LESSON MAKER PRO

Wave Pattern Lab

Read and sketch sine and cosine graphs

HIGH SCHOOL · MT.PLUS.ALG.TRIG.3.a

MT.PLUS.ALG.TRIG.3.a "Graph trigonometric functions with and without the use of technology by: Graphing sine and cosine functions, identifying period, midline, and amplitude, and"

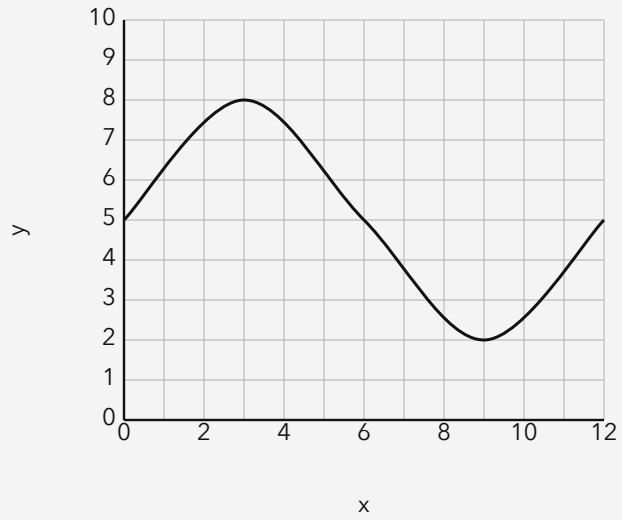
NAME _____ DATE _____

FIND THE CYCLE

The midline is halfway between a graph's highest and lowest points. The amplitude is half the distance between those points, and the period is the horizontal distance for one full cycle. For y = D + A sin(Bx) or y = D + A cos(Bx), the midline is y = D, the amplitude is |A|, and the period is 2pi/|B|.

WORKED EXAMPLE

Use the graph to find the midline, amplitude, and period.

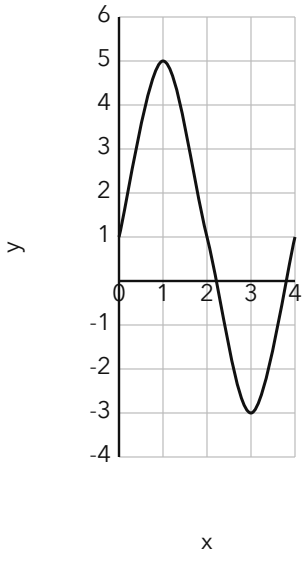


1. The highest point is at y = 8, and the lowest is at y = 2.
2. Midline: (8 + 2)/2 = 5.
3. Amplitude: (8 - 2)/2 = 3.
4. One full cycle runs from x = 0 to x = 12, so the period is 12.

Answer: Midline: y = 5; amplitude: 3; period: 12.

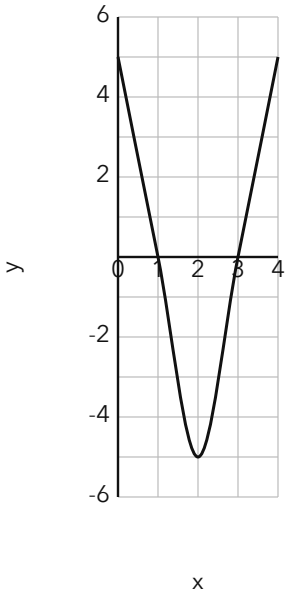
PRACTICE 6 problems

1 Use the graph to find the midline and amplitude.



ANSWER _____

2 Use the graph to find the amplitude and period.



ANSWER _____

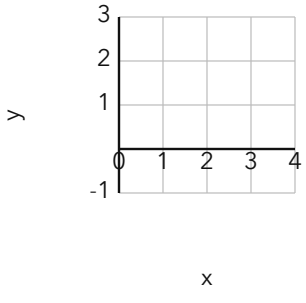
3 Find the midline and period of y = 4 - 2 cos(pi x/3).

