instrument Point
**I?** Instrument Height
**V?** Vertical Distance
**R?** Rod Height
**S?** Cut/Fill Slope
**M?** Horizontal Distance

After you have entered the **M** value and pressed **R/S**, the following results will be displayed:

**G?** Grade Rod or Rod Elevation
**Z?** Elevation Difference
**C?** Calculated Distance
**D?** Difference in Distance, **- = IN (FORWARD), + = OUT (BACK)**

Press **R/S** to enter another **V?** and **M?**
**V?** Vertical Distance
**M?** Horizontal Distance

**S01. LBL S**
**S02. FIX 2**
**S03. SF 10**
**S04. "SLOPE STAKING"**
**S05. PSE**
**S06. "ENTR HP ELEV"**
**S07. PSE**
**S08. INPUT H**
**S09. SF 10**
**S10. "ENTR 0.5xBASE"**
**S11. PSE**
**S12. INPUT B**
**S13. SF 10**
**S14. "ENTR HGT INST"**
**S15. PSE**
**S16. INPUT E**
**S17. SF 10**
**S18. "ENTR INST HGT"**
**S19. PSE**
**S20. INPUT I**
**S21. SF 10**
**S22. "ENTR V DIST"**
**S23. PSE**
**S24. INPUT V**
**S25. SF 10**
**S26. "ENTR ROD HGT"**
**S27. PSE**
**S28. INPUT R**
**S29. SF 10**
**S30. "ENTR SLOPE"**
**S31. PSE**
**S32. INPUT S**
**S33. SF 10**
**S34. "ENTR H DIST"**
**S35. PSE**
**S36. INPUT M**
**S37. RCL E**
**S38. RCL I**
**S39. +**
**S40. RCL V**
**S41. +**
**S42. RCL R**
**S43. -**
**S44. STO G**
**S45. RCL H**
**S46. RCL G**
**S47. -**
**S48. ABS**
**S49. STO Z**
**S50. RCL S**
**S51. RCL Z**
**S52. x**
**S53. RCL B**
**S54. +**
**S55. STO C**
**S56. RCL C**
**S57. RCL M**
**S58. -**

```
S59.  STO D
S60.  FIX 4
S61.  VIEW G
S62.  VIEW Z
S63.  VIEW C
S64.  VIEW D

O01.  LBL O
O02.  0
O03.  STO V
O04.  SF 10
O05.  "ENTER V DIST"
O06.  PSE
O07.  INPUT V
O08.  0
O09.  STO M
O10.  SF 10
O11.  "ENTER V DIST"
O12.  PSE
O13.  INPUT M
O14.  RCL E
O15.  RCL I
O16.  +
O17.  RCL V
O18.  +
O19.  RCL R
O20.  -
O21.  STO G
O22.  RCL H
O23.  RCL G
O24.  -
O25.  ABS
O26.  STO Z
O27.  RCL S
O28.  RCL Z
O29.  x
O30.  RCL B
O31.  +
O32.  STO C
O33.  RCL C
O34.  RCL M
O35.  -
O36.  STO D
O37.  SF 10
O38.  "ROD ELEV GRADE"
O39.  PSE
O40.  VIEW G
O41.  SF 10
O42.  "ELEV DIFFERENCE"
O43.  PSE
O44.  VIEW Z
O45.  SF 10
O46.  "CALC DISTANCE"
O47.  PSE
O48.  VIEW C
O49.  SF 10
O50.  "DIST DIFFERENCE"
O51.  PSE
O52.  SF 10
O53.  "-IN +OUT"
O54.  PSE
O55.  VIEW D
O56.  GTO O
```

## Traverse-1 (2 Labels)

**XEQ T** (Traverse by Azimuth)

**XEQ T** to start the program.

At the prompts, enter a value for the following and press **R/S**

**N?** Northing
**E?** Easting
**A?** Azimuth
**D?** Horizontal distance to fore sight

The program will display the northing of the fore sight.
Press **R/S** and the easting of the fore sight will be displayed.
Press **R/S** to start the next leg of the traverse by entering the azimuth and distance to the next point.

```
T01.  LBL T
T02.  CLVARS
T03.  FIX 4
T04.  SF 10
T05.  "TRAV BY AZ"
T06.  PSE
T07.  "START NORTH(Y)"
T08.  PSE
T09.  INPUT N
T10.  STO Y
T11.  "START EAST(X)
T12.  PSE
T13.  INPUT E
T14.  STO X

N01.  LBL N
N02.  0
N03.  "ENTR AZIMUTH"
N04.  PSE
N05.  INPUT A
N06.  STO A
N07.  ENTR DISTANCE"
N08.  PSE
N09.  "INPUT D
N10.  STO D
N11.  FIX 4
N12.  RCL A
N13.  ⇨HR
N14.  COS
N15.  RCL D
N16.  x
N17.  RCL Y
N18.  +
N19.  STO Y
N20.  STO N
N21.  RCL A
N22.  ⇨HR
N23.  SIN
N24.  RCL D
N25.  x
N26.  RCL X
N27.  +
N28.  STO X
N29.  STO E
N30.  "NORTHING="
N31.  PSE
N32.  VIEW N
N33.  "EASTING="
N34.  PSE
N35.  VIEW E
N36.  GTO N
```

**Check**

**1st Point**
**N=5000**
**E=10000**
**A=26°10'075077"**
**D=285.1390288**

**N=5255.912**
**E=10125.751**

**2nd Point**
**A=146°03'033078"**
**D=670.14958460**

**N=4700**
**E=10500**

## Triangle-1 (1 Label)

**XEQ A** (Triangle – S1, S2, S3)

**XEQ A** to start the program.

**A01. LBL A**
**A02. FIX 4**
**A03. CLVARS**
**A04. SF 10**
**A05. "TRI S1 S2 S3"**
**A06. PSE**
**A07. "ENTR SIDE 1"**
**A08. PSE**
**A09. INPUT S**
**A10. STO A**
**A11. "ENTR SIDE 2"**
**A12. PSE**
**A13. INPUT S**
**A14. STO B**
**A15. "ENTR SIDE 3"**
**A16. PSE**
**A17. INPUT S**
**A18. STO C**
**A19. $X^2$**
**A20. RCL B**
**A21. $X^2$**
**A22. +**
**A23. RCL A**
**A24. $X^2$**
**A25. -**
**A26. RCL ÷ B**
**A27. RCL ÷ C**
**A28. 2**
**A29. ÷**
**A30. ACOS**
**A31. ⇨HMS**
**A32. "ANGLE 1="**
**A33. PSE**
**A34. STOP**
**A35. RCL C**
**A36. $X^2$**
**A37. RCL A**
**A38. $X^2$**
**A39. +**
**A40. RCL B**
**A41. $X^2$**
**A42. -**
**A43. RCL ÷ C**
**A44. RCL ÷ A**
**A45. 2**
**A46. ÷**
**A47. ACOS**
**A48. ⇨HMS**
**A49. "ANGLE 2="**
**A50. PSE**
**A51. STOP**
**A52. RCL B**
**A53. $X^2$**
**A54. RCL A**
**A55. $X^2$**
**A56. +**
**A57. RCL C**
**A58. $X^2$**
**A59. -**
**A60. RCL ÷ A**
**A61. RCL ÷ B**
**A62. 2**
**A63. ÷**
**A64. ACOS**
**A65. STO D**
**A66. ⇨HMS**
**A67. "ANGLE 3="**
**A68. PSE**
**A69. STOP**
**A70. RCL D**
**A71. SIN**
**A72. 2**
**A73. ÷**
**A74. RCLxA**
**A75. RCLxB**
**A76. "AREA="**
**A77. PSE**
**A78. STOP**
**A79. CF 10**
**A80. RTN**

