LESSON MAKER PRO

Angle Answer Hunt

Use inverse trig to find every solution in a full turn.

HIGH SCHOOL · HSF-TF.B.7

CCSS.Math.Content.HSF-TF.B.7 "(+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. *"

NAME _____ DATE _____

FIND THE REFERENCE ANGLE

Use an inverse trig function to find a reference angle, then use the sign of sine, cosine, or tangent to choose the correct quadrants. When an interval is given in degrees, set your technology to degree mode and list only solutions in that interval.

WORKED EXAMPLE

Solve tan x = -sqrt(3) for x in one full turn, 0° <= x < 360°.

1. Use inverse tangent: $\tan^{-1}(-\sqrt{3}) = -60°$.
2. The reference angle is 60°.
3. Tangent is negative in Quadrants II and IV.
4. The angles are 120° and 300°.

Answer: x = 120°, 300°

PRACTICE 6 problems

1 Solve cos x = 0 for 0° <= x < 360°.

ANSWER _____

2 Solve sin x = 1/2 for 0° <= x < 360°.

ANSWER _____

3 Solve tan x = -1 for 0° <= x < 360°.

ANSWER _____

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

ANSWER _____

5 Solve sin x = -sqrt(3)/2 for 0° <= x < 360°.

ANSWER _____

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

ANSWER _____

APPLY IT Show your work

1 A student programs an LED display for a school event. Its brightness is modeled by B(t) = 50 + 30 sin(30t), where B is in percent and t is in minutes. During the first 12 minutes, when is the brightness 65 percent?

WORK SPACE

ANSWER _____

2 For a robotics club demo, a sensor on a rotating arm has height h(t) = 8 + 2 cos(90t), where h is in inches above the table and t is in seconds. During the first 4 seconds, when is the sensor 9 inches above the table?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Solve cos(2x) = -1/2 for 0° <= x < 360°. Explain why there are four solutions.

WORK SPACE AND ANSWER

ANSWER KEY

Angle Answer Hunt

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Solve cos x = 0 for 0° <= x < 360°.	**x = 90°, 270°**
2	Solve sin x = 1/2 for 0° <= x < 360°.	**x = 30°, 150°**
3	Solve tan x = -1 for 0° <= x < 360°.	**x = 135°, 315°**
4	Solve cos x = -sqrt(2)/2 for 0° <= x < 360°.	**x = 135°, 225°**
5	Solve sin x = -sqrt(3)/2 for 0° <= x < 360°.	**x = 240°, 300°**
6	Solve tan x = sqrt(3)/3 for 0° <= x < 360°.	**x = 30°, 210°**

PART 2 · APPLY IT

1. **t = 1 minute and t = 5 minutes** Set 50 + 30 sin(30t) = 65, so sin(30t) = 1/2. In the first 12 minutes, 30t = 30° or 150°, giving t = 1 or 5.
2. **t = 2/3 second and t = 10/3 seconds** Set 8 + 2 cos(90t) = 9, so cos(90t) = 1/2. During one 4-second rotation, 90t = 60° or 300°, giving t = 2/3 or 10/3.

CHALLENGE

x = 60°, 120°, 240°, 300°. Since 2x runs from 0° to less than 720°, cosine equals -1/2 at 120°, 240°, 480°, and 600°, then dividing each angle by 2 gives the four values of x.

Accept equivalent ordered lists of all correct degree measures. For the modeling items, accept exact fractional times and matching decimal forms, 0.667 and 3.333 seconds, when appropriately rounded.