LESSON MAKER PRO

Find Every Angle

Use inverse trig functions to find and interpret solutions.

HIGH SCHOOL · PC.T.2.4

PC.T.2.4 "Use inverse functions to solve trigonometric equations; evaluate the solution and interpret them in terms of context."

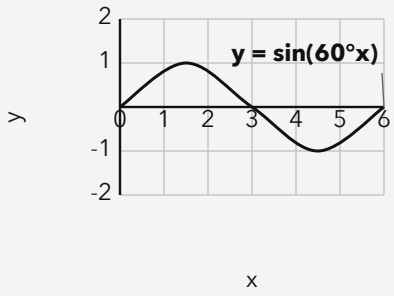
NAME _____ DATE _____

ONE VALUE, MORE THAN ONE ANGLE

An inverse trig function gives a starting angle, but it may not give every solution. Use the sign of the trig value and the angle interval to find the other angles. Check each answer in the original equation.

WORKED EXAMPLE

The graph shows y = sin(60°x). Find every x from 0 through 6 where y = sqrt(3)/2.

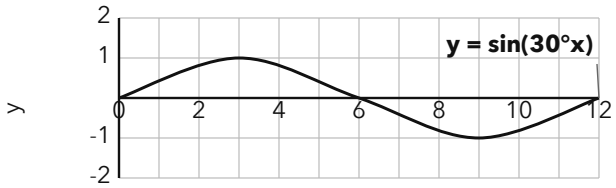


1. $\sin^{-1}(\text{sqrt}(3)/2) = 60°$.
2. Sine is positive at 60° and 120° in this cycle.
3. Solve 60°x = 60° or 60°x = 120°.

Answer: x = 1 or x = 2

PRACTICE 6 problems

1 Each x-axis unit on the graph is 30°. Find all angles from 0° up to, but not including, 360° where y = 1/2.



ANSWER _____

2 Solve sin(x) = -1/2 for 0° ≤ x < 360°.

ANSWER _____

3 Solve tan(x) = sqrt(3) for 0° ≤ x < 360°.

ANSWER _____

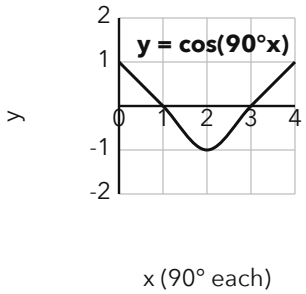
4 Solve cos(x) = sqrt(3)/2 for 0° ≤ x < 360°.

ANSWER _____

5 Solve sin(2x) = 0 for 0° < x < 180°.

ANSWER _____

6 Each x-axis unit on the graph is 90°. Find all angles from 0° up to, but not including, 360° where y = -sqrt(2)/2.



ANSWER _____

APPLY IT Show your work

1 A Ferris wheel seat's height is $h = 18 + 12\cos(x)$ feet, where x is the wheel's angle in degrees. During one turn, $0° \le x < 360°$, at which angles is the seat 24 feet high?

WORK SPACE

ANSWER _____

2 In an arcade game, a moving target's horizontal position is $d = 6\sin(x)$ centimeters from the center, where x is the rotation angle. During one turn, $0° \le x < 360°$, at which angles is the target $3\sqrt{2}$ centimeters to the right of center?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve $\sin(3x) = 1/2$ for $0° \le x < 360°$. Explain why your list has six solutions.

WORK SPACE AND ANSWER

Find Every Angle

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Each x-axis unit on the graph is 30°. Find all angles from 0° up to, but not including, 360° where y = 1/2.	**30°, 150°**
2	Solve sin(x) = -1/2 for 0° ≤ x < 360°.	**x = 210° or x = 330°**
3	Solve tan(x) = sqrt(3) for 0° ≤ x < 360°.	**x = 60° or x = 240°**
4	Solve cos(x) = sqrt(3)/2 for 0° ≤ x < 360°.	**x = 30° or x = 330°**
5	Solve sin(2x) = 0 for 0° < x < 180°.	**x = 90°**
6	Each x-axis unit on the graph is 90°. Find all angles from 0° up to, but not including, 360° where y = -sqrt(2)/2.	**135°, 225°**

PART 2 · APPLY IT

1. **60° and 300°** Set 18 + 12cos(x) = 24, so cos(x) = 1/2. The seat reaches 24 feet twice in the turn, at 60° and 300°.
2. **45° and 135°** Set 6sin(x) = 3sqrt(2), so sin(x) = sqrt(2)/2. The target is at that position at 45° and 135°.

CHALLENGE

x = 10°, 50°, 130°, 170°, 250°, or 290°. As x makes one turn, 3x makes three turns, with two solutions in each turn.

Accept solutions in any order. For graph questions, the angle answers are in degrees, not x-axis units.