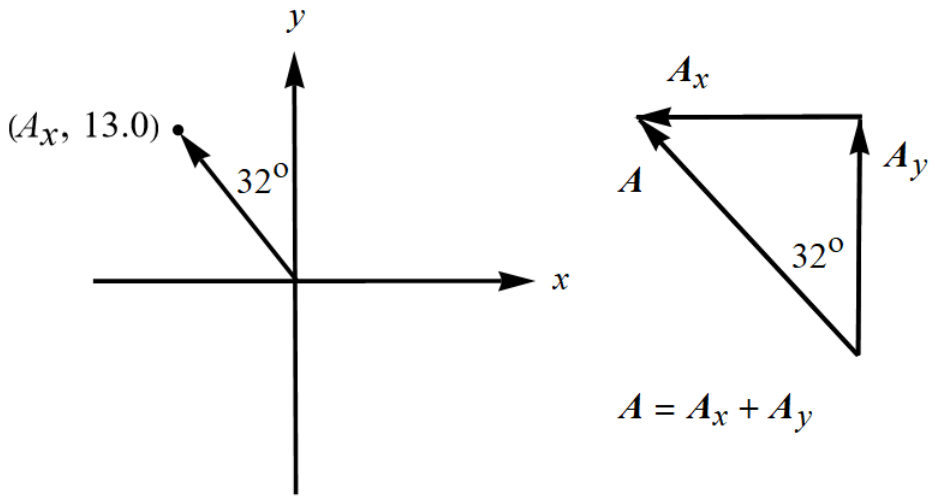
Exercise 1.33

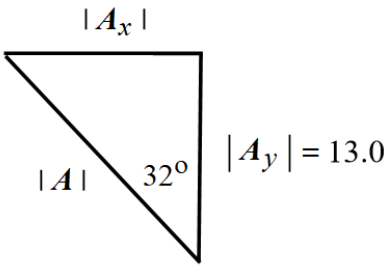
Vector $\vec{A}$ has y-component $A_y = +13.0$ m. $\vec{A}$ makes an angle of 32.0° counterclockwise from the $+y$-axis. (a) What is the x-component of $\vec{A}$? (b) What is the magnitude of $\vec{A}$?

Solution

Draw the vector **A** in the xy-plane and decompose it into components along the x- and y-axes.



The triangle involving the magnitudes of these vectors is shown below.



Use trigonometry to determine $|\mathbf{A}_x|$ and the magnitude $|\mathbf{A}|$.

$$\tan 32° = \frac{|\mathbf{A}_x|}{13.0} \quad \rightarrow \quad |\mathbf{A}_x| = 13.0 \tan 32° \approx 8.12 \text{ m}$$

$$\cos 32° = \frac{13.0}{|\mathbf{A}|} \quad \rightarrow \quad |\mathbf{A}| = \frac{13.0}{\cos 32°} \approx 15.3 \text{ m}$$

Since $\mathbf{A}_x$ points to the left in the negative x-direction, there's a minus sign in the x-component of **A**: $A_x \approx -8.12$ m.

$$\mathbf{A}_x = \langle A_x, 0 \rangle \approx \langle -8.12, 0 \rangle \text{ m}$$