LESSON MAKER PRO

Wave Patterns

Read and graph sine and cosine cycles.

HIGH SCHOOL · A2S.AF.H.20.b

A2S.AF.H.20.b "Graph sine and cosine functions expressed symbolically, showing period, midline, and amplitude."

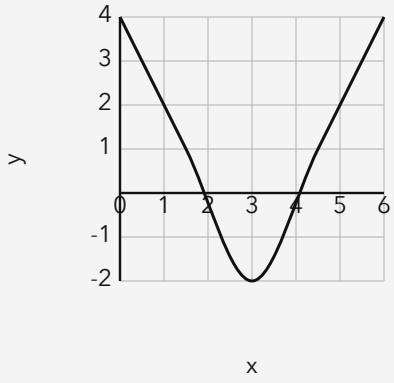
NAME _____ DATE _____

READ THE CYCLE

For y = A sin(Bx) + D or y = A cos(Bx) + D, the amplitude is |A|, the midline is y = D, and the period is 2pi/|B|. On a graph, the midline is halfway between a peak and a trough, and one period runs from a peak to the next peak.

WORKED EXAMPLE

The grid shows y = 3 cos(pi x/3) + 1. Use the graph and the rule to find its amplitude, midline, and period.



1. The peak is 4 and the trough is -2, so the amplitude is (4 - (-2))/2 = 3.
2. The midline is halfway between them: y = (4 + (-2))/2 = 1.
3. The peaks occur at x = 0 and x = 6, so the period is 6.

Answer: Amplitude: 3; midline: y = 1; period: 6.

PRACTICE 4 problems

1 For y = 4 sin(pi x/2) - 2, find the amplitude and period.

ANSWER _____

2 For y = 5 cos(pi x/4) + 2, find the midline and period.

ANSWER _____

3 For y = -2 sin(4pi x) - 5, find the amplitude and midline.

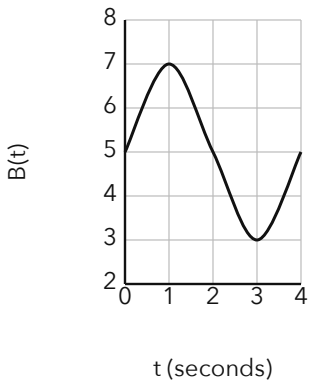
ANSWER _____

4 For y = 7 cos(pi x/5) + 4, find the amplitude and period.

ANSWER _____

APPLY IT Show your work

1 Concert lights follow B(t) = 2 sin(pi t/2) + 5, where t is seconds. Use the graph to find the amplitude and period.



ANSWER _____

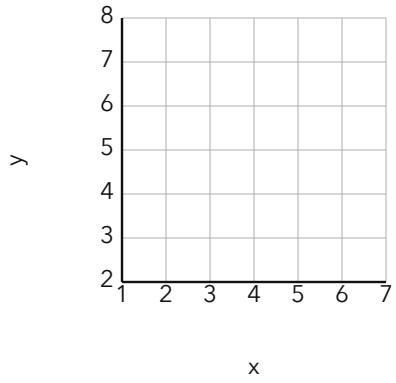
2 A game avatar's height is h(t) = -4 cos(pi t/3) + 8, with height in pixels and time t in seconds. What is its maximum height? How many seconds pass between peaks?

WORK SPACE

ANSWER _____

CHALLENGE One step up

On the grid, sketch one full cycle of y = -2 sin(pi(x - 2)/2) + 5 from x = 2 to x = 6. Label the amplitude, midline, and period.



WORK SPACE AND ANSWER

ANSWER KEY

Wave Patterns

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For y = 4 sin(pi x/2) - 2, find the amplitude and period.	**Amplitude: 4; period: 4.**
2	For y = 5 cos(pi x/4) + 2, find the midline and period.	**Midline: y = 2; period: 8.**
3	For y = -2 sin(4pi x) - 5, find the amplitude and midline.	**Amplitude: 2; midline: y = -5.**
4	For y = 7 cos(pi x/5) + 4, find the amplitude and period.	**Amplitude: 7; period: 10.**

PART 2 · APPLY IT

1. **Amplitude: 2; period: 4 seconds.** The graph rises 2 units above its midline of 5. The curve completes one cycle from t = 0 to t = 4.
2. **Maximum height: 12 pixels; time between peaks: 6 seconds.** The maximum is the midline plus the amplitude, 8 + 4 = 12. The period is 2pi/(pi/3) = 6 seconds.

CHALLENGE

Sketch a smooth curve through (2, 5), (3, 3), (4, 5), (5, 7), and (6, 5). Amplitude: 2; midline: y = 5; period: 4.

Accept smooth sketches that pass through the five challenge points and show the stated labels. Equivalent expressions for the period are acceptable.