INSTRUCTIONS

NOTE: YOU MUST HIT R/S AFTER EVERY VARIABLE ENTERED TO PROMPT YOU FOR NEXT VARIABLE.

XEQ A= TRIANGLES SIDE, SIDE, SIDE
This program prompts you for three sides of a triangle and gives you the answers in the order they were given side angle side angle side angle. THIS IS THE ONLY TRIANGLE PROGRAM THAT DISPLAYS AREA.
XEQ B= TRIANGLES SIDE, ANGLE, SIDE
This program prompts you for side included angle and side of a triangle and gives you the answers in the order they were given side angle side angle side angle.
XEQ C= TRIANGLES SIDE, ANGLE, ANGLE
This program prompts you for side included angle and opposite angle of a triangle and gives you the answers in the order they were given side angle side angle side angle.
XEQ D= TRIANGLES ANGLE, SIDE, ANGLE
This program prompts you for angle included side and angle of a triangle and gives you the answers in the order they were given side angle side angle side angle.
XEQ E= TRIANGLES SIDE, SIDE, ANGLE, BOTH SOLUTIONS
This program prompts you for side side and opposite angle of a triangle and gives you the answers in the order they were given side angle side angle side angle. There are two possible solutions so both are given.
XEQ F= AREA BY COORDINATES enter coordinates of given area and when finished RE-enter the beginning coordinates to get results. Perimeter, square feet and acreage are displayed.
XEQ H= HORIZONTAL CURVE SOLUTION
This program prompts you for radius and delta of a horizontal curve. All components of the curve will be displayed.

XEQ I= INVERSE
Input beginning northing and Easting and ending northing and easting and hit r/s twice and the distance will be displayed on top and the angle on bottom.

XEQ J= AZIMUTH AZIMUTH INTERSECTION
Enter northing and easting of first point to intersect followed by the azimuth. Then enter northing and easting of second point to intersect followed by the azimuth. The intersecting N&E WILL BE DISPLAYED.

XEQ K= DISTANCE DISTANCE INTERSECTION
Enter northing and easting of first point to intersect followed by the distance left of baseline. Then enter northing and easting of second point to intersect followed by the distance right of baseline. You must enter the left distance first no matter how you look at it. The intersecting N&E WILL BE DISPLAYED.
XEQ L= LAYOUT CURVE WITH OFFSET
First enter beginning curve station, beginning curve northing, beginning curve easting, radius point northing, radius point easting, than hit r/s twice the answers displayed are azimuth and distance from bc to radius and vice versa. Then enter the direction of curve 0=left 1= right. Then input station to stake and offset radius. You must enter the radius of you offset line. Then hit r/s and the distance on top is distance from the instrument and azimuth. In stakeout left you must hit r/s twice to get your angle and distance from instrument. Don't forget to setup instrument coordinates with XEQ O.
XEQ M= HOURS, MINUTES, SECONDS MINUS-
Enter larger value first in hms and smaller value second in hms and the answer will be subtracted in hours minutes and seconds.

XEQ N= HOURS, MINUTES, SECONDS PLUS+
Enter value first in hms and value second in hms and the answer will be added in hours minutes and seconds.
XEQ O=OCCUPYING NORTHING AND EASTING FOR INSTRUMENT
This works in conjunction with traverse and is for the occupied northing and easting. This will also be for up and coming programs.

XEQ P= Point in direction with offset. Enter beginning station of tangent, beginning northing of tangent, beginning easting of tangent, beginning azimuth of tangent, direction of offset 0=left 1= right, hit r/s and enter station to be staked and offset from object line, if no offset needed enter 0. This will give you a distance on top and an azimuth on bottom from instrument. Don't forget to setup instrument with XEQ O.

XEQ Q= ANGLE DISTANCE INTERSECTION
Enter northing and easting of first point to intersect followed by the azimuth from the baseline. Then enter northing and easting of second point to intersect followed by the distance from baseline. Two solutions should appear.

XEQ S= STRAIGHT GRADE/ RATE PROGRAM
Enter beginning station beginning elevation and beginning grade 1.0 is one percent if you want negative one percent you muse enter -1.0 and then enter station desired to calculate grade. The top line will display the station and the bottom line will be the elevation at the station desired. If you enter 0 this will start the rate program.

XEQ T= TRAVERSE
Enter the beginning northing and easting the azimuth you are traversing on and the distance you are traveling. Hit r/s once and the distance from the occupied point will be on top and the azimuth on the bottom. Hit r/s again and the northing of the point you just traversed to will display in the northing portion and the easting in the easting portion. This way you do not have to re-enter the coordinates in traverse and can see them as you continue to traverse with new azimuth and distance.

