PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

11. **Use Structure** Find the radian measures of the angles θ whose cosine is -1.5. Explain your reasoning.

12. **Communicate Precisely** In order to define the inverse sine, inverse cosine, and inverse tangent functions, the domains of the sine, cosine, and tangent functions must be restricted. Explain why.

13. **Error Analysis** Describe and correct the error a student made in solving the following trigonometric equation for θ.

$2 \sin \theta + 3 = 4$
$2 \sin \theta = 1$
$\sin \theta = \frac{1}{2}$
$\theta = \sin^{-1}\left(\frac{1}{2}\right)$
$\theta = \frac{\pi}{3} + 2\pi n$ or $\frac{5\pi}{3} + 2\pi n$ ✗

14. **Construct Arguments** Explain why there is no solution for $\theta = \cos^{-1} 3.75$.

15. **Generalize** Find $\sec^{-1}\left(\frac{1}{2}\right)$. Justify your answer.

16. **Higher Order Thinking** Evaluate or simplify.

a. $\cos^{-1}\left(\cos\left(\frac{\pi}{8}\right)\right)$

b. $\tan\left(\tan^{-1}(-3.6)\right)$

c. $\sin^{-1}\left(\tan\left(-\frac{\pi}{4}\right)\right)$

17. **Generalize** Find the value(s) of $\sin \theta$, if $\sin^2 \theta = 1$.

18. **Mathematical Connections** Write a trigonometric equation with solutions of 240° and 300° in the domain [0, 360°].

PRACTICE

19. How would you restrict the domain of the cotangent function to define the inverse cotangent function? SEE EXAMPLE 1

Evaluate the inverse trigonometric functions at the given value. Keep the angle values within the range of each inverse function. Give answers in both radian and degree measures. SEE EXAMPLE 2

20. $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)$

21. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

22. $\tan^{-1}(-1)$

23. $\cos^{-1}\left(-\frac{1}{2}\right)$

Find all the angle values of the trigonometric functions that have the given values. Give answers in degree measures rounded to the nearest tenth. SEE EXAMPLE 3

24. $\sin x = 0.64$

25. $\cos x = -0.6293$

26. $\sin x = -0.39$

27. $\tan x = -0.6293$

Solve each trigonometric equation for values between 0 and 2π. SEE EXAMPLE 4

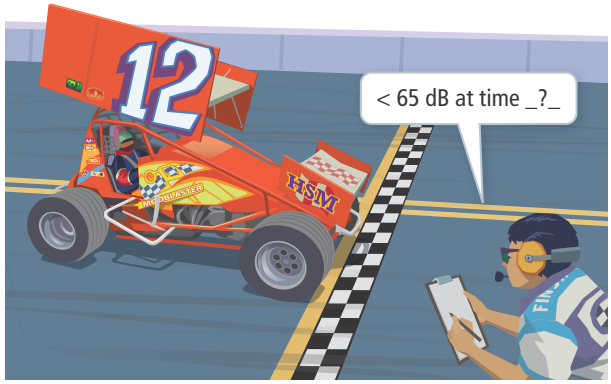
28. $\sqrt{3} \tan x + 1 = 0$

29. $2 \sin x + \sqrt{3} = 0$

30. $2 \cos^2 \theta - 1 = 0$

31. $2 \sin^2 \theta + \sin \theta - 1 = 0$ (*Hint*: Factor the trinomial).

32. A sprint car with a loud engine is racing around a track. The engine's volume V, in dB, is defined as $V = -12 \sin\left(\frac{2\pi}{15}t\right) + 70$, where t is the time in minutes since the sprint car has passed your position. When will the sound of the sprint car first be below 65 dB?



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Mixed Review Available Online

APPLY

33. Make Sense and Persevere A pendulum is pulled away from its resting position and released. The equation $h = 2\cos(\pi t) + 6$ models the height h in inches as a function of time at t seconds.

a. Solve the equation for t.