**CHECK 1:**

**SIDE 1=100.00**
**SIDE 2=100.00**
**SIDE 3=100.00**

**ANGLE 1=60°00'00"**
**ANGLE 2=60°00'00"**
**ANGLE 3=60°00'00"**
**AREA=4,330.127**

**CHECK 2:**

**SIDE 1=10.00**
**SIDE 2=10.00**
**SIDE 3=18.00**

**ANGLE 1=25°50'31"**
**ANGLE 2=25°50'31"**
**ANGLE 3=128°18'58"**
**AREA=39.230**

## Triangle-2 (1 Label)

**XEQ B** (Triangle – S1, S2, A3)

**XEQ B** to start the program.

**B01.** **LBL B**
**B02.** **FIX 4**
**B03.** **CLVARS**
**B04.** **SF 10**
**B05.** **"TRI S1 S2 A3"**
**B06.** **PSE**
**B07.** **"ENTR SIDE 1"**
**B08.** **PSE**
**B09.** **INPUT S**
**B10.** **STO A**
**B11.** **"ENTR SIDE 2"**
**B12.** **PSE**
**B13.** **INPUT S**
**B14.** **STO B**
**B15.** **"ENTR ANGLE 3"**
**B16.** **PSE**
**B17.** **INPUT S**
**B18.** **⇨HR**
**B19.** **STO C**
**B20.** **COS**
**B21.** **RCLxA**
**B22.** **RCLxB**
**B23.** **2**
**B24.** **x**
**B25.** **RCL A**
**B26.** **$X^2$**
**B27.** **X<>Y**
**B28.** **-**
**B29.** **RCL B**
**B30.** **$X^2$**
**B31.** **+**
**B32.** **√X**
**B33.** **STO D**
**B34.** **"SIDE 3="**
**B35.** **PSE**
**B36.** **STOP**
**B37.** **RCL C**
**B38.** **SIN**
**B39.** **RCL ÷ D**
**B40.** **STO D**
**B41.** **RCLxA**
**B42.** **ASIN**
**B43.** **⇨HMS**
**B44.** **"ANGLE 1="**
**B45.** **PSE**
**B46.** **STOP**
**B47.** **RCL D**
**B48.** **RCLxB**
**B49.** **ASIN**
**B50.** **⇨HMS**
**B51.** **"ANGLE 2="**
**B52.** **PSE**
**B53.** **STOP**
**B54.** **RCL C**
**B55.** **SIN**
**B56.** **RCLxA**
**B57.** **RCLxB**
**B58.** **2**
**B59.** **÷**
**B60.** **"AREA="**
**B61.** **PSE**
**B62.** **STOP**
**B63.** **CF 10**
**B64.** **RTN**

**CHECK 1:**

**SIDE 1=100.00**
**SIDE 2=100.00**
**ANGLE 3=60°00'00"**

**SIDE 3=100.00**
**ANGLE 1=60°00'00"**
**ANGLE 2=60°00'00"**
**AREA=4,330.127**

**CHECK 2:**

**SIDE 1=10.00**
**SIDE 2=10.00**
**ANGLE 3=128°18'58"**

**SIDE 3=18.00**
**ANGLE 1=25°50'31"**
**ANGLE 2=25°50'31"**
**AREA=39.230**

## Triangle-3 (1 Label)

**XEQ C** (Triangle – A1, A2, S3)

**XEQ C** to start the program.

```
C01.  LBL C
C02.  FIX 4
C03.  CLVARS
C04.  SF 10
C05.  "TRI A1 A2 S3"
C06.  PSE
C07.  "ENTR ANGLE 1"
C08.  PSE
C09.  INPUT S
C10.  ⇨HR
C11.  STO A
C12.  "ENTR ANGLE 2"
C13.  PSE
C14.  INPUT S
C15.  ⇨HR
C16.  STO B
C17.  "ENTR SIDE 3"
C18.  PSE
C19.  INPUT S
C20.  STO C
C21.  180
C22.  RCL-A
C23.  RCL-B
C24.  STO D
C25.  ⇨HMS
C26.  "ANGLE 3="
C27.  PSE
C28.  STOP
C29.  RCL C
C30.  RCL D
C31.  SIN
C32.  STO E
C33.  ÷
C34.  STO F
C35.  RCL A
C36.  SIN
C37.  x
C38.  STOxE
C39.  "SIDE 1="
C40.  PSE
C41.  STOP
C42.  RCL F
C43.  RCL B
C44.  SIN
C45.  x
C46.  STOxE
C47.  "SIDE 2="
C48.  PSE
C49.  STOP
C50.  RCL E
C51.  2
C52.  ÷
C53.  "AREA="
C54.  PSE
C55.  STOP
C56.  CF 10
C57.  RTN
```

**CHECK 1:**

**ANGLE 1=60°00'00"**
**ANGLE 2=60°00'00"**
**SIDE 3=100.00**

**ANGLE 3=60°00'00"**
**SIDE 1=100.00**
**SIDE 2=100.00**
**AREA=4,330.127**

**CHECK 2:**

**ANGLE 1=25°50'31"**
**ANGLE 2=25°50'31"**
**SIDE 3=18.00**

**ANGLE 3=128°18'58"**
**SIDE 1=10.00**
**SIDE 2=10.00**
**AREA=39.230**

## Triangle-4 (1 Label)

**XEQ D** (Triangle – A1, A3, S3)

**XEQ D** to start the program.

```
D01.  LBL D
D02.  FIX 4
D03.  CLVAR
D04.  SF 10
D05.  "TRI A1 A3 S3"
D06.  PSE
D07.  "ENTR ANGLE 1"
D08.  PSE
D09.  INPUT S
D10.  ⇨HR
D11.  STO A
D12.  "ENTR ANGLE 3"
D13.  PSE
D14.  INPUT S
D15.  ⇨HR
D16.  STO B
D17.  "ENTR SIDE 3"
D18.  PSE
D19.  INPUT S
D20.  STO C
D21.  RCL B
D22.  SIN
D23.  ÷
D24.  STO D
D25.  RCL A
D26.  SIN
D27.  x
D28.  "SIDE 1="
D29.  PSE
D30.  STOP
D31.  180
D32.  RCL-A
D33.  RCL-B
D34.  STO E
D35.  ⇨HMS
D36.  "ANGLE 2="
D37.  PSE
D38.  STOP
D39.  RCL E
D40.  SIN
D41.  RCLxD
D42.  STO E
D43.  "SIDE 2="
D44.  PSE
D45.  STOP
D46.  RCL E
D47.  RCLxC
D48.  RCL A
D49.  SIN
D50.  x
D51.  2
D52.  ÷
D53.  "AREA="
D54.  PSE
D55.  STOP
D56.  CF 10
D57.  RTN
```