XEQ V= VERTICAL CURVE
Enter beginning station, beginning elevation, grade in, grade out, and length of vertical curve. Rcl H to find the lowpoint or highpoint station. Hit r/s to enter station desired. Top line will be the elevation and the bottom line will be the station desired.

At any time you can recall a variable entered by RCL N for Northing etc. when a program prompts you for information you must learn what the program is prompting you for, which is labeled in each program.

IF YOU ARE IN A PLACE IN THE CALCULATOR AND WANT TO STOP EVERYTHING HIT THE ON KEY UNTIL THE PROGRAM IS TERMINATED.

NEVER PUT CALCULATOR NEAR A MAGNET

Very important when clearing variables **NEVER** hit green clear and hit the 3 key all.
This will erase all your programs. ← **key** is the drop key and is sufficient to erase the line.
If you think you need to use green clear ← key you can use clear vars only #2.
I suggest don't play with this green option until you understand what you are doing

(PLEASE READ 6-3 OF YOUR HP33S MANUAL)
(PLEASE READ 17-2 OF YOUR HP33S MANUAL)
INTEREST (TIME VALUE OF MONEY)

Px100x(1-(1+I/100)^-N)/I+Fx(1+I/100)^-N+B page 17-2

P=PAYMENTS I=ANNUAL INTEREST
N=NO. PAYMENTS F=FUTURE VALUE
B=BORROWED AMOUNT

EXAMPLE: BORROW $32,000.00 FOR 5 YEARS AT 5%.
FUTURE VALUE = 0 (NO BALLOON) MONTHLY
PAYMENTS AND MONTHLY INTEREST

<SOLVE>_ P I? 5<ENTER> 12÷ R/S N? 5<ENTER>12x R/S
F? 0 R/S B? 32000 R/S P=-603.88

EXAMPLE: P=$500, ALL OTHERS REMAIN THE SAME,
FIND B:

<SOLVE>_ B P? 500± R/S I? R/S N? R/S F? R/S
B=26495.35

LONG CHORD EQUATION ENTRY

R=C÷(2*SIN(D÷2))

THIS SOLVES FOR MISSING DELTA, RADIUS, LONG CHORD, ANY COMBINATION OF 2.
VERY IMPORTANT THAT DELTA IS ENTERED IN DECIMALS OF A DEGREE

MIDDLE ORDINATE EQUATION ENTRY

R=M÷(1-COS(D÷2))

THIS SOLVES FOR MISSING DELTA, RADIUS, MIDDLE ORDINATE, ANY COMBINATION OF 2.
VERY IMPORTANT THAT DELTA IS ENTERED IN DECIMALS OF A DEGREE

EXTERNAL ORDINATE EQUATION ENTRY

R=E*COS(D÷2)÷(1-COS(D÷2))

THIS SOLVES FOR MISSING DELTA, RADIUS, EXTERNAL ORDINATE, ANY COMBINATION OF 2. VERY IMPORTANT THAT DELTA IS ENTERED IN DECIMALS OF A DEGREE

TANGENT EQUATION ENTRY

R=T*(1÷TAN(D÷2))

THIS SOLVES FOR MISSING DELTA, RADIUS,TANGENT, ANY COMBINATION OF 2.
VERY IMPORTANT THAT DELTA IS ENTERED IN DECIMALS OF A DEGREE

LENGTH OF CURVE EQUATION ENTRY

L=PIE*R*D÷180

THIS SOLVES FOR MISSING DELTA, RADIUS,LENGTH OF CURVE, ANY COMBINATION OF 2.
VERY IMPORTANT THAT DELTA IS ENTERED IN DECIMALS OF A DEGREE

LOCATE STATION AND OFFSET BY COORDINATES

WRITTEN BY JOHN BUTCHER

PROGRAM FOR THE HP 33S

YOU MUST SET UP YOUR LAYOUT CURVE WITH OFFSET STAKING FIRST. THIS WORKS SEPERATE FROM ANY OTHER PROGRAM. AFTER DOING YOUR LOCATE STATION AND OFFSET BY COORDINATES, YOU MUST RE-ENTER YOUR OCCUPIED POINT AND LAYOUT CURVE WITH OFFSET INFORMATION TO START RADIAL STAKEOUT AGAIN.YOU CANNOT MIX AND MATCH WITH THIS PROGRAM.

