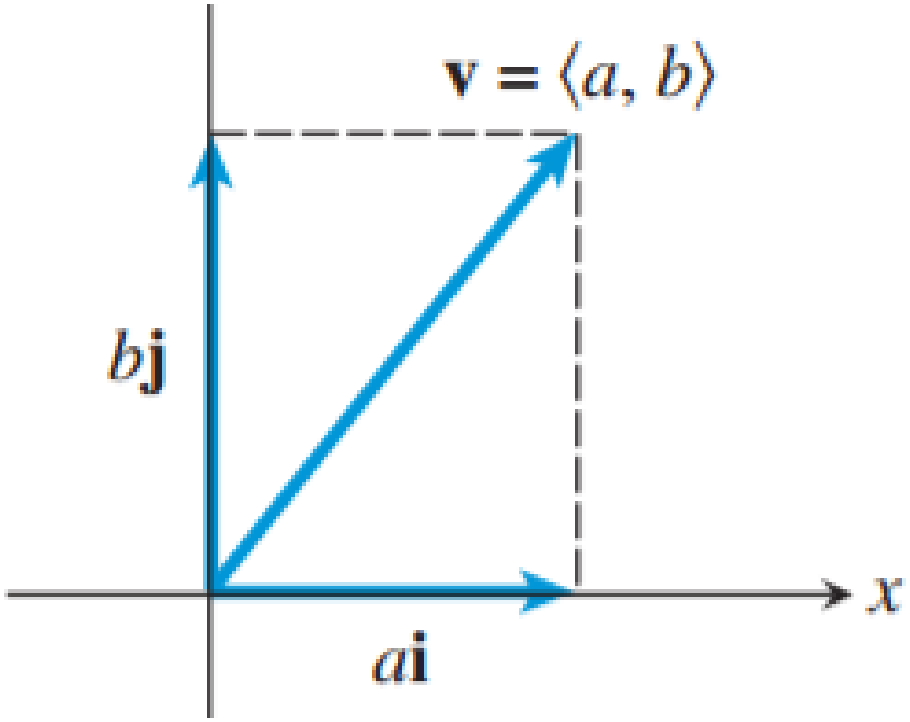
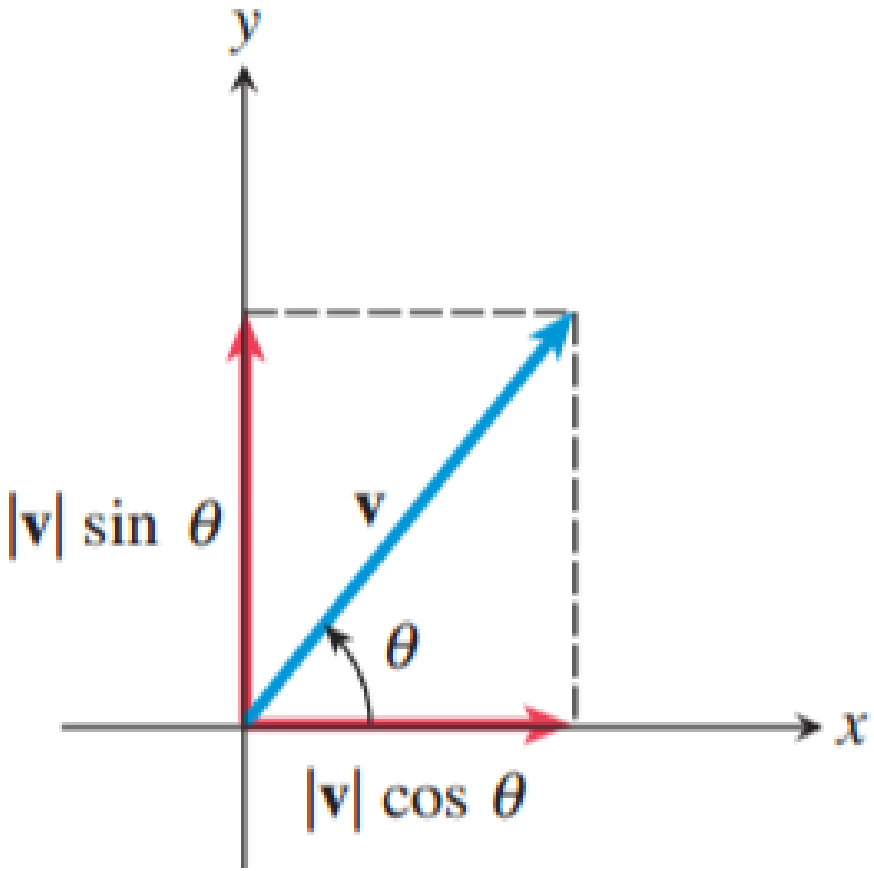

v = ⟨a, b⟩
bj
x
ai


y
|v| sin θ
v
θ
x
|v| cos θ

Resolving the Vector

If $\mathbf{v}$ has direction angle θ, the components of $\mathbf{v}$ can be computed using the formula

