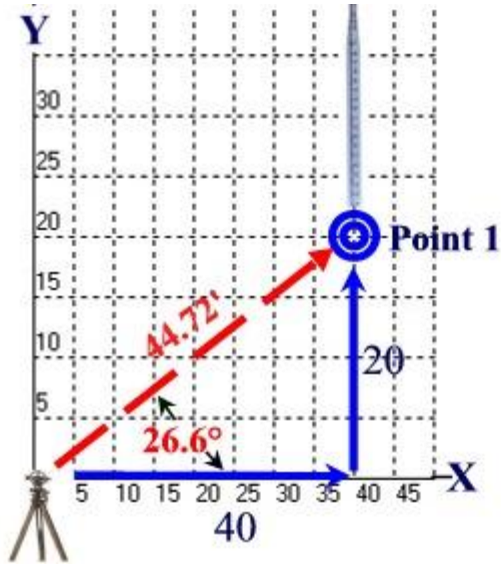
POLAR COORDINATES: Seeking a Distance and an Angle

It is convenient at times to locate points on a jobsite by turning a certain angle along a known line and measuring a distance from the instrument to the desired point. The example below is used in the explanation of Rectangular Coordinates, as used in Total Station layout. Point 1 is 40’ along one axis and then offset 20’ at 90°. Using a Transit and tape measure (or the stadia feature in a Transit), Point 1 can be located by turning an angle of 26.6° and measuring out 44.72’. For those fluent with trigonometry, a tangent calculation and Pythagorean Theorem exercise will obtain the desired angle and distance. For the rest of us, an inexpensive Scientific Calculator will solve the problem nicely. In selecting a Calculator, be sure the instrument converts **Rectangular→Polar Coordinates** and also **Decimal Degrees→DegreesMinutesSeconds**.



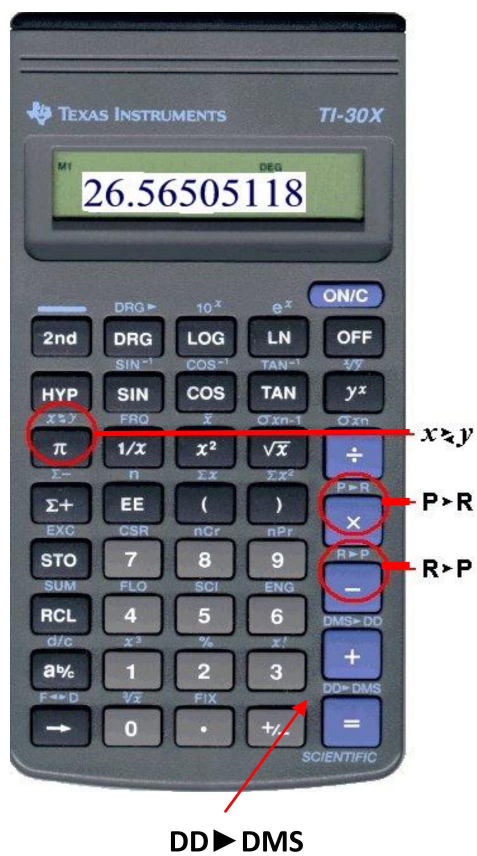
Various calculators will have slightly different sequences to obtain Polar Coordinates (i.e. angle & distance). Having access to a Texas Instrument TI-30x, the key strokes are as follows

Rectangular to Polar

[2nd] [R▸P] converts rectangular coordinates (x,y) to polar coordinates (r,θ).

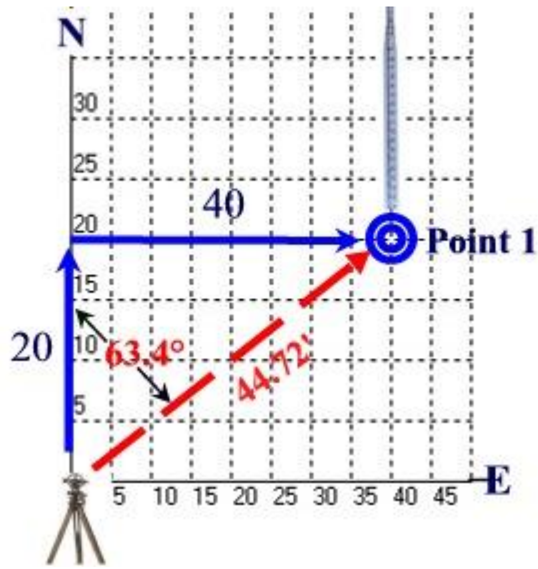
Convert rectangular coordinates (40,20) to polar.

40 [2nd] [x⇄y] **20**	DEG	**20**
[2nd] [R▸P] (display r)	DEG r	**44.7213595**
[2nd] [x⇄y] (display θ)	DEG	**26.56505118**



With 26.56505118 displayed as a Decimal Degree, by choosing **2nd** function and **DD▶DMS** a reading of **26°33’54”** will be displayed.

To use N/E instead of X/Y, such as shown:



the results would be the following:

Rectangular to Polar

[2nd] [R►P] converts rectangular coordinates (x,y) to polar coordinates (r,θ).

Convert rectangular coordinates(20,40) to polar.

20 [2nd] [x⇆y] **40**	DEG	**40**
[2nd] [R►P] (display r)	DEG r	**44.7213595**
[2nd] [x⇆y] (display θ)	DEG	**63.4349488**

With 63.4349488 displayed as a Decimal Degree, by choosing **2nd** function and **DD►DMS** a reading of **63°26’05”** will be displayed.