**CHECK 1:**

**ANGLE 1=60°00'00"**
**ANGLE 3=60°00'00"**
**SIDE 3=100.00**

**SIDE 1=100.00**
**ANGLE 2=60°00'00"**
**SIDE 2=100.00**
**AREA=4,330.127**

**CHECK 2:**

**ANGLE 1=25°50'31"**
**ANGLE 3=128°18'58"**
**SIDE 3=18.00**

**SIDE 1=10.00**
**ANGLE 2=25°50'31"**
**SIDE 2=10.00**
**AREA=39.230**

## Triangle-5 (1 Label)

**XEQ E** (Triangle – S1, S2, A1)

**XEQ E** to start the program.

**E01. LBL E**
**E02. FIX 4**
**E03. CLVARS**
**E04. SF 10**
**E05. "TRI S1 S2 A1"**
**E06. PSE**
**E07. "ENTR SIDE 1"**
**E08. PSE**
**E09. INPUT S**
**E10. STO A**
**E11. "ENTR SIDE 2"**
**E12. PSE**
**E13. INPUT S**
**E14. STO B**
**E15. "ENTR ANGLE 1"**
**E16. PSE**
**E17. INPUT S**
**E18. ⇨HR**
**E19. STO C**
**E20. SIN**
**E21. RCL ÷ A**
**E22. STO D**
**E23. RCLxB**
**E24. ASIN**
**E25. STO E**
**E26. 180**
**E27. X<>Y**
**E28. -**
**E29. RCL-C**
**E30. STO F**
**E31. SIN**
**E32. RCLxA**
**E33. RCL C**
**E34. SIN**
**E35. ÷**
**E36. STO G**
**E37. RCL F**
**E38. SIN**
**E39. RCLxA**
**E40. RCLxB**
**E41. 2**
**E42. ÷**
**E43. STO H**
**E44. "SOLUTION 1"**
**E45. PSE**
**E46. "ANGLE 2="**
**E47. PSE**
**E48. RCL E**
**E49. ⇨HMS**
**E50. STOP**
**E51. "ANGLE 3="**
**E52. PSE**
**E53. RCL F**
**E54. ⇨HMS**
**E55. STOP**
**E56. "SIDE 3="**
**E57. PSE**
**E58. RCL G**
**E59. STOP**
**E60. "AREA="**
**E61. PSE**
**E62. RCL H**
**E63. STOP**
**E64. 180**
**E65. RCL-E**
**E66. STO E**
**E67. 180**
**E68. X<>Y**
**E69. -**
**E70. RCL-C**
**E71. STO F**
**E72. SIN**
**E73. RCLxA**
**E74. RCL C**
**E75. SIN**
**E76. ÷**
**E77. STO G**
**E78. RCL F**
**E79. SIN**
**E80. RCLxA**
**E81. RCLxB**
**E82. 2**
**E83. ÷**
**E84. STO H**
**E85. "SOLUTION 2"**
**E86. PSE**
**E87. "ANGLE 2="**
**E88. PSE**
**E89. RCL E**
**E90. ⇨HMS**
**E91. STOP**
**E92. "ANGLE 3="**
**E93. PSE**
**E94. RCL F**
**E95. ⇨HMS**
**E96. STOP**
**E97. "SIDE 3="**
**E98. PSE**
**E99. RCL G**
**E100. STOP**

```
E101.  "AREA="
E102.  PSE
E103.  RCL H
E104.  STOP
E105.  CF 10
E106.  RTN
```

**CHECK 1:**

**SIDE 1=100.00**
**SIDE 2=100.00**
**ANGLE 1=60°00'00"**

**SOLUTION 1**

**ANGLE 2=60°00'00"**
**ANGLE 3=60°00'00"**
**SIDE 3=100.00**
**AREA=4,330.127**

**SOLUTION 2**

**ANGLE 2=120°00'00"**
**ANGLE 3=00°00'00"**
**SIDE 3=00.00**
**AREA=00.00**

**CHECK 2:**

**SIDE 1=10.00**
**SIDE 2=10.00**
**ANGLE 1=25°50'31"**

**SOLUTION 1**

**ANGLE 2=25°50'31"**
**ANGLE 3=128°18'58"**
**SIDE 3=18.00**
**AREA=39.230**

**SOLUTION 2**

**ANGLE 2=154°09'29"**
**ANGLE 3=00°00'00"**
**SIDE 3=00.00**
**AREA=00.00**

## UTILITY-1 (2 Labels)

**XEQ R** (Geodetic to State Plane Coordinates)

**XEQ R** to start the program.

ZN1=1 ZN2=2
Enter 1 or 2 for zone, if not press **R/S**
ZN3=3 ZN4=4
Enter 3 or 4 for zone, if not press **R/S**
ZN5=5 ZN6=6
Enter 5 or 6 for zone, then press **R/S**

At the prompts, enter a value for the following and press **R/S**

**B?** Latitude (DDMMSS)
**L?** Longitude (DDMMSS)

After you have entered the **L** value (Longitude) and pressed **R/S**, the following results will be displayed:

