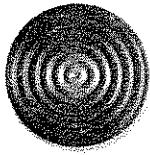


KEY



Quick Warm-Up: Assessing Prior Knowledge
13.1 Right-Triangle Trigonometry

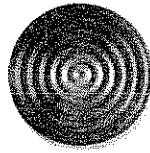
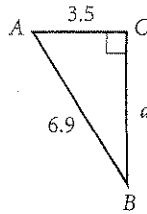
Rewrite as a decimal rounded to the nearest ten-thousandth.

1. $\frac{13}{24}$ _____ 2. $\frac{24}{13}$ _____

Solve each equation.

3. $0.3 = \frac{m}{8}$ _____ 4. $1.25 = \frac{7}{y}$ _____

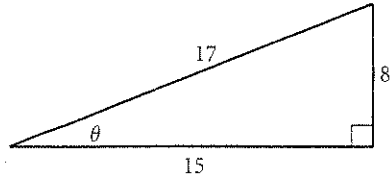
5. Find the unknown length in the right triangle ABC. _____



Lesson Quiz
13.1 Right-Triangle Trigonometry

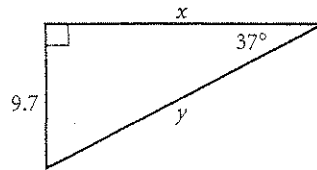
1. Find the values of the six trigonometric functions of θ for the right triangle shown. Give exact answers and answers rounded to the nearest ten-thousandth.

$\sin \theta = \frac{8}{17}$ $\cos \theta = \frac{15}{17}$
 $\tan \theta = \frac{8}{15}$ $\csc \theta = \frac{17}{8}$
 $\sec \theta = \frac{17}{15}$ $\cot \theta = \frac{15}{8}$



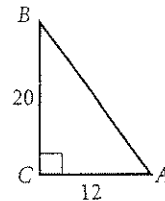
2. Find x and y in the triangle shown. Round your answers to the nearest hundredth.

$x \approx 12.87$ $y \approx 16.12$

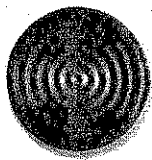


3. Solve $\triangle ABC$. Round $m\angle A$ and $m\angle B$ to the nearest degree and round AB to the nearest tenth.

$\angle A \approx 59^\circ$ $\angle B \approx 31^\circ$ $AB \approx 23.3$



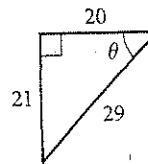
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Quick Warm-Up: Assessing Prior Knowledge

13.2 Angles of Rotation

Find the values of each trigonometric function for angle θ .
Give exact answers and answers rounded to the nearest ten-thousandth.



1. $\sin \theta$ _____ 2. $\cos \theta$ _____ 3. $\tan \theta$ _____
4. $\csc \theta$ _____ 5. $\sec \theta$ _____ 6. $\cot \theta$ _____



Lesson Quiz

13.2 Angles of Rotation

Find the coterminal angle, θ , for each angle such that $-360^\circ < \theta < 360^\circ$.

1. 125° -235° 2. -215° 145°

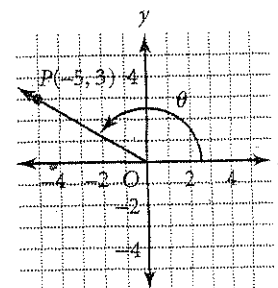
Find the reference angle, θ_{ref} , for each angle.

3. 305° 55° 4. -100° 80° 5