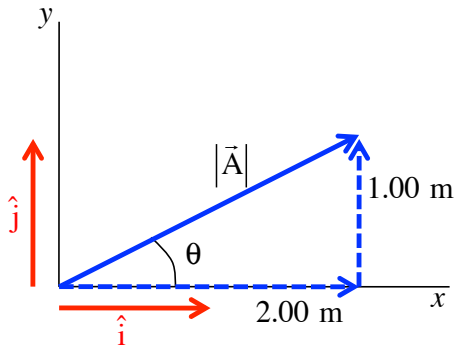
Problem 3.3

What we are being given are the components of the fly's position vector. In math classes, the information would be presented as your book does as (2.00, 1.00) meters. Physics uses a different notation, a *unit vector notation*, which is shown below.

$$\vec{A} = \left(2.00\hat{i} + 1.00\hat{j}\right)\text{m}$$

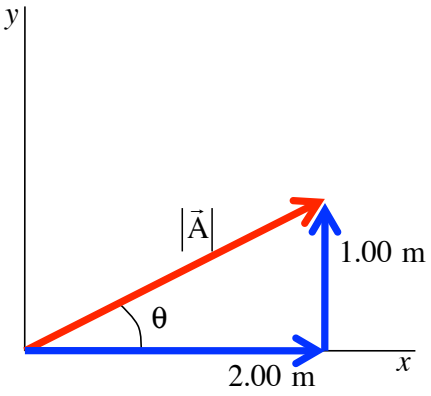
Note about the notation: If you define a vector $\hat{i}$ (termed "i-hat") to have a magnitude of "1.00" and a direction in the +x-direction, multiplying that unit vector by a scalar value of 2.00 yields a vector in the x-direction equal to $2.00\hat{i}$, or exactly what we want for the x-part of vector $\vec{A}$. If we doing a similar process with a unit vector in the y-direction (identified as $\hat{j}$) to get a y-part of $\vec{A}$, we can write $\vec{A}$ as the vector sum of the two mini-vectors $2.00\hat{i}$ and $1.00\hat{j}$ producing:

$$\vec{A} = \left(2.00\hat{i} + 1.00\hat{j}\right)\text{m}$$



In other words, the discussion on the previous page is just presenting another way of representing a 2-D (or 3-D vector if you add in a unit vector in the z-direction) vector.

In any case, a *graphical* representation of this vector is shown to the right with the unknown magnitude and angular position additionally identified.

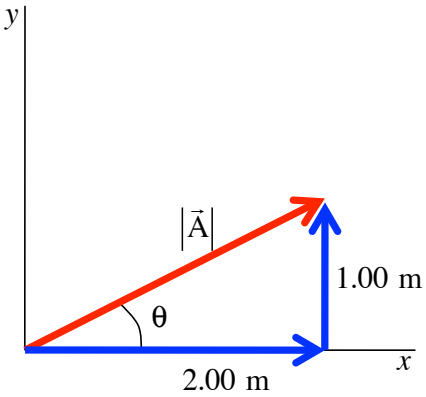


Using trig, we can write:

$$\begin{aligned}|\vec{A}| &= \left(A_x^2 + A_y^2\right)^{1/2} \\ &= \left((2.00\text{ m})^2 + (1.00\text{ m})^2\right)^{1/2} \\ &= 2.24\text{ m}\end{aligned}$$

Again, using trig we can write:

$$\theta = \tan^{-1}\left(\frac{A_y}{A_x}\right)^{1/2}$$
$$= \tan^{-1}\left(\frac{1.00}{2.00}\right)^{1/2}$$
$$= 26.6^{\circ}$$



Your math class would have you present this as an ordered pair, or $\vec{A} = (2.24\ \text{m}, 26.6^{\circ})$

As pointed out in the Problem 3.1, when a magnitude and angle are required a physicist will use an alternate notation called *polar notation*. Using that, we can write:

$$\vec{A} = (2.24\ \text{m}) \measuredangle 26.6^{\circ}$$

Note: Clearly the mathematicians notation is easier as all you have to do is present the ordered pair and you are done. Nevertheless, in physics you will be expected to present your vectors in a physics-style polar or unit vector notation, depending upon the situation.