**C?** Convergence Angle (DDMMSS)
**N?** Northing
**E?** Easting

**R01. LBL R**
**R02. XEQ U**
**R03. SF 10**
**R04. "GEOD – CCS83"**
**R05. PSE**
**R06. "ZN1=1 ZN2=2"**
**R07. 1**
**R08. –**
**R09. STO X**
**R10. X=0?**
**R11. SF 1**
**R12. X>0?**
**R13. SF 2**
**R14. X<0?**
**R15. SF 3**
**R16. CF 10**
**R17. FS? 1**
**R18. INPUT B**
**R19. ⇨HR**
**R20. STO B**
**R21. FS? 1**
**R22. INPUT L**
**R23. ⇨HR**
**R24. STO L**
**R25. FS? 1**
**R26. "B-40.8351061249"**
**R27. STO A**
**R28. FS? 1**
**R29. "Ax(364300.5191+Ax(31.6772+Ax(18.4872+0.0698xA)))"**
**R30. STO U**
**R31. FS? 1**
**R32. "24244708.912-U"**
**R33. STO R**
**R34. FS? 1**
**R35. "(122-L)x0.6538843054"**
**R36. STO C**
**R37. FS? 1**
**R38. "2187504.093+U+(RxSIN(C)xTAN(C÷2))"**
**R39. STO N**
**R40. FS? 1**
**R41. "6561666.667+(RxSIN(C))"**
**R42. STO E**
**R43. FS? 1**
**R44. RCL C**
**R45. ⇨HMS**
**R46. STO C**
**R47. FS? 1**
**R48. VIEW C**
**R49. FS? 1**
**R50. VIEW N**
**R51. FS? 1**
**R52. VIEW E**
**R53. FS? 1**
**R54. STOP**
**R55. CLVARS**
**R56. FS? 2**
**R57. INPUT B**
**R58. ⇨HR**
**R59. STO B**
**R60. FS? 2**
**R61. INPUT L**
**R62. ⇨HR**

R63. STO L
R64. FS? 2
R65. “B-39.0846839219”
R66. STO A
R67. FS? 2
R68. “Ax(364197.5131+Ax(31.3198+Ax(184998+0.065577xA)))”
R69. STO U
R70. FS? 2
R71. “25795162.985-U”
R72. STO R
R73. FS? 2
R74. “(122-L)x63.0468335285E-2”
R75. STO C
R76. FS? 2
R77. “2156844.531+U+(RxSIN(C)xTAN(C÷2))”
R78. STO N
R79. FS? 2
R80. “6561666.667+(RxSIN(C))”
R81. STO E
R82. FS? 2
R83. RCL C
R84. ⇨HMS
R85. STO C
R86. FS? 2
R87. VIEW C
R88. FS? 2
R89. VIEW N
R90. FS? 2
R91. VIEW E
R92. FS? 2
R93. STOP
R94. FS? 3
R95. SF 10
R96. “ZN3=3 ZN4=4”
R97. 3
R98. –
R99. STO X
R100. X=0?
R101. SF 4
R102. X>0?
R103. SF 5
R104. X<0?
R105. SF 6
R106. CLVARS
R107. CF 10
R108. FS? 4
R109. INPUT B
R110. ⇨HR
R111. STO B
R112. FS? 4
R113. INPUT L
R114. ⇨HR
R115. STO L
R116. FS? 4
R117. “B-37.7510694363”
R118. STO A
R119. FS? 4
R120. “Ax(364119.7127+Ax(30.9692+Ax(18.5086+0.062493xA)))”
R121. STO U
R122. FS? 4
R123. “27056804.05-U”
R124. STO R
R125. FS? 4
R126. “(120.5-L)x61.2232038295E-2”
R127. STO C
R128. FS? 4
R129. “2095943.327+U+(RxSIN(C)xTAN(C÷2))”
R130. STO N
R131. FS? 4
R132. “6561666.667+(RxSIN(C))”
R133. STO E
R134. FS? 4
R135. RCL C
R136. ⇨HMS
R137. STO Y
R138. FS? 4
R139. VIEW C
R140. FS? 1
R141. VIEW N
R142. FS? 1
R143. VIEW E
R144. FS? 4
R145. STOP
R146. CLVARS
R147. FS? 5
R148. INPUT B
R149. ⇨HR
R150. STO B
R151. FS? 5
R152. INPUT L
R153. ⇨HR
R154. STO L
R155. FS? 5
R156. “B-36.6258593071”
R157. STO A
R158. FS? 5
R159. “Ax(364054.6183+Ax(30.6211+Ax(18.5174+0.060308xA)))”
R160. STO U
R161. FS? 5
R162. “28181724.783-U”
R163. STO R
R164. FS? 5
R165. “(119-L)x0.59658714988”
R166. STO C
R167. FS? 5

**R168.** **“2110955.377+U+(RxSIN(C)xTAN(C÷2)**
**)”**
**R169.** **STO N**
**R170.** **FS? 5**
**R171.** **“6561666.667+(RxSIN(C))”**
**R172.** **STO E**
**R173.** **FS? 5**
**R174.** **RCL C**
**R175.** **⇨HMS**
**R176.** **STO C**
**R177.** **FS? 5**
**R178.** **VIEW C**
**R179.** **FS? 5**
**R180.** **VIEW N**
**R181.** **FS? 5**
**R182.** **VIEW E**
**R183.** **FS? 5**
**R184.** **STOP**
**R185.** **SF 10**
**R186.** **FS? 6**
**R187.** **CF 1**
**R188.** **“ZN5=5 ZN6=6”**
**R189.** **5**
**R190.** **–**
**R191.** **STO X**
**R192.** **X=0?**
**R193.** **SF 1**
**R194.** **X>0?**
**R195.** **SF 8**
**R196.** **CLVARS**
**R197.** **CF 10**
**R198.** **FS? 1**
**R199.** **INPUT B**
**R200.** **⇨HR**
**R201.** **STO B**
**R202.** **FS? 1**
**R203.** **INPUT L**
**R204.** **⇨HR**
**R205.** **STO L**
**R206.** **FS? 1**
**R207.** **“B-34.7510553142”**
**R208.** **STO A**
**R209.** **FS? 1**
**R210.** **“Ax(363934.259+Ax(29.9356+Ax(18.5303**
**+0.057234xA)))”**
**R211.** **STO U**
**R212.** **FS? 1**
**R213.** **“30193453.753-U”**
**R214.** **STO R**
**R215.** **FS? 1**
**R216.** **“(118-L)x57.0011896174E-2”**
**R217.** **STO C**
**R218.** **FS? 1**
**R219.** **“2095707.846+U+(RxSIN(C)xTAN(C÷2)**
**)”**
**R220.** **STO N**
**R221.** **FS? 1**
**R222.** **“6561666.667+(RxSIN(C))”**
**R223.** **STO E**
**R224.** **FS? 1**
**R225.** **RCL C**
**R226.** **⇨HMS**
**R227.** **STO C**
**R228.** **FS? 1**
**R229.** **VIEW C**
**R230.** **FS? 1**
**R231.** **VIEW N**
**R232.** **FS? 1**
**R233.** **VIEW E**
**R234.** **FS? 1**
**R235.** **STOP**
**R236.** **CLVARS**
**R237.** **FS? 8**
**R238.** **INPUT B**
**R239.** **⇨HR**
**R240.** **STO B**
**R241.** **FS? 8**
**R242.** **INPUT L**
**R243.** **⇨HR**
**R244.** **STO L**
**R245.** **FS? 8**
**R246.** **“B-33.3339229447”**
**R247.** **STO A**
**R248.** **FS? 8**
**R249.** **“Ax(363861.895+Ax(29.3368+Ax(18.5396**
**+0.053054xA)))”**
**R250.** **STO U**
**R251.** **FS? 8**
**R252.** **“31845868.317-U”**
**R253.** **STO R**
**R254.** **FS? 8**
**R255.** **“(116.25-L)x54.9517575763E-2”**
**R256.** **STO C**
**R257.** **FS? 8**
**R258.** **“2065126.163+U+(RxSIN(C)xTAN(C÷2)**
**)”**
**R259.** **STO N**
**R260.** **FS? 8**
**R261.** **“6561666.667+(RxSIN(C))”**
**R262.** **STO E**
**R263.** **FS? 8**
**R264.** **RCL C**
**R265.** **⇨HMS**
**R266.** **STO C**
**R267.** **FS? 8**
**R268.** **VIEW C**
**R269.** **FS? 8**
**R270.** **VIEW N**
**R271.** **FS? 8**
**R272.** **VIEW E**
**R273.** **FS? 8**
**R274.** **STOP**

```
R275.  RTN

U01.   LBL U
U02.   CF 10
U03.   CF 0
U04.   CF 1
U05.   CF 2
U06.   CF 3
U07.   CF 4
U08.   CF 5
U09.   CF 6
U10.   CF 8
U11.   CLVARS
U12.   CLx
U13.   RTN
```

