Vocabulary

Review

1. Circle the graph that shows a periodic function.

![Graphs showing periodic functions]

Vocabulary Builder

**sine** (noun) syn

**Related Words:** sine function (noun), sine curve (noun), cosine (noun)

**Definition:** If the terminal side of an angle $\theta$ in standard position intersects the unit circle at the point $(x, y)$, then the **sine** of $\theta$ is the $y$-coordinate of the point $(x, y)$.

**In Symbols:** $\sin \theta$

Use Your Vocabulary

2. Circle the sine of each angle $\theta$.

![Graphs with points on the unit circle]

-1 $\frac{-1}{2}$ $\frac{\sqrt{3}}{2}$ 1

-1 1

-1 $\frac{-\sqrt{2}}{2}$ $\frac{\sqrt{2}}{2}$ 1
Problem 1  Estimating Sine Values Graphically

Got It? What is a reasonable estimate for the value \( \sin \theta \) from the graph? Check your estimate with a calculator.

3. Circle the \( \theta \)-value that is closest to \( \theta = 3 \).

\[
\begin{array}{cccc}
0 & \frac{\pi}{2} & \pi \\
\end{array}
\]

4. The value of \( y = \sin \theta \) at your chosen \( \theta \)-value is \( \boxed{ } \).

5. Circle the best estimate of \( \sin 3 \).

\[
\begin{array}{cccc}
0 & 0.01 & 0.1 & 1 & \frac{\pi}{3} & \frac{\pi}{2} \\
\end{array}
\]

6. Check Use a calculator in radian mode to check your estimate: \( \sin 3 \approx \boxed{ } \).

The graph of the sine function is called a sine curve.

Problem 2  Finding the Period of a Sine Curve

Got It? How many cycles occur in the graph? What is the period of the cycle?

7. Circle each cycle in the graph. There are \( \boxed{ } \) cycles.

8. To find the period of one cycle, divide the length of the interval by the number of cycles. Cross out the expressions that do NOT give the period.

\[
\begin{array}{ccc}
2\pi & 4\pi & 4\pi \\
\div 2 & \div 2 & \div 4 \\
\end{array}
\]

9. The period is \( \boxed{ } \).

Problem 3  Finding the Amplitude of a Sine Curve

Got It? The equation of the graph is of the form \( y = a \sin x \). What is the amplitude of the sine curve? What is the value of \( a \)?

10. Underline the correct words to complete each sentence.

   The amplitude of a periodic function is \boxed{ } the difference / half the difference of the maximum and the minimum values.

   Because the first cycle begins below the \( x \)-axis, the value of \( a \) in the sine curve at the right is \boxed{ } positive / negative .

11. Use the graph at the right. Find the amplitude of the sine curve.

12. The amplitude is \( \boxed{ } \), and the value of \( a \) is \( \boxed{ } \).
Suppose \( y = a \sin b \theta \), with \( a \neq 0 \), and \( \theta \) in radians.
- \(|a|\) is the amplitude of the function.
- \( b \) is the number of cycles in the interval from 0 to \( 2\pi \).
- \( \frac{2\pi}{b} \) is the period of the function.

13. Identify the amplitude, number of cycles, and period of \( y = -\sin \frac{1}{2} \theta \).
   amplitude = \[ \boxed{\text{number of cycles} = \boxed{\text{period} = \boxed{}}} \]

14. Underline the correct word or number to complete each sentence.
   The amplitude is 3, so the maximum is \[ -4 / -3 / 0 / 3 / 4 \] and the minimum is \[ -4 / -3 / 0 / 3 / 4 \].
   Since \( a > 0 \), the maximum value occurs before / after the minimum value.

15. Complete the table.

<table>
<thead>
<tr>
<th>Zero</th>
<th>Max</th>
<th>Zero</th>
<th>Min</th>
<th>Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>beginning of cycle</td>
<td>middle of the first half</td>
<td>middle of whole cycle</td>
<td>middle of the second half</td>
<td>end of cycle</td>
</tr>
<tr>
<td>(0, 0)</td>
<td>(( \pi, ) )</td>
<td>(2( \pi, ) )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

16. Use the ordered pairs from the table to graph one cycle of the sine curve on the coordinate plane.

17. Since \( 4\pi = \frac{2\pi}{b} \), \( b = \boxed{\text{}} \).

18. An equation for the function is \( y = \boxed{\sin \theta} \).
Lesson 13-4

Got It? What is the graph of one cycle of the sine function \( y = 1.5 \sin 2\theta \)?

19. Write the value of each variable or expression.
\[
\begin{align*}
    a &= \quad b &= \quad \frac{2\pi}{b} = \quad \frac{2\pi}{1.5} = \\
    \quad &= \quad &= \\
\end{align*}
\]

20. One cycle runs from 0 to \( \frac{\pi}{4} / \frac{\pi}{2} / \pi / 2\pi \).

21. Graph one cycle of \( y = 1.5 \sin 2\theta \) on the coordinate plane.

Lesson Check • Do you UNDERSTAND?

Error Analysis A student drew this graph for the function \( y = -3 \sin \pi \theta \). Describe and correct the student’s error.

22. Cross out the statements that do NOT describe the graph of \( y = -3 \sin \pi \theta \).

\[
\begin{align*}
    a > 0 & \quad \text{The period is 2.} & \quad \text{The amplitude is} & \quad -3. \\
    a < 0 & \quad \text{The period is} & \quad \text{The amplitude is} & \quad 3. \\
\end{align*}
\]

23. Describe the student’s error.

24. Circle the graph of \( y = -3 \sin \pi \theta \).

Math Success

Check off the vocabulary words that you understand.

- [ ] sine function   - [ ] sine curve   - [ ] periodic function   - [ ] amplitude

Rate how well you can graph a sine function.

Need to review 0 2 4 6 8 10 Now I get it!