

# HP-41C

## Surveying

### Quick Reference Card

#### Traverses Inverses and Side Shots

(Minimum size 016)

Place TRAV overlay on keyboard.

**XEO** TRAV and choose output modes.

Input beginning coordinates: N1 **R/S**, E1 **R/S**.

#### Bearing/Azimuth Traverse

Input BRG **B** and QD **R/S**, or AZ **B** and horizontal distance; HD **D**.

#### Or, Field Angle Traverse

Input Ref. Azimuth away from point; AZ **H**

Or, Ref. Azimuth toward point; AZ **B**

Or, bearing toward point; BRG **B** and QD **R/S**.

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Then input:

Angle right; AR **C**

Or, angle left; AL **CHS** **C**

Or, deflection right; DR **C**

Or, deflection left; DL **CHS** **C**

And horizontal distance; HD **D**.

Press **R/S** to display results.

Repeat for next course.

Press **A** to start new traverse.

#### Inverse

Input beginning coordinates **A**, N1 **R/S**, E1 **R/S**. (Not required if inverting from current point.)

Input coordinates of next point; N **ENTER** E **A**.

Press **R/S** to display results.

Repeat for next course.

Press **A** to start new traverse.

#### Sideshots

Occupied point is last point traversed.

For different occupied point; press **A** and input coordinates. (Caution: this destroys traverse data.)

Press **J** to set side shot mode. See SS.

Make sideshots in same way as traverse or inverse.

To return to traverse mode press **I**

#### Slope Distance Reduction

Input slope distance; SD **D** and vertical or zenith angle; **R/S**.

Horizontal distance is automatically input.

Press **R/S** to display results.

#### Closure for Traverses

Complete the closed traverse and begin closure: Press **E**,  $\Sigma$ HD is displayed. Press **R/S**, AREA is displayed.

Input correct closing coordinates; N **R/S**, E **R/S** and press **R/S** to display closure azimuth (or bearing) and closure distance.

To include error course; inverse to correct coordinates and execute closure routine again.

#### Curved Sides for Traverses

Traverse to PC, input the angle to PT

Begin Curved Sides routine: **E**, input central angle: DELTA **R/S**.

Input radius: R **R/S** and display segment area. (Note: input negative radius to exclude the segment area from traverse.)

Press **R/S** to display tangent (T), arc length (L) and chord (C).

Press **D** to input (C) as the horizontal distance to PT.

Press **R/S** to display results.

## Traverse Adjustments

(Minimum size 016)

Choose compass rule; **XEQ** **COMP**, or transit rule; **XEQ** **TRANSIT**

Answer DATA IN?. If traverse has just been run, **Y** **R/S**.

If data must be stored manually, **N** **R/S**.

If data must be stored: input beginning **N** **R/S**, beginning **E** **R/S**,  $\Sigma$ HD (compass rule only) **R/S**, ending **N** **R/S**, ending **E** **R/S**.

Answer the prompt OPEN?; if traverse is open, answer **Y** **R/S** and input correct end **N** **R/S** and correct end **E** **R/S**.

If traverse is closed answer **N** **R/S**.

*For Transit Rule only:* input coordinates of each point in order, beginning with second point and including the ending point. Then **XEQ** **ADJUST**

Then input coordinates of points in order, beginning with second point and obtain adjusted coordinates for each point by pressing **R/S**. Repeat for each pair of coordinates.

## Intersections

(Minimum size 014)

Begin intersections program; **XEQ** **INTER** and choose type of intersection.

Bearing-Bearing (BB); press **A**

Bearing-Distance (BD); press **B**

Distance-Distance (DD); press **C**

Offset from point to line (OFS); press **D**  
Follow prompting; input coordinates of points 1 and 2 and bearings or distances from the points.

Obtain results by pressing **R/S**.

## Curve Solutions

(Minimum size 005)

Place CURVE overlay on keyboard.

Begin curve solutions program; **XEQ** **CURVE**  
Input radius (R), or press **R/S** and input degree of curve (D), or press **R/S** and input central angle (DELTA).

If R or D, and DELTA were input press **R/S** to obtain results.

If only one of the above was input see prompt: L T C M E.

Input:

Arc length; L, press **A**,

or Tangent; T, press **B**,

or Chord; C, press **C**,

or Midordinate; M, press **D**,

or External; E, press **E**.

Then press **R/S** to obtain results.

To start over; press **A**

To calculate L, T, C, M and E, press **B**

To calculate areas; press **C**

(Note: For D, by chord definition, set mode by pressing **E**.)

## Horizontal Curve Layout

(Minimum size 014)

Place HORIZ overlay on keyboard.

Begin horizontal curve layout; **XEQ** **HORIZ**  
Input R (or D) and DELTA.

Press **R/S** to calculate L.

Input PC **R/S** or press **R/S** and input PI **R/S**.

Press **R/S** to display PT, PI and PC.

Input station; STA **G** and display prompt for type of layout: PC PI TO CO

Choose type of layout:

PC deflection; press **A**

PI deflection; press **B**

Tangent Offset; press **C**

Chord Offset; press **D**

Press **R/S** to display field data.

Input next desired station; STA **G** and proceed as above or, if automatic stationing is desired, input stationing interval; INT **I** and proceed as above, choosing type of layout. Then continue to press **R/S** and obtain field data until PT is reached.

## Vertical Curves and Grades

(Minimum size 014)

Place VERT overlay on keyboard.