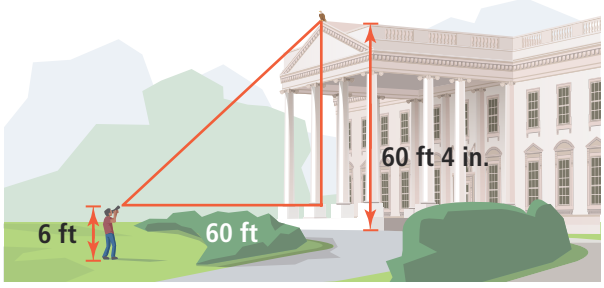
b. Find the first time at which the pendulum is at a height of 5 in. Round to the nearest hundredth second.

34. Model With Mathematics Air traffic controllers at LaGuardia Airport have asked an aircraft to maintain a holding pattern near the airport. The function $d(x) = 70\sin(0.60x) + 120$ represents the horizontal distance d, in miles, of the aircraft from the airport at time x, in minutes.

a. When the aircraft enters the holding pattern, $x = 0$, how far is it from LaGuardia Airport?

b. During the first 15 min after the aircraft enters the holding pattern, at what time, x, is the aircraft exactly 187 mi from the airport?

35. Make Sense and Persevere A photographer stands 60 ft from the White House, which is, 60 ft, 4 in. tall, and photographs a bird sitting on the roof. Provided the line of sight of the photographer is 6 ft above the ground, find the angle of elevation of the line of sight of the photographer to the roof of the White House. Round the angle measure to the nearest degree.



36. Model With Mathematics The tides at a particular North Carolina beach could be modeled by $h = 4.5\cos\frac{3\pi}{17}t$, where h is the height of the tide in feet above the mean water level and t is the number of hours past midnight. At what time will the tide be about $2\frac{1}{2}$ ft above the mean water level?

ASSESSMENT PRACTICE

37. Solve the equation $4\sin^2\theta - 3 = 0$ for θ measured in radians. Determine if each of the following are part of the solution set. Select *Yes* or *No*.

	Yes	No
a. $\frac{\pi}{6} + 2k\pi$, where k is an integer	❑	❑
b. $\frac{\pi}{3} + k\pi$, where k is an integer	❑	❑
c. $\frac{\pi}{3} + 2k\pi$, where k is an integer	❑	❑
d. $\frac{2\pi}{3} + 2k\pi$, where k is an integer	❑	❑
e. $\frac{2\pi}{3} + k\pi$, where k is an integer	❑	❑
f. $\frac{5\pi}{6} + k\pi$, where k is an integer	❑	❑

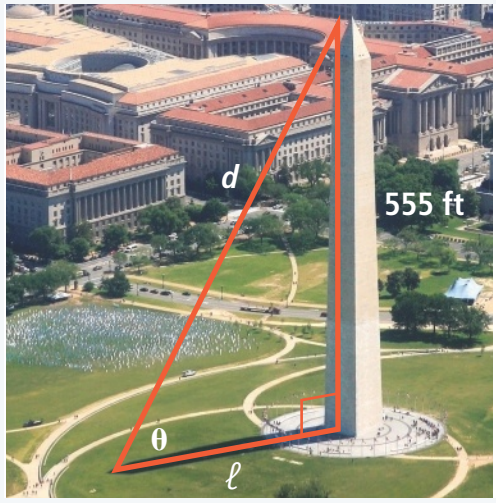
38. SAT/ACT What is the approximate measure of the angle θ in the triangle shown?

Not drawn to scale

Ⓐ $\theta = 22.6°$ Ⓑ $\theta = 24.6°$

Ⓒ $\theta = 65.4°$ Ⓓ $\theta = 67.4°$

39. Performance Task The Washington Monument is 555 ft tall. The angle of elevation from the end of the monument's shadow to the top of the monument has a cosecant of 1.10.



Part A What is the measure of the angle θ?

Part B What is the distance d from the end of the monument's shadow to the top of the monument? Round to the nearest tenth of a foot.

Part C What is the length l of the monument's shadow? Round to the nearest tenth of a foot.

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