

[6.25] Polar and rectangular coordinate conversions

The 89/92+ provide a variety of methods to convert point or vector coordinates between polar and rectangular formats.

You can use the Vector Format setting in the Mode menu to perform conversions automatically from the command line. If the Vector Format is set to RECTANGULAR, then coordinates entered in polar format are converted to rectangular coordinates when the vector is entered. For example, if the mode is RECTANGULAR and $[\sqrt{2}, \angle\pi/4]$ in polar coordinates is entered, then $[1,1]$ is returned. If the Vector Format is set to CYLINDRICAL or SPHERICAL and $[1,1]$ in rectangular coordinates is entered, then $[\sqrt{2}, \angle\pi/4]$ is returned.

You can also use the conversion functions $\blacktriangleright\text{Polar}$ and $\blacktriangleright\text{Rect}$ to convert vector coordinates. For example, $[1,1]\blacktriangleright\text{Polar}$ returns $[\sqrt{2}, \angle\pi/4]$, and $[\sqrt{2}, \angle\pi/4]\blacktriangleright\text{Rect}$ returns $[1,1]$. However, note that $\blacktriangleright\text{Polar}$ and $\blacktriangleright\text{Rect}$ are called "display-format" instructions. They only affect the display of the vector: they do not really convert the vectors.

Finally, these functions can be used to return just one part of a converted vector:

$\text{P}\blacktriangleright\text{Rx}(r, \theta)$	Return x-coordinate of polar vector argument
$\text{P}\blacktriangleright\text{Ry}(r, \theta)$	Return y-coordinate of polar vector argument
$\text{R}\blacktriangleright\text{Pr}(x, y)$	Return magnitude r of rectangular vector argument
$\text{R}\blacktriangleright\text{P}\theta(x, y)$	Return angle θ of rectangular vector argument

These functions can be used to write user functions which, unlike $\blacktriangleright\text{Polar}$ and $\blacktriangleright\text{Rect}$, *do* actually convert the input vector. These functions are:

```
polar(v)
func
©Convert vector v to polar
[R▶Pr(v[1,1],v[1,2]),R▶Pθ(v[1,1],v[1,2])]
EndFunc
```

```
rect(v)
func
©Convert vector v to rectangular
[P▶Rx(v[1,1],v[1,2]),P▶Ry(v[1,1],v[1,2])]
EndFunc
```

$\text{polar}([1,1])$ returns $[\sqrt{2}, \pi/4]$. $\text{rect}([\sqrt{2}, \pi/4])$ returns $[1,1]$. Note that these routines assume the current Angle Mode setting. If the angle mode is radians, then the angles are in radians. If you or your application expect the arguments or results to be in degrees or radians, set the proper mode.

(Credit to Sam Jordan for prompting my write-up; code (and bugs) are mine)