Begin program; **XEQ** **VERT** and answer

CURVE? prompt **Y** **R/S** for vertical curves or **N** **R/S** for straight grades.

### For Grades:

Input beginning station; STA1 **[R/S]**, elevation at beginning station; EL1 **[R/S]** and GRADE % **[R/S]**.

### For Vertical Curves:

Input PC **[R/S]**, or press **[R/S]** and input PI **[R/S]**.

Input elevation of PC or PI (whichever was input above), EL **[R/S]**.

Input beginning grade; GRADE BEG% **[R/S]** and ending grade; GRADE END% **[R/S]**.

Input horizontal length of curve; L **[R/S]** or press **[R/S]** and input elevation of the high or low point of the curve; EL0 **[R/S]**, or press **[R/S]** and input station and elevation through which the curve passes; STA **[R/S]**, EL **[R/S]**.

### For Either Case:

Input station; STA **[G]** and press **[R/S]** to find its elevation.

Or, input elevation; EL **[H]** and press **[R/S]** to find station (2 stations for curves).

Or (for vertical curves only), press **[J]** to find max. or min. station; press **[R/S]** for corresponding elevation.

### For Automatic Stationing:

Input stationing interval; INT **[I]** and press **[R/S]** to display results. (For curve, automatic stationing will halt at PT.)

## Resection

(Minimum size 016)

Begin resection program; **[XEQ] RESECT** and answer **Y [R/S]** if coordinates are known or **N [R/S]** if they are not known.

### If Coordinates Are Known:

Input coordinates of points 1 through 3 in clockwise order, pressing **[R/S]** after each.

### Or, if Coordinates Are Not Known:

Input distances between points 1 and 2 and points 2 and 3, then input angle C, pressing **[R/S]** after each.

### In Either Case:

Input angles A and B, pressing **[R/S]** after each; press **[R/S]** to obtain answers.

## Predetermined Area

(Minimum size 014)

Begin predetermined area program; **[XEQ] PREAREA** and see prompt: TRI&?

Answer **Y [R/S]** if land parcel is a triangle, **N [R/S]** if a trapezoid. Press **[R/S]** and see prompt: COORDS?

Answer prompt; **Y [R/S]** if coordinates are known, **N [R/S]** if unknown.

### For Triangular Parcels:

Input coordinates of points 1 and 2 and bearing from point 2 to 3, or, (if coordinates are not known), input angle at point 2 and horizontal distance from point 1 to point 2, pressing **[R/S]** after each.

See prompt: AREA=?

Input the desired area, press **[R/S]** to obtain the results.

### For Trapezoidal Parcels:

Input coordinates of point 1, bearing of line from 1 to 3, coordinates of point 2, bearing of line from 2 to 4. Or, (if coordinates are not known), input angles at points 1 and 2 and the distance from point 1 to point 2, pressing **[R/S]** after each.

See prompt: AREA=?

Input the desired area, press **[R/S]** to obtain the results.

## Volume by Average End Area

(Minimum size 014)

Begin program; **[XEQ] ENDEVOL** and see prompt: CU YDS?

Choose volume output:

**Y [R/S]** if in cubic yards;

**N [R/S]** if in cubic feet.

Press **[R/S]**, see STA#, then press **[R/S]** for prompt: EL↑D=?

Input elevation; EL **ENTER** and distance; D **R/S** for each point on the cross-section.

Continue around section until all points have been input, including reinput of the beginning point.

(Note: If a section has zero area press **R/S** without entering data.)

Press **R/S** and input interval between stations: INT **R/S**. Press **R/S** to obtain results. (Note: Input INT=0 for first station.)

## Volume of a Borrow Pit

(Minimum size 014)

Begin program; **XEQ** PIT and see prompt: CU YDS?

Choose volume output;

**Y** **R/S** if in cubic yards,

**N** **R/S** if in cubic feet.

Press **R/S** see STA#, then press **R/S** for prompt B↑H=?

Input base (or width); B **ENTER** and height (or length) H **R/S** of the triangular (or rectangular) section.

Input elevation at each corner; EL **R/S**.

After last elevation (third for triangular, fourth for rectangular) is input, press **R/S**, *without data entry*, to obtain results. Then go to the next station by pressing **R/S**.

## Coordinate Transformation

(Minimum size 014)

Begin program; **XEQ** COORD, see prompt ROT.Δ=?

### If Rotation Angle is Known:

Input rotation angle (negative for clockwise rotation); **R/S**, and scale factor (if other than 1), press **R/S**.

Input coordinates of a point in the old system; N1 OLD **R/S**, E1 OLD **R/S** and coordinates of same point in new system; N1 NEW **R/S**, E1 NEW **R/S**.

### Or, if 2 Points in Each System Are Known:

At prompt; ROT.Δ=? press **R/S**, *without prior data entry*. Then input coordinates of points 1 and 2 in the old system; N1 OLD **R/S**, E1 OLD **R/S**, N2 OLD **R/S**, E2 OLD **R/S** and coordinates of same points in new system; N1 NEW **R/S**, E1 NEW **R/S**, N2 NEW **R/S**, E2 NEW **R/S**.

### To Transform Coordinates From Old to New System:

Input coordinates in old system; N **ENTER** E **A** and obtain coordinates in new system. (Press **R/S** to obtain E.)

### To Transform Coordinates From New to Old System:

Input coordinates in new system; N **ENTER** E **B** and obtain coordinates in old system. (press **R/S** to obtain E.)

