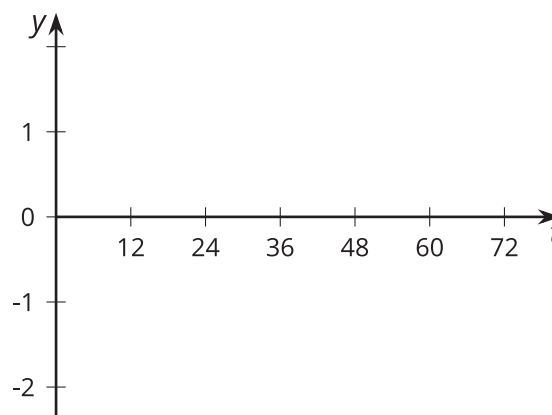


Lesson 19 Practice Problems

1. The water level f , in feet, at a certain beach is modeled by the function $f(t) = 2 \sin\left(\frac{2\pi t}{24}\right)$, where t is the number of hours since the level was measured.

a. What is the amplitude of the function? What does it mean in this context?



b. What is the period of the function? What does it mean in this context?

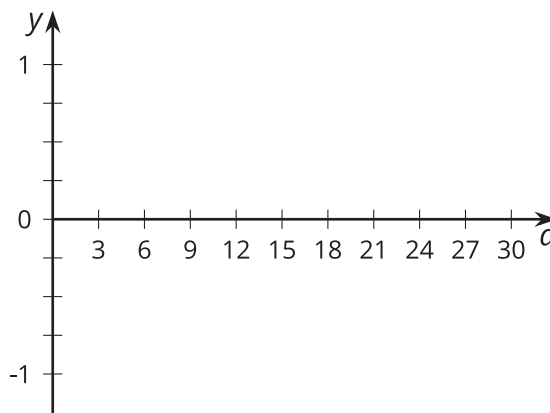
c. Sketch a graph of the function over 72 hours.

2. The amount of the Moon visible d days after November 30 is modeled by the equation $f(d) = 0.5 \cos\left(\frac{2\pi \cdot (d-6)}{30}\right) + 0.5$. Select **all** the statements that are true for this model.

- A. The model predicts a full moon on December 6.
- B. The model predicts that there will be two full moons in December.
- C. The model predicts that none of the Moon will be visible on December 21.
- D. The model predicts that more than half of the Moon will be visible on December 13.
- E. The model predicts that there is a full moon every 30 days.

3. One month, the amount of the Moon visible d days after the beginning of the month is modeled by the equation $y = 0.5 \cos\left(\frac{2\pi d}{30} - \frac{\pi}{4}\right) + 0.5$.

- Explain why the Moon will be full when $\frac{2\pi d}{30} = \frac{\pi}{4}$. Which day of the month is this?
- Explain why none of the Moon will be visible when $\frac{2\pi d}{30} = \frac{5\pi}{4}$. Which day of the month is this?
- Sketch a graph of the equation.

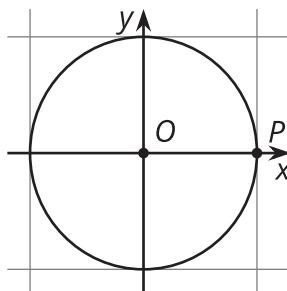


4. The center of a clock is $(0, 0)$ in a coordinate system, and the hour hand is 8 inches long. It is 10:30 p.m. Which of the following are true of the end of the hour hand? Select **all** that apply.

- its coordinates are about $(-5.7, 5.7)$
- its coordinates are about $(5.7, -5.7)$
- its coordinates are about $(-5.7, -5.7)$
- its coordinates are $(8 \cos(\frac{3\pi}{4}), 8 \sin(\frac{3\pi}{4}))$
- its coordinates are $(8 \sin(\frac{3\pi}{4}), 8 \cos(\frac{3\pi}{4}))$

(From Unit 6, Lesson 7.)

5. Label these points on the unit circle.



- Q is the image of P after a $-\frac{\pi}{6}$ radian rotation with center O .
- R is the image of P after a $-\frac{\pi}{2}$ radian rotation with center O .
- S is the image of P after a $-\frac{4\pi}{3}$ radian rotation with center O .
- T is the image of P after a $-\frac{5\pi}{3}$ radian rotation with center O .

(From Unit 6, Lesson 11.)

6. The function h given by $h(\theta) = 15 + 4 \sin(\theta)$ models the height, in feet, at the tip of a windmill blade that has rotated through an angle θ .

- What is the height of the windmill? Explain how you know.
- What is the length of the windmill blade? Explain how you know.

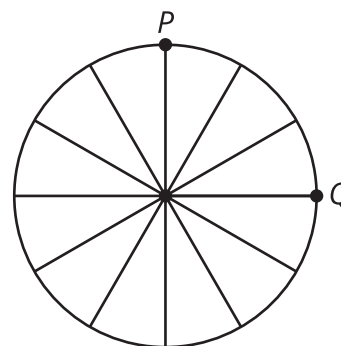
(From Unit 6, Lesson 13.)

7. The vertical position of a seat on a Ferris wheel is described by the function $f(t) = 80 \sin\left(\frac{2\pi t}{30}\right) + 95$. Time t is measured in seconds and the output of f is measured in feet.
- Write an equation describing the vertical position on a Ferris wheel that is the same size as the Ferris wheel described by f but spins twice as quickly.
 - Write an equation describing the vertical position on a Ferris wheel that spins the same speed as the Ferris wheel described by f but whose radius is twice as large.

(From Unit 6, Lesson 16.)

8. Here is the initial position of a bike wheel before it starts to move.

The vertical position, in inches, of P is given by $y = 10 \cdot \sin\left(\frac{\pi}{2} + 6\pi s\right) + 10$, where s is the number of seconds since the wheel began to move. Select **all** the true statements.



- The wheel makes 3 revolutions per second.
- The wheel makes one revolution every 3 seconds.
- After $\frac{1}{4}$ of a second, the point P will be in the position marked Q .
- After $\frac{3}{4}$ of a second, the point P will be in the position marked Q .
- The radius of the wheel is 10 inches.

(From Unit 6, Lesson 18.)