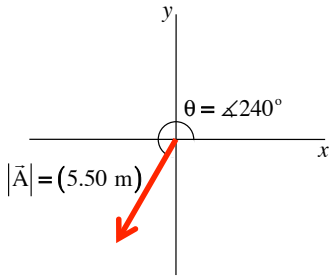
Problem 3.1

Polar notation gives you a magnitude (in this case, 5.5 meters) and an angular position (in this case 240 degrees) and presents the information as shown below:

$$\vec{A} = (5.50\ \text{m}) \measuredangle 240^\circ$$

Notice that this is not the ordered pair $(5.50\ \text{m},\ 240^\circ)$ you are used to seeing in math class. It is the same information, just presented differently!

As the angle is measured relative to the +x axis, the graph is as shown to the right:

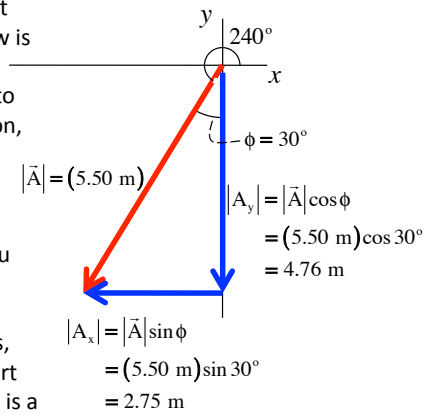


The most visually justifiable way of getting the end-point is to create a right-triangle one-angle of which you know. I've done this below.

Though there is a lot more information that could be mined from this problem (like how is the vector represented using a *unit vector notation*), the sketch presents the answer to our question. Using standard math notation, the endpoint can be seen to be:

(-2.75, -4.76) meters.

Note that in creating your own triangle, you created a situation in which you could use angles less than 90°. As such angles always produce positive sine and cosine quantities, with this approach you must manually insert any needed signs. For this case, the vector is a third quadrant vector, so both the x and y-components are negative.



As an additional note, if you wanted to present the vector A in *unit vector notation* (the standard for physicists when components are involved), you would essentially have to tack unit vectors onto the component magnitudes (sign included), and add the mini-vectors vectorially. This will be more completely explained in Problem 3.3. In any case, that quantity would be:

$$\begin{aligned}\vec{A} &= \vec{A}_x + \vec{A}_y \\ &= (2.75\ \text{m})(-\hat{i}) + (4.76\ \text{m})(-\hat{j}) \\ &= (-2.75\hat{i} - 4.76\hat{j})\ \text{m}\end{aligned}$$

Note 1: Notice that the negative sign is technically attached to the unit vector.

Note 2: The magnitude, sign included, is called *the component*.

Note 3: You'd never take all these steps on a test. It's perfectly OK to jump straight to the final presentation.