EXAMPLE 6 **Model with a trigonometric function**
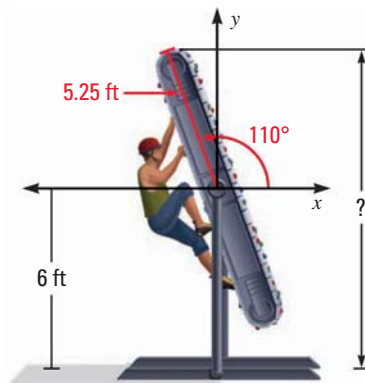
ROCK CLIMBING A rock climber is using a rock climbing treadmill that is 10.5 feet long. The climber begins by lying horizontally on the treadmill, which is then rotated about its midpoint by 110° so that the rock climber is climbing towards the top. If the midpoint of the treadmill is 6 feet above the ground, how high above the ground is the top of the treadmill?

Solution

$$\sin \theta = \frac{y}{r} \qquad \text{Use definition of sine.}$$

$$\sin 110° = \frac{y}{5.25} \qquad \text{Substitute 110° for } \theta \text{ and } \frac{10.5}{2} = 5.25 \text{ for } r.$$

$$4.9 \approx y \qquad \text{Solve for } y.$$

▶ The top of the treadmill is about $6 + 4.9 = 10.9$ feet above the ground.

✓ **GUIDED PRACTICE** **for Examples 5 and 6**

10. TRACK AND FIELD Estimate the horizontal distance traveled by a track and field long jumper who jumps at an angle of 20° and with an initial speed of 27 feet per second.

11. WHAT IF? In Example 6, how high is the top of the rock climbing treadmill if it is rotated 100° about its midpoint?

13.3 EXERCISES

HOMEWORK KEY

○ = **WORKED-OUT SOLUTIONS**
on p. WS1 for Exs. 5, 17, and 37

🤚 = **TAKS PRACTICE AND REASONING**
Exs. 11, 33, 37, 39, 41, 42, and 43

SKILL PRACTICE

1. VOCABULARY Copy and complete: A(n) __?__ is an angle in standard position whose terminal side lies on an axis.

2. WRITING Given an angle θ in Quadrant III, explain how you can use a reference angle to find $\cos \theta$.

EXAMPLE 1
on p. 866
for Exs. 3–11

USING A POINT Use the given point on the terminal side of an angle θ in standard position to evaluate the six trigonometric functions of θ.

3. $(8, 15)$ **4.** $(-9, 12)$ **5.** $(-7, -24)$ **6.** $(5, -12)$

7. $(2, -2)$ **8.** $(-6, 9)$ **9.** $(-3, -5)$ **10.** $\left(5, -\sqrt{11}\right)$

11. 🤚 **TAKS REASONING** Let $(-7, -4)$ be a point on the terminal side of an angle θ in standard position. What is the value of $\tan \theta$?

Ⓐ $-\frac{7}{4}$ Ⓑ $-\frac{4}{7}$ Ⓒ $\frac{4}{7}$ Ⓓ $\frac{7}{4}$