

# Sinusoidal Modeling and Wave Behavior

Sinusoidal models, phase and amplitude reasoning, damped motion, and combining periodic waves.

Name \_\_\_\_\_ Date \_\_\_\_\_

32 main 2-up grid 2 pages

## Completion Reward



Shown here as a small pack artifact, not a preview destination.

1. For  $y = 3\sin(x)$ , what is the amplitude?

- A. 3
- B.  $1/3$
- C.  $2\pi$
- D. 0

2. For  $y = 2\cos(x) + 4$ , what is the midline?

- A.  $y = 2$
- B.  $y = 4$
- C.  $y = 0$
- D.  $x = 4$

3. For  $y = \sin(2x)$ , what is the period?

- A.  $2\pi$
- B.  $4\pi$
- C.  $1/2$
- D.  $\pi$

4. Compared to  $y = \sin(x)$ , what does  $y = \sin(3x)$  do?

- A. It triples the amplitude
- B. It moves the graph up 3
- C. It reflects the graph
- D. It completes cycles three times as fast

5. What does  $y = \sin(x - \pi/4)$  do to  $y = \sin(x)$ ?

- A. Shifts it right by  $\pi/4$
- B. Shifts it left by  $\pi/4$
- C. Shifts it up by  $\pi/4$
- D. Reflects it over the x-axis

6. What does  $y = -2\sin(x)$  do compared to  $y = \sin(x)$ ?

- A. Shifts up 2
- B. Triples the period
- C. Shifts right 2
- D. Reflects across the x-axis and doubles the amplitude

7. If you want the maximum of  $y = 4\sin(x) - 1$ , what should you read first?

- A. Only the period
- B. The amplitude and midline
- C. Only the phase shift
- D. The x-intercepts first

8. A Ferris wheel repeats every 20 seconds and has radius 6. What features belong in the model first?

- A. Amplitude 20 and period 6
- B. Midline 6 and period 20
- C. Amplitude 6 and period 20
- D. Only a phase shift

9. A student says the period of  $y = \cos(4x)$  is  $8\pi$ . What is the mistake?

- A. They forgot the amplitude
- B. They multiplied by 4 instead of dividing by 4
- C. They used sine instead of cosine
- D. Nothing is wrong

10. A student says the amplitude of  $y = -5\cos(x) + 2$  is -5. What is the mistake?

- A. Amplitude is 2 because of the vertical shift
- B. Amplitude is x because cosine depends on x
- C. Amplitude is -5 because the graph is reflected
- D. Amplitude is always nonnegative, so it is 5

11. For  $y = 3\sin(x) + 2$ , what is the maximum value? Answer with a number.

12. For  $y = 3\sin(x) + 2$ , what is the minimum value? Answer with a number.

13. A sinusoid has maximum 9 and minimum 1. What is its amplitude? Answer with a number.

14. A sinusoid has maximum 9 and minimum 1. What is its midline value? Answer with a number.

15. For  $y = \cos(4x)$ , what is the period? Answer as an exact value.

16. For  $y = \sin(x/2)$ , what is the period? Answer as an exact value.

17. Find y when  $x = \pi/2$  for  $y = 2\sin(x) - 3$ . Answer with a number.

18. Find y when  $x = 0$  for  $y = 5\cos(x) + 1$ . Answer with a number.

19. A sinusoidal model has period 12. What is the value of b in  $y = A \sin(bx) + D$ ? Answer as an exact value.

20. A sinusoidal model has period 8. What is the value of b in  $y = A \cos(bx) + D$ ? Answer as an exact value.

21. A model is  $y = 6\sin((\pi/10)x)$ . Find y when  $x = 5$ . Answer with a number.

22. A model is  $y = 4\cos((\pi/6)x) - 2$ . Find y when  $x = 3$ . Answer with a number.

23. Write a sine model with amplitude 3, period  $2\pi$ , and midline 1. Answer as an equation.

24. Write a cosine model with amplitude 2, period  $\pi$ , and midline -1. Answer as an equation.

25. A sinusoid has maximum 11 and minimum 3. Write its midline. Answer as an equation.
26. A sinusoid has maximum 10 and minimum -2. Write its amplitude as a number. Answer as an equation.
27. Write the inside expression for a sine graph shifted right  $\pi/3$ . Answer as an equation.
28. Write a cosine model with amplitude 4 reflected across the x-axis and no shifts. Answer as an equation.
29. A Ferris wheel radius is 7 and the center is 9 units above the ground. Write the amplitude-midline part of a model. Answer as an equation.
30. For  $y = A \sin(bx) + D$ , write the period. Answer as an expression.
31. Which description matches  $y = 3\sin(x) + 1$ ?
- A. Amplitude 1 and midline  $y = 3$   
B. Amplitude 3 and midline  $y = 1$   
C. Period 3 and midline  $y = 0$   
D. Amplitude 4 and midline  $y = 0$
32. Which description matches  $y = 2\cos(x - \pi/2)$ ?
- A. Amplitude 2, shifted left  $\pi/2$   
B. Amplitude 2, shifted right  $\pi/2$   
C. Midline 2, shifted right  $\pi/2$   
D. Reflected and shifted down 2