ACTIVITY 35 PRACTICE

Write your answers on notebook paper.
Show your work.

Lesson 35-1

1. A Ferris wheel has a diameter of 94 feet, and the highest point of the wheel is 102 feet above the ground. The Ferris wheel makes one rotation every 80 seconds.
- **a.** Write a trigonometric function that models the motion of one car on the Ferris wheel.
- **b.** According to your model, what is the height of the car when the ride starts?
- **c.** What is the height of the car after 4 seconds?

2. A bicycle wheel has a diameter of 26 inches. Isabelle rides the bike so that the wheel makes two complete rotations per second. Which function models the height of a spot on the edge of the wheel?
- **A.** $h(t) = 13\sin(2\pi t) + 13$
- **B.** $h(t) = 13\sin(4\pi t)$
- **C.** $h(t) = 13\sin(4\pi t) + 13$
- **D.** $h(t) = 13\sin(2\pi t)$

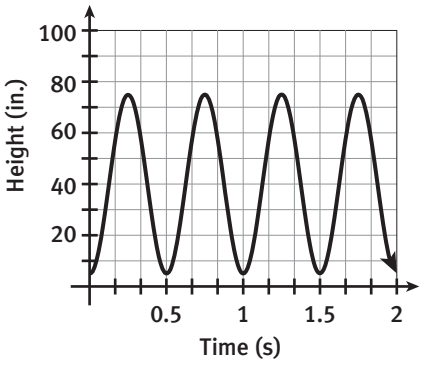
3. The function $f(x)$ models the height in feet of the tide at a specific location x hours after high tide.

$$f(x) = 3.5\cos\left(\frac{\pi}{6}x\right) + 3.7$$

- **a.** What is the height of the tide at low tide?
- **b.** What is the period of the function? What does this tell you about the tides at this location?
- **c.** How many hours after high tide is the tide at a height of 3 feet for the first time?

4. An office building has a large clock on one face of the building. The minute hand of the clock is 12 feet long, and the center of the clock is 160 feet above the ground. The function $f(t)$ models the height of the tip of the minute hand above the ground in feet, with t representing the time in minutes.
- **a.** What is the period of the function?
- **b.** Write an equation for $f(t)$ in the form $f(t) = a\sin b(t - h) + k$. Assume the minute hand points to the 12 on the clock at $t = 0$. (*Hint:* Be sure to write the function so that the minute hand is rotating clockwise!)
- **c.** Graph the function.
- **d.** What is the value of $f(15)$? Explain why this makes sense.
- **e.** Explain how you can find $f(180)$ without using a calculator.

5. Sonia and Jeremy turn a jump rope. The graph shows the height of a point at the middle of the rope. How many times do Sonia and Jeremy turn the rope each minute?



For Items 6–10, the height of an object, in centimeters, is modeled by the function $y = 42\sin\left(\frac{\pi}{10}(x-h)\right) + 55$. Determine whether each statement is always, sometimes, or never true.

6. The period of the function is 20.

7. The maximum height of the object is 55 centimeters.

8. The minimum height of the object occurs when $x = 0$.

9. The graph of the function has the midline $y = 55$.

10. The amplitude of the function is 84.

11. The function $f(t) = 40\sin\left(\frac{\pi}{45}t\right) + 48$ models the height in feet of one car of a Ferris wheel called The Colossus, where t is the time in seconds. Each of the functions below models the motion of a different Ferris wheel. Which Ferris wheel has the same diameter as The Colossus?

A. $g(t) = 40\cos\left(\frac{\pi}{45}t\right) + 50$

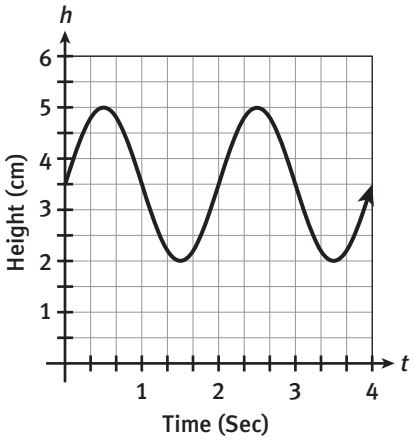
B. $h(t) = 39\cos\left(\frac{\pi}{60}t\right) + 49$

C. $j(t) = 39\sin\left(\frac{\pi}{45}t\right) + 48$

D. $k(t) = 39\sin\left(\frac{\pi}{45}t\right) + 49$

12. The motion of a point on the drum of a clothes dryer is modeled by the function $y = 12\sin\left(\frac{4}{3}\pi t\right) + 20$, where t is the time in seconds. How many times does the dryer rotate per minute?

13. The graph shows the height of a scratch on the edge of a circular gear.



Which function is the best model for the height of the scratch?

A. $h(t) = 3.5\sin(\pi t) + 1.5$

B. $h(t) = 1.5\sin(\pi t) + 3.5$

C. $h(t) = 1.5\sin(2\pi t) + 3.5$

D. $h(t) = 1.5\sin\left(\frac{\pi}{2}t\right) + 3.5$

14. The height in feet of an object above the ground is modeled by the function $y = 3\cos(3\pi t) + 7.8$, where t is the time in minutes. During the first complete cycle, at what times is the object closer than 6 feet to the ground? Use an inequality to express your answer.

MATHEMATICAL PRACTICES

Construct Viable Arguments and Critique the Reasoning of Others

15. A student was asked to model the motion of one car of a Ferris wheel. The student claimed that it is possible to use the tangent function to model the motion, since the tangent function is periodic. Do you agree or disagree with the student's reasoning? Justify your answer.