STATION WILL BE DISPLAYED ON TOP LINE AND OFFSET FROM RADIUS WILL BE DISPLAYED ON THE BOTTOM LINE. THE OFFSET DISPLAYED WILL BE FROM THE RADIUS. IF CENTERLINE IS 4OO FEET AND IT SAYS YOU ARE 450 THAT WOULD MEAN YOU ARE 5O FEET FROM CENTERLINE.

BY JOHN BUTCHER

THIS PROGRAM WAS WRITTEN AS AN ALTERNATIVE TO HMS+

This program will not work when delta goes past 180

CHECK PROBLEMS FOR PROGRAMS

PLEASE USE ANGLE DISTANCE INTERSECTION TRIANGLE DIAGRAM FOR CHECK PROBLEMS

HORIZONTAL CURVE SOLUTION

RADIUS = 450
DELTA = 45
LENGTH = 353.429
CHORD = 344.415
TANGENT=186.396
MID ORDINATE = 34.254
EXT ORDINATE = 37.076
SECTOR AREA = 79,521.561
FILLET = 4356.682
SEGMENT AREA = 7927.002

VERTICAL CURVE
BVC 10+00 EL = 106.50
EVC 11+46 EL = 108.69
HIGH LOW POINT = RCL H 10+41.71
BEG GRADE -2.0
END GRADE 5.0
VC LENGTH 146.0

PERIMETER FOR PROBLEM = 248.5532
SQUARE FEET 3,658.175
ACRES = .084

POINT IN DIRECTION WITH OFFSET

OCCUPIED SETUP
1000.0
1000.0
BEG STATION = 1+00
BEG COORDINATES
963.4182
1058.0677
AZIMUTH 48.5355
DIRECTION OF OFFSET 0 = LEFT 1 = RIGHT
STATION TO STAKE 1+55.647

OFFSET = 0
DISTANCE = 100.00 AZIMUTH = 90.0000
15.0 OFFSET LEFT DISTANCE =90.845 AZIMUTH = 82.5109
15.0 OFFSET RIGHT DISTANCE = 110.441 AZIMUTH = 95.5227
OFFSET LEFT TO RIGHT CAN BE DONE BY USING -15 FOR LEFT IN RIGHT SIDE STAKING MODE

THIS CHECK PROBLEM USES ANGLE/DISTANCE TRIANGLE DIAGRAM COORDINATES

CURVE OFFSET STAKING

OCCUPIED
1000.00
1000.00
BEG STATION 1+00
BEG CURVE NORTHING AND EASTING
1000.00
1100.00
BEG RADIUS NORTHING AND EASTING
963.4182
1058.0677
HIT R/S TWICE THEN THE RADIUS IS DISPLAYED ON THE TOP AND THE AZIMUTH FROM RADIUS POINT TO THE BEG COORDINATES IS DISPLAYED ON THE BOTTOM.
HIT R/S AGAIN AND ENTER DIRECTION OF CURVE 0 = LEFT 1= RIGHT
STATION TO STAKE 1+00
OFFSET = **RADIUS TO BE STAKED VERY IMPORTANT**
HIT R/S
DISTANCE ON TOP = 100.00
AZIMUTH = 90.0000

ANSWERS ARE FOR CURVE RIGHT

OFFSET 15 RIGHT 1+00 DISTANCE = 89.24 AZIMUTH = 96.2038

OFFSET 15 LEFT 1+00 DISTANCE = 111.74 AZIMUTH = 84.5614

ANSWERS ARE FOR CURVE LEFT

STATION 1+00 15 LEFT DISTANCE = 89.24 AZIMUTH = 96.2038

STATION 1+00 15 RIGHT DISTANCE = 111.74 AZIMUTH = 84.5614

I suggest reading chapter 12-5 to 12-15, 17-1

CURRENT COORDINATE

AT THE END OF EVERY OFFSET STAKING PROGRAM
AFTER RCL Q THEN STOP YOU CAN ADD THIS SUB-ROUTINE.

THIS WILL GIVE YOU A COORDINATE OF THE LAST CALCULATED OFFSET STAKED POINT AFTER THE DISTANCE AND AZIMUTH ARE DISPLAYED

RCL Q
STOP
Then add the following
RCL Q
→HR
RCL P
O,R→Y,X
RCL + Y
STO G
X<>Y
RCL + X
STO H
RCL G **(OFFSET NORTHING)**
RCL H **(OFFSET EASTING)**
STOP
THEN THE REST OF THE PROGRAM SHOULD BE
GTO___
RTN