## UTILITY-2 (2 Labels)

**XEQ F** (State Plane Coordinates to Geodetic)

**XEQ F** to start the program.

ZN1=1 ZN2=2
Enter 1 or 2 for zone, if not press **R/S**
ZN3=3 ZN4=4
Enter 3 or 4 for zone, if not press **R/S**
ZN5=5 ZN6=6
Enter 5 or 6 for zone, then press **R/S**

At the prompts, enter a value for the following and press **R/S**

**N?** Northing
**E?** Easting

After you have entered the **E** value (Easting) and pressed **R/S**, the following results will be displayed:

**C?** Convergence Angle (DDMMSS)
**B?** Latitude (DDMMSS)
**L?** Longitude (DDMMSS)

**F01. LBL F**
**F02. XEQ U**
**F03. SF 10**
**F04. "CCS83 – GEOD"**
**F05. PSE**
**F06. "ZN1=1 ZN2=2"**
**F07. 1**
**F08. –**
**F09. STO X**
**F10. X=0?**
**F11. SF 1**
**F12. X>0?**
**F13. SF 2**
**F14. X<0?**
**F15. SF 3**
**F16. FS? 1**
**F17. INPUT N**
**F18. FS? 1**
**F19. INPUT E**
**F20. CF 10**
**F21. FS? 1**
**F22. "ATAN((E-6561666.667) ÷(26432213.018-N))"**
**F23. STO C**
**F24. FS? 1**
**F25. "122-(C ÷ 0.6538843054)"**
**F26. ⇨HMS**
**F27. STO L**
**F28. FS? 1**
**F29. "N-2187504.093-(E-6561666.667)xTAN(C ÷ 2))"**
**F30. STO U**
**F31. FS? 1**
**F32. "40.8351061249+Ux(-6.55192E-16+Ux(-1.04884E-21+-9.6167E-30xU)))"**
**F33. ⇨HMS**
**F34. STO B**
**F35. FS? 1**
**F36. RCL C**
**F37. ⇨HMS**
**F38. STO C**
**F39. FS? 1**
**F40. VIEW C**
**F41. FS? 1**
**F42. VIEW B**
**F43. FS? 1**
**F44. VIEW L**
**F45. FS? 1**
**F46. STOP**
**F47. FS? 2**
**F48. INPUT N**
**F49. FS? 2**
**F50. INPUT E**
**F51. FS? 2**
**F52. "ATAN((E-6561666.667) ÷(27952007.517-N))"**
**F53. STO Y**
**F54. FS? 2**
**F55. "122-(C ÷ 6304.68335285)"**
**F56. ⇨HMS**
**F57. STO L**
**F58. FS? 2**
**F59. "N-2156844.531-(E-6561666.667)xTAN(C ÷ 2))"**

```
F60.
F61.  STO U
F62.  FS? 2
F63.  "39.0846839219+Ux(2.745762818E-
      06+Ux(-6.48347E-16+Ux(-1.0508E-21+-
      8.9858E-30xU)))"
F64.  ⇨HMS
F65.  STO B
F66.  FS? 2
F67.  RCL C
F68.  ⇨HMS
F69.  STO C
F70.  FS? 2
F71.  VIEW C
F72.  FS? 2
F73.  VIEW B
F74.  FS? 2
F75.  VIEW L
F76.  FS? 2
F77.  STOP
F78.  SF 10
F79.  FS? 3
F80.  "ZN3=3 ZN4=4"
F81.  3
F82.  –
F83.  STO X
F84.  X=0?
F85.  SF 4
F86.  X>0?
F87.  SF 5
F88.  X<0?
F89.  SF 6
F90.  CF 10
F91.  FS? 4
F92.  INPUT N
F93.  FS? 4
F94.  INPUT E
F95.  FS? 4
F96.  "ATAN((E-6561666.667)
      ÷(29152747.378-N))"
F97.  STO Y
F98.  FS? 4
F99.  "122.5-(C÷0.612232038295)"
F100. ⇨HMS
F101. STO L
F102. FS? 4
F103. "N-2095943.327-((E-
      6561666.667)xTAN(C÷2))"
F104. STO U
F105. FS? 4
F106. "37.7510694363+Ux(2.746349509E-
      06+Ux(-6.41501E-16+Ux(-1.0523E-21+-
      8.5291E-30xU)))"
F107. ⇨HMS
F108. STO B
F109. FS? 4
F110. RCL C
F111. ⇨HMS
F112. STO C
F113. FS? 4
F114. VIEW C
F115. FS? 4
F116. VIEW B
F117. FS? 4
F118. VIEW L
F119. FS? 4
F120. STOP
F121. FS? 5
F122. INPUT N
F123. FS? 5
F124. INPUT E
F125. FS? 5
F126. "ATAN((E-6561666.667)
      ÷(30292680.161-N))"
F127. STO C
F128. FS? 5
F129. "119-(C÷0.59658714988)"
F130. ⇨HMS
F131. STO L
F132. FS? 5
F133. "N-2110955.377-(E-
      6561666.667)xTAN(C÷2))"
F134. STO U
F135. FS? 5
F136. "36.6258593071+Ux(2.746840562E-
      06+Ux(-6.34643E-16+Ux(-1.05351E-21+-
      8.1324E-30xU)))"
F137. ⇨HMS
F138. STO B
F139. FS? 5
F140. RCL C
F141. ⇨HMS
F142. STO C
F143. FS? 5
F144. VIEW C
F145. FS? 5
F146. VIEW B
F147. FS? 5
F148. VIEW L
F149. FS? 5
F150. STOP
F151. SF 10
F152. CF 1
F153. FS? 6
F154. "ZN5=5 ZN6=6"
F155. 5
F156. –
F157. STO X
F158. X=0?
F159. SF 1
F160. X>0?
F161. SF 8
```

