ALBERT

Name _____ Date _____

Modeling with Trigonometric Functions Worksheet

Algebra 2 · Common Core HSF-TF.B.5

> Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

Practice

Builds the skill step by step.

1. What is the amplitude of $y = 3 \sin x$?

2. What is the midline of $y = \sin x + 4$? Give the y-value.

3. The period of $y = \sin(2x)$ is $k\pi$. What is k?

4. What is the maximum value of $y = 2 \sin x + 5$?

5. What is the minimum value of $y = 2 \sin x + 5$?

6. What is the amplitude of a periodic function?

   A. half the distance between its maximum and minimum

   B. the length of one cycle

   C. the average of its values

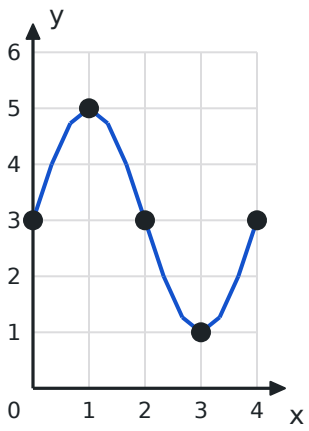
   D. its maximum value

7. A Ferris wheel seat's height varies between 2 meters and 30 meters. What is the midline height?

8. A Ferris wheel seat's height varies between 2 meters and 30 meters. What is the amplitude?

9. High tide is 9 feet and low tide is 1 foot. What is the amplitude?

10. The graph shows one full cycle. What is its period?



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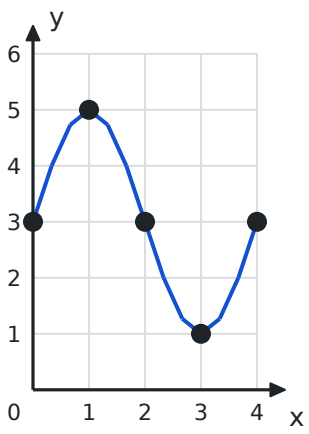
On Level

Grade-level practice.

1. A Ferris wheel's height is $h = 16 - 14\cos(k\pi t)$, with t in minutes, and it makes one turn every 10 minutes. What is k?

2. A wheel completes one turn every 10 minutes. What is its frequency, in turns per minute?

3. What is the midline of the graph? Give the y-value.



4. What is the period of $y = 4\sin(\frac{\pi t}{3}) + 10$?

5. What is the maximum of $y = 4 \sin(\frac{\pi t}{3}) + 10$?

6. The temperature in a town varies from a low of 60°F to a high of 80°F over a 24-hour day. Explain how to find the amplitude, midline and B in $y = A \sin(Bt) + D$.

7. Which function has amplitude 5, period 2π and midline $y = -1$?

   A. $y = -\sin(5x)$

   B. $y = 5 \sin x - 1$

   C. $y = \sin x + 5$

   D. $y = -5 \sin x + 1$

8. For $h = 16 - 14 \cos(\frac{\pi t}{5})$, what is $h(0)$?

9. For $h = 16 - 14 \cos(\frac{\pi t}{5})$, what is $h(5)$?

10. A spring bounces 3 times per second. What is its period, in seconds?

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Challenge

Multi-step and word problems that stretch it.

1. Tide height is $h = 5 + 4\cos(\frac{\pi t}{6})$ feet, t hours after high tide. What is h(4)?

2. For $h = 5 + 4\cos(\frac{\pi t}{6})$, how many hours after high tide is the first low tide?

3. A model has period 365 days. Its B value is kπ. What is k?

4. What is the maximum value of $y = -3\cos(2x) + 1$?

5. A Ferris wheel has diameter 50 meters and its center is 30 meters high. It turns once every 4 minutes, starting at the bottom: $h = 30 - 25\cos(\frac{\pi t}{2})$. What is h(1)?

6. In $y = A\sin(Bx) + D$, which change alters how many cycles happen in a given time?

   A. changing A

   B. changing D

   C. changing B

   D. none of them

7. A sound wave is $y = 0.02 \sin(880\pi t)$, with t in seconds. How many cycles happen per second?

8. Explain how to decide whether to model data with a sine or a cosine function.

9. Daylight hours are modeled by $D(t) = 12 + 3 \sin(\frac{2\pi(t - 80)}{365})$. What is the greatest number of daylight hours?

10. For $D(t) = 12 + 3 \sin(\frac{2\pi(t - 80)}{365})$, on which day t is daylight greatest? Round to the nearest whole day.