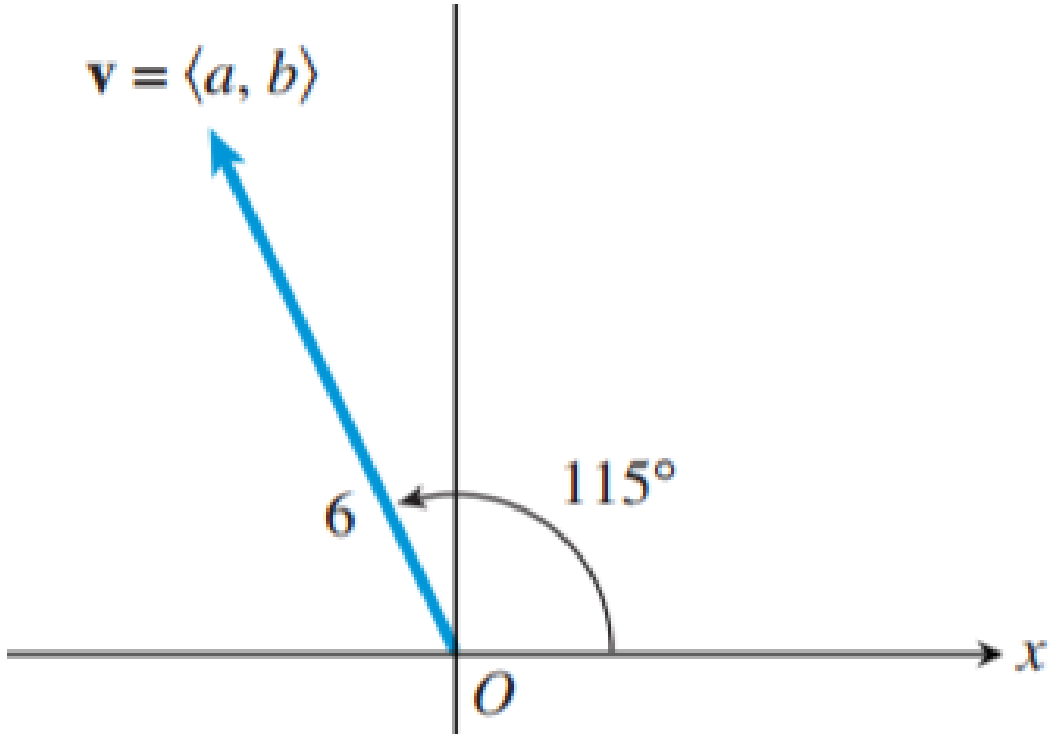
$$\mathbf{v} = \langle |\mathbf{v}| \cos\theta, |\mathbf{v}| \sin\theta \rangle.$$

From the formula above, it follows that the unit vector in the direction of $\mathbf{v}$ is

$$\mathbf{u} = \frac{\mathbf{v}}{|\mathbf{v}|} = \langle \cos\theta, \sin\theta \rangle.$$

EXAMPLE 5 Finding the Components of a Vector

Find the components of the vector **v** with direction angle 115° and magnitude 6