**F162.** CF 10
**F163.** FS? 1
**F164.** INPUT N
**F165.** FS? 1
**F166.** INPUT E
**F167.** FS? 1
**F168.** "ATAN((E-6561666.667) ÷ (32289161.599-N))"
**F169.** STO C
**F170.** FS? 1
**F171.** "118-(C ÷ 0.570011896174)"
**F172.** ⇨HMS
**F173.** STO L
**F174.** FS? 1
**F175.** "N-2095707.846-((E-6561666.667)xTAN(C ÷ 2))"
**F176.** STO U
**F177.** FS? 1
**F178.** "34.7510553142+Ux(2.747748987E-06+Ux(-6.21091E-16+Ux(-1.05565E-21+-7.4567E-30xU)))"
**F179.** ⇨HMS
**F180.** STO B
**F181.** FS? 1
**F182.** RCL C
**F183.** ⇨HMS
**F184.** STO C
**F185.** FS? 1
**F186.** VIEW C
**F187.** FS? 1
**F188.** VIEW B
**F189.** FS? 1
**F190.** VIEW L
**F191.** FS? 1
**F192.** STOP
**F193.** FS? 8
**F194.** INPUT N
**F195.** FS? 8
**F196.** INPUT E
**F197.** FS? 8
**F198.** INPUT H
**F199.** FS?8
**F200.** "ATAN((E-6561666.667) ÷ (33910994.48-N))"
**F201.** STO C
**F202.** FS? 8
**F203.** "116.25-(C ÷ 0.549517575763)"
**F204.** ⇨HMS
**F205.** STO L
**F206.** FS? 8
**F207.** "N-2065126.163-(E-6561666.667)xTAN(C ÷ 2))"
**F208.** STO U
**F209.** FS? 8
**F210.** "($U^3$x1.18E-23)+( $U^2$x1.14504E-15)+0.99995414249"
**F211.** STO K
**F212.** FS? 8
**F213.** "20897688.1859 ÷ (20897576.6759+H)"
**F214.** STO R
**F215.** FS? 8
**F216.** "RxK"
**F217.** STO D
**F218.** FS? 8
**F219.** "33.3339229447+Ux(2.748295465E-06+Ux(-6.08981E-16+Ux(-1.05713E-21+-7.1424E-30xU)))"
**F220.** ⇨HMS
**F221.** STO B
**F222.** FS? 8
**F223.** RCL C
**F224.** ⇨HMS
**F225.** STO C
**F226.** FS? 8
**F227.** VIEW C
**F228.** FS? 8
**F229.** VIEW K
**F230.** FS? 8
**F231.** VIEW D
**F232.** FS? 8
**F233.** VIEW B
**F234.** FS? 8
**F235.** VIEW L
**F236.** STOP
**F237.** RTN

**U01.** LBL U
**U02.** CF 10
**U03.** CF 0
**U04.** CF 1
**U05.** CF 2
**U06.** CF 3
**U07.** CF 4
**U08.** CF 5
**U09.** CF 6
**U10.** CF 8
**U11.** CLVARS
**U12.** CLx
**U13.** RTN

## Vertical Curve-1 (3 Labels)

**XEQ V** (Vertical Curve Using BVC & EVC)

**XEQ V** to start the program.
At the prompts, enter a value for the following and press **R/S**

**I?** Grade in (%)
**O?** Grade out (%)
**C?** PVC STA (without + sign)
**E?** PVC Elevation
**T?** PVT STA (without + sign)

After you have entered the **T** value and pressed **R/S**, the **PVT elevation** will be displayed.
Press **R/S** and the **Low or High Pt. Station** will be displayed.
Press **R/S** and the **Low or High Pt. Elevation** will be displayed.
Press **R/S** and you will be prompted for a station along the curve **S?**.
Enter the **station** (without + sign) and press **R/S**.
The **station elevation** will be displayed.
Press **R/S** to enter another **station** (without the + sign).

**V01. LBL V**
**V02. CLVARS**
**V03. FIX 4**
**V04. SF 10**
**V05. "VERT CURVE 1"**
**V06. PSE**
**V07. "ENTR GRADE IN"**
**V08. PSE**
**V09. INPUT I**
**V10. 100**
**V11. ÷**
**V12. STO I**
**V13. "ENTR GRADE OUT"**
**V14. PSE**
**V15. INPUT O**
**V16. 100**
**V17. ÷**
**V18. STO O**
**V19. "ENTR BVC STA"**
**V20. PSE**
**V21. INPUT B**
**V22. 0**
**V23. STO E**
**V24. STO F**
**V25. "ENTR BVC ELEV"**
**V26. PSE**
**V27. INPUT E**
**V28. STO A**
**V29. "ENTR EVC STA"**
**V30. PSE**
**V31. INPUT T**
**V32. "EVC ELEV="**
**V33. PSE**

**W01. LBL W**
**W02. CF 10**
**W03. T-B**
**W04. STO L**
**W05. (O-I) ÷(2xL)**
**W06. STO R**
**W07. A+(IxL)+(RxL$^2$)**
**W08. STO E**
**W09. RCL F**
**W10. X=0?**
**W11. VIEW E**
**W12. IxO**
**W13. X>0?**
**W14. GTO X**
**W15. (IxL) ÷(I-O)**
**W16. STO X**
**W17. B+X**
**W18. STO S**
**W19. STO L**
**W20. STO H**
**W21. A+(IxX)+RxX$^2$)**
**W22. STO E**
**W23. RCL A**
**W24. SF10**
**W25. "HI-LOW STA="**
**W26. PSE**
**W27. X>Y?**
**W28. VIEW L**
**W29. X<Y?**
**W30. VIEW H**
**W31. "HI-LOW ELEV="**
**W32. PSE**
**W33. VIEW E**
**W34. CF 10**

**X01. LBL X**
**X02. 0**
**X03. SF 10**
**X04. STO S**
**X05. "ENTR NEW STA"**
**X06. PSE**
**X07. INPUT S**
**X08. CF 10**
**X09. S-B**
**X10. STO X**
**X11. A+(IxX)+(RxX$^2$)**
**X12. STO E**
**X13. SF 10**
**X14. "NEW ELEV="**
**X15. PSE**
**X16. VIEW E**
**X17. CF 10**
**X18. GTO X**