ANSWER _____

4 Find the amplitude and period of y = -4 + 2 sin(pi x/5).

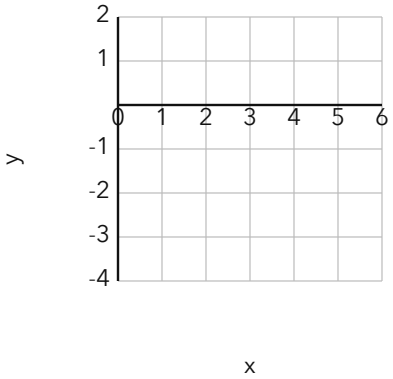
ANSWER _____

5 On the grid, sketch one full period of y = 1 + sin(pi x/2) from x = 0 to x = 4. Mark the five key points.



ANSWER _____

6 On the grid, sketch one full period of y = -1 + 2 cos(pi x/3) from x = 0 to x = 6. Mark the five key points.



ANSWER _____

APPLY IT Show your work

1 A Ferris wheel rider's height above the ground, in meters, is h(t) = 11 + 9 cos(pi t/8), where t is minutes after the rider reaches the top. Find the midline and amplitude. What does each mean for the ride?

WORK SPACE

ANSWER _____

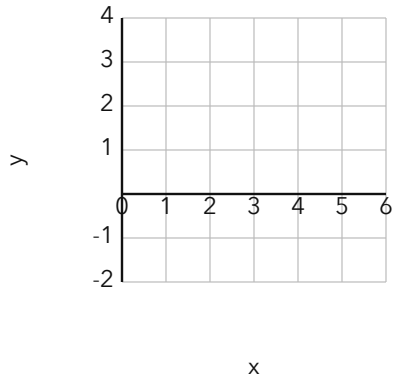
2 The brightness of an animated stage light is B(t) = 50 + 30 sin(pi t/4), where B is a percentage and t is time in seconds. What is its brightness range? How many seconds does one full brightness cycle take?

WORK SPACE

ANSWER _____

CHALLENGE One step up

On the grid, sketch one full period of y = 1 + 2 sin(pi (x - 1)/2) from x = 1 to x = 5. Mark the five key points. Explain how the shift changes the graph without changing its period.



WORK SPACE AND ANSWER

ANSWER KEY

Wave Pattern Lab

HIGH SCHOOL · MT.PLUS.ALG.TRIG.3.a

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the graph to find the midline and amplitude.	**Midline: y = 1; amplitude: 4.**
2	Use the graph to find the amplitude and period.	**Amplitude: 5; period: 4.**
3	Find the midline and period of y = 4 - 2 cos(pi x/3).	**Midline: y = 4; period: 6.**
4	Find the amplitude and period of y = -4 + 2 sin(pi x/5).	**Amplitude: 2; period: 10.**
5	On the grid, sketch one full period of y = 1 + sin(pi x/2) from x = 0 to x = 4. Mark the five key points.	**A smooth sine curve through (0, 1), (1, 2), (2, 1), (3, 0), and (4, 1).**
6	On the grid, sketch one full period of y = -1 + 2 cos(pi x/3) from x = 0 to x = 6. Mark the five key points.	**A smooth cosine curve through (0, 1), (3/2, -1), (3, -3), (9/2, -1), and (6, 1).**

PART 2 · APPLY IT

1. **Midline: h = 11 meters, the height of the wheel's center. Amplitude: 9 meters, the vertical distance from the center to the rider at the top or bottom.** The constant term gives the midline, and the absolute value of the cosine coefficient gives the amplitude.
2. **The brightness ranges from 20% to 80%. One full cycle takes 8 seconds.** Add and subtract the amplitude, 30, from the midline, 50. The period is 2pi/(pi/4) = 8 seconds.

CHALLENGE

A smooth sine curve passes through (1, 1), (2, 3), (3, 1), (4, -1), and (5, 1). The graph shifts right 1 unit. Its period remains 4 because the shift does not change the horizontal length of a cycle.

Accept smooth sketches that pass through the five key points and have the correct wave shape. Equivalent expressions for the midline and period are acceptable.