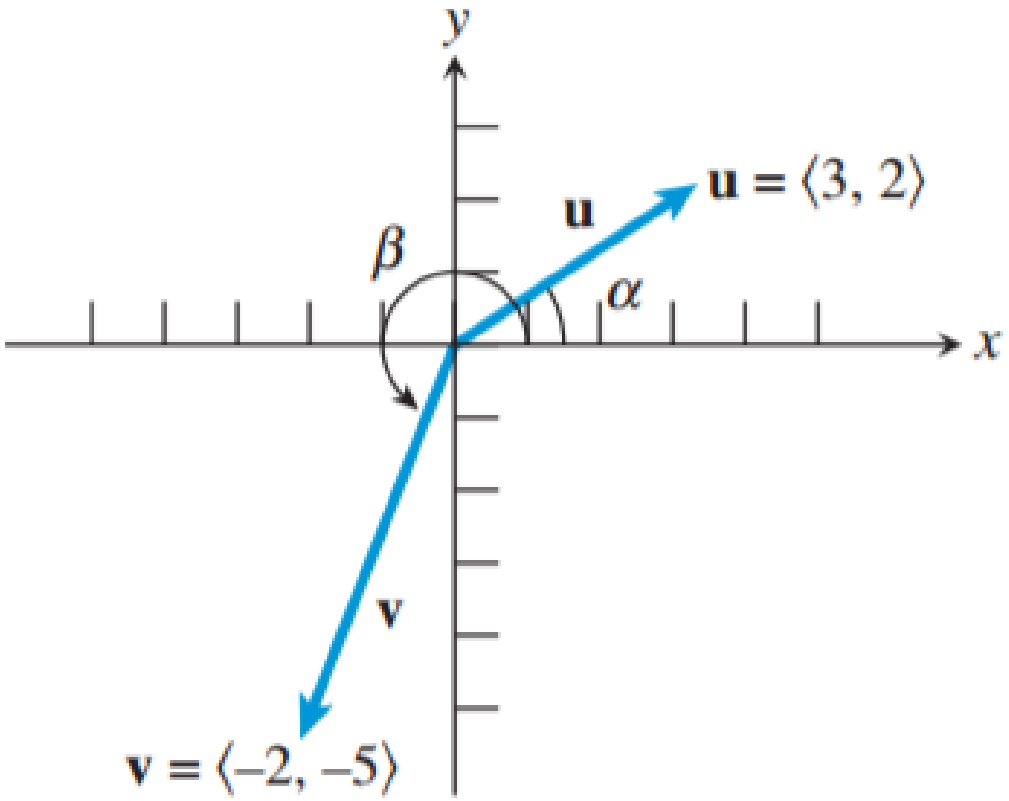


EXAMPLE 6 Finding the Direction Angle of a Vector

Find the magnitude and direction angle of each vector:

(a) $\mathbf{u} = \langle 3, 2 \rangle$

(b) $\mathbf{v} = \langle -2, -5 \rangle$

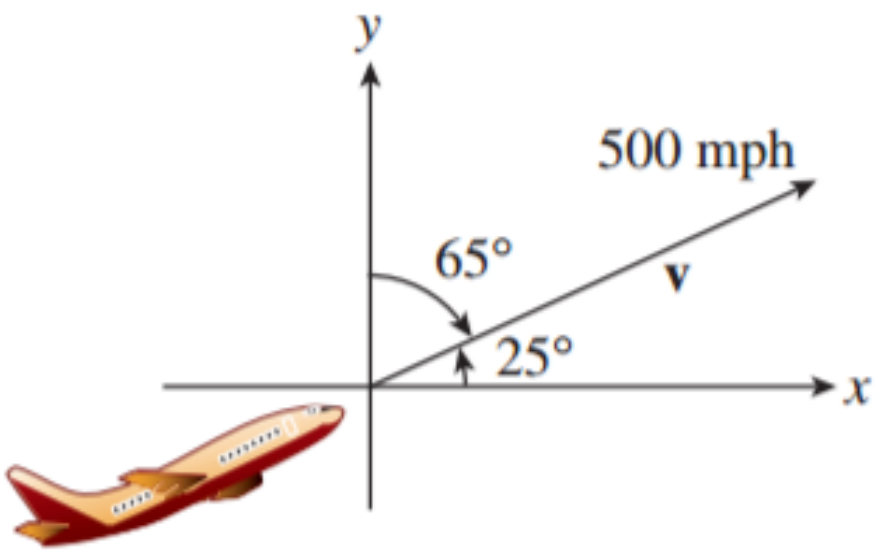


Applications of Vectors

The **velocity** of a moving object is a vector because velocity has both magnitude and direction. The magnitude of velocity is **speed**.

EXAMPLE 7 Writing Velocity as a Vector

A DC-10 jet aircraft is flying on a bearing of 65° at 500 mph. Find the component form of the velocity of the airplane. Recall that the bearing is the angle that the line of travel makes with due north, measured clockwise (see Section 4.1, Figure 4.2).



EXAMPLE 8 Calculating the Effect of Wind Velocity

Pilot Megan McCarty's flight plan has her leaving San Francisco International Airport and flying a Boeing 727 due east. There is a 65-mph wind with the bearing 60°. Find the compass heading McCarty should follow, and determine what the airplane's ground speed will be (assuming that its speed with no wind is 450 mph).