**CHECK**

**1a.**
**I = GRADE IN = -3.5**
**O = GRADE OUT = 2.75**
**B = BVC STATION = 1350**
**E = BVC ELEVATION = 495.875**
**T = EVC STATION = 1650**

**E = EVC ELEVATION = 494.75**
**L = HI-LOW STATION = 1518**
**E = HI-LOW ELEVATION = 492.935**

**S = NEW STATION = 1570**

**E = NEW ELEVATION = 493.2167**

**2a.**
**I = GRADE IN = 3.5**
**O = GRADE OUT = -2.75**
**B = BVC STATION = 1350**
**E = BVC ELEVATION = 494.75**
**T = EVC STATION = 1650**

**E = EVC ELEVATION = 495.875**
**L = HI-LOW STATION = 1518**
**E = HI-LOW ELEVATION = 497.69**

**S = NEW STATION = 1570**

**E = NEW ELEVATION = 497.4083**

**1b.**
**I = GRADE IN = -3.5**
**O = GRADE OUT = -2.75**
**B = BVC STATION = 1350**
**E = BVC ELEVATION = 495.875**
**T = EVC STATION = 1650**

**E = EVC ELEVATION = 486.5**

**L = HI-LOW STATION = 1570**
**E = HI-LOW ELEVATION = 488.78**

**2b.**
**I = GRADE IN = 3.5**
**O = GRADE OUT = 2.75**
**B = BVC STATION = 1350**
**E = BVC ELEVATION = 494.75**
**T = EVC STATION = 1650**

**E = EVC ELEVATION = 504.125**

**L = HI-LOW STATION = 1570**
**E = HI-LOW ELEVATION = 501.845**

## Vertical Curve-2 (1 Label)
### (MUST BE USED IN CONJUNCTION WITH VERT 1!!!)

**XEQ Y** (Vertical Curve Elevations)

**XEQ Y** to start the program.
At the prompts, enter a value for the following and press **R/S**

**R?** PI STA (without + sign)
**S?** PI Elevation
**P?** Grade-in (%)
**Q?** Grade-out (%)
**L?** Curve length

After you have entered the **L** value and pressed **R/S**, the **High-Low Station** will be displayed.
Press **R/S** and the **High-Low Elevation** will be displayed.
Press **R/S** and the **PVC Station** will be displayed.
Press **R/S** and the **PVC Elevation** will be displayed.
Press **R/S** and the **PVT Station** will be displayed.
Press **R/S** and the **PVT Elevation** will be displayed
Press **R/S** and you will be prompted to run additional computations.

**Y01. LBL Y**
**Y02. FIX 4**
**Y03. CLVARS**
**Y04. SF 10**
**Y05. "VERT CURVE 2"**
**Y06. PSE**
**Y07. "ENTR GRADE IN"**
**Y08. PSE**
**Y09. INPUT I**
**Y10. 100**
**Y11. ÷**
**Y12. STO I**
**Y13. "ENTR GRADE OUT"**
**Y14. PSE**
**Y15. INPUT O**
**Y16. 100**
**Y17. ÷**
**Y18. STO O**
**Y19. "ENTR PVI STA"**
**Y20. PSE**
**Y21. INPUT P**
**Y22. 0**
**Y23. STO E**
**Y24. "ENTR PVI ELEV"**
**Y25. PSE**
**Y26. INPUT E**
**Y27. STO Z**
**Y28. 0**
**Y29. STO L**
**Y30. "ENTR CURVE LEN"**
**Y31. PSE**
**Y32. INPUT L**
**Y33. CF 10**
**Y34. P-(L ÷ 2)**
**Y35. STO B**
**Y36. SF 10**
**Y37. "BVC STA="**
**Y38. PSE**
**Y39. VIEW B**
**Y40. CF 10**
**Y41. E-(Ix(L ÷ 2))**
**Y42. STO E**
**Y43. STO A**
**Y44. SF 10**
**Y45. "BVC ELEV="**
**Y46. PSE**
**Y47. VIEW E**
**Y48. CF 10**
**Y49. P+(L ÷ 2)**
**Y50. STO T**
**Y51. SF 10**
**Y52. "EVC STA="**
**Y53. PSE**
**Y54. VIEW T**
**Y55. CF 10**
**Y56. Z+(Ox(L ÷ 2))**
**Y57. STO E**
**Y58. STO F**
**Y59. SF 10**
**Y60. "EVC ELEV="**
**Y61. PSE**
**Y62. VIEW E**
**Y63. CF 10**
**Y64. GTO W**

**CHECK 1**
**I = GRADE IN = -3.5**
**O = GRADE OUT = 2.75**
**P = PVI STATION = 1500**
**E = PVI ELEVATION = 490.625**
**L = CURVE LENGTH = 300**

**B = BVC STATION = 1350**
**E = BVC ELEVATION = 495.875**
**T = EVC STATION = 1650**
**E = EVC ELEVATION = 494.75**

**L = HI-LOW STATION = 1518**
**E = HI-LOW ELEVATION = 492.935**

**S = NEW STATION = 1570**

**E = NEW ELEVATION = 493.2167**

**CHECK 2**
**I = GRADE IN = 3.5**
**O = GRADE OUT = -2.75**
**P = PVI STATION = 1500**
**E = PVI ELEVATION = 500.000**
**L = CURVE LENGTH = 300**

**B = BVC STATION = 1350**
**E = BVC ELEVATION = 494.75**
**T = EVC STATION = 1650**
**E = EVC ELEVATION = 495.875**

**L = HI-LOW STATION = 1518**
**E = HI-LOW ELEVATION = 497.69**

**S = NEW STATION = 1570**

**E = NEW ELEVATION = 497.4083**

## XYZ-1 (1 Label)

**XEQ X** (Lat/Long to XYZ)

**XEQ X** to start the program.
At the prompts, enter a value for the following and press **R/S**

**A?** Ellipsoid semi-major axis (Defaulted to NAD83/WGS84/GRS80)
**E?** Eccentricity of Ellipsoid (Defaulted to NAD83/WGS84/GRS80)
**F?** Latitude
**L?** Longitude
**H?** Ellipsoidal height

After you have entered the **H** value and pressed **R/S**, the following results will be displayed:

**X?** X Co-ordinate
**Y?** **Y** Co-ordinate
**Z?** **Z** Co-ordinate

**X01. LBL X**
**X02. 6378137**
**X03. STO A**
**X04. 0.006694381**
**X05. STO E**
**X06. SF 10**
**X07. "ENTR SEMI-MAJOR AXIS"**
**X08. PSE**
**X09. "DEFAULT NAD83"**
**X10. PSE**
**X11. INPUT A**
**X12. "ENTR SEMI-MAJOR AXIS"**
**X13. PSE**
**X14. "DEFAULT NAD83"**
**X15. PSE**
**X16. INPUT E**
**X17. "ENTR LATITUDE"**
**X18. PSE**
**X19. INPUT F**
**X20. "ENTR LONGITUDE"**
**X21. PSE**
**X22. INPUT L**
**X23. "ENTR ELIPSOID HEIGHT"**
**X24. PSE**
**X25. INPUT H**
**X26. RCL A**
**X27. 1**
**X28. RCL F**
**X29. ⇨HR**
**X30. SIN**
**X31. $X^2$**
**X32. RCLxE**
**X33. –**
**X34. √X**
**X35. ÷**
**X36. STO V**
**X37. RCL+H**
**X38. RCL F**
**X39. ⇨HR**
**X40. COS**
**X41. x**
**X42. RCL L**
**X43. ⇨HR**
**X44. COS**
**X45. x**
**X46. STO X**
**X47. "X CO-ORDINATE="**
**X48. PSE**
**X49. VIEW X**
**X50. RCL L**
**X51. ⇨HR**
**X52. TAN**
**X53. x**
**X54. STO Y**
**X55. "Y CO-ORDINATE="**
**X56. PSE**
**X57. VIEW Y**
**X58. RCL V**
**X59. 1**
**X60. RCL-E**
**X61. x**
**X62. RCL+H**
**X63. RCL F**
**X64. ⇨HR**
**X65. SIN**
**X66. x**
**X67. STO Z**
**X68. "Z CO-ORDINATE="**
**X69. PSE**
**X70. VIEW Z**
**X71. RTN**

## XYZ-2 (1 Label)

**XEQ Y** (XYZ to Lat/Long)

**XEQ Y** to start the program.
At the prompts, enter a value for the following and press **R/S**

**A?** Ellipsoid semi-major axis (Defaulted to NAD83/WGS84/GRS80)
**E?** Eccentricity of Ellipsoid (Defaulted to NAD83/WGS84/GRS80)
**X?** X Co-ordinate
**Y?** **Y** Co-ordinate
**Z?** **Z** Co-ordinate

After you have entered the **Z** value and pressed **R/S**, the following results will be displayed:

**F?** Latitude
**L?** Longitude
**H?** Ellipsoidal height

**Y01. LBL Y**
**Y02. 6378137**
**Y03. STO A**
**Y04. 0.006694381**
**Y05. STO E**
**Y06. SF 10**
**Y07. "ENTR SEMI-MAJOR AXIS"**
**Y08. PSE**
**Y09. "DEFAULT NAD83"**
**Y10. PSE**
**Y11. INPUT A**
**Y12. "ENTR ECCENTRICITY"**
**Y13. PSE**
**Y14. "DEFAULT NAD83"**
**Y15. PSE**
**Y16. INPUT E**
**Y17. "ENTR X COORDINATE"**
**Y18. PSE**
**Y19. INPUT X**
**Y20. "ENTR Y COORDINATE"**
**Y21. PSE**
**Y22. INPUT Y**
**Y23. "ENTR Z COORDINATE"**
**Y24. PSE**
**Y25. INPUT Z**
**Y26. RCL Y**
**Y27. RCL X**
**Y28. ÷**
**Y29. ATAN**
**Y30. STO L**
**Y31. 1**
**Y32. RCL-E**
**Y33. RCL A**
**Y34. $X^2$**
**Y35. x**
**Y36. √X**
**Y37. STO B**
**Y38. RCL A**
**Y39. $X^2$**
**Y40. RCL B**
**Y41. $X^2$**
**Y42. –**
**Y43. RCL B**
**Y44. $X^2$**
**Y45. ÷**
**Y46. STO D**
**Y47. RCL X**
**Y48. RCL Y**
**Y49. y,x⇨0,r**
**Y50. STO P**
**Y51. RCL Z**
**Y52. X<>Y**
**Y53. ÷**
**Y54. RCL A**
**Y55. RCL ÷ B**
**Y56. x**
**Y57. ATAN**
**Y58. STO U**
**Y59. SIN**
**Y60. 3**
**Y61. $Y^X$**
**Y62. RCLxB**
**Y63. RCLxD**
**Y64. RCL+Z**
**Y65. RCL U**
**Y66. COS**
**Y67. 3**
**Y68. $Y^X$**
**Y69. RCLxA**
**Y70. RCLxE**

**Y71. RCL P**
**Y72. X<>Y**
**Y73. –**
**Y74. ÷**
**Y75. ATAN**
**Y76. STO F**
**Y77. RCL A**
**Y78. 1**
**Y79. RCL F**
**Y80. SIN**
**Y81. $X^2$**
**Y82. RCLxE**
**Y83. –**

**Y84. √X**

**Y85. ÷**
**Y86. STO V**
**Y87. RCL F**
**Y88. COS**
**Y89. x**
**Y90. RCL L**
**Y91. COS**
**Y92. x**
**Y93. STO C**
**Y94. RCL-X**
**Y95. $X^2$**
**Y96. STO H**
**Y97. RCL C**
**Y98. $X^2$**
**Y99. STO G**
**Y100. RCL C**
**Y101. RCL L**
**Y102. TAN**
**Y103. x**
**Y104. STO C**
**Y105. $X^2$**
**Y106. STO+G**
**Y107. RCL C**
**Y108. RCL-Y**
**Y109. $X^2$**
**Y110. STO+H**
**Y111. RCL V**
**Y112. 1**
**Y113. RCL-E**
**Y114. x**
**Y115. RCL F**
**Y116. SIN**
**Y117. x**
**Y118. STO C**
**Y119. $X^2$**
**Y120. STO+G**
**Y121. RCL C**
**Y122. RCL-Z**
**Y123. $X^2$**
**Y124. STO+H**
**Y125. RCL X**
**Y126. $X^2$**
**Y127. STO Y**
**Y128. $X^2$**
**Y129. +**
**Y130. RCL Z**
**Y131. $X^2$**
**Y132. +**

**Y133. √X**

**Y134. RCL G**

**Y135. √X**

**Y136. –**
**Y137. ENTER**
**Y138. ABS**
**Y139. ÷**
**Y140. RCL H**

**Y141. √X**

**Y142. x**
**Y143. STO H**
**Y144. RCL F**
**Y145. ⇨HMS**
**Y146. STO F**
**Y147. "LATITUDE="**
**Y148. PSE**
**Y149. VIEW F**
**Y150. RCL L**
**Y151. ⇨HMS**
**Y152. STO L**
**Y153. "LONGITUDE="**
**Y154. PSE**
**Y155. VIEW L**
**Y156. "ELIPSOID HEIGHT="**
**Y157. PSE**
**Y158. VIEW H**
**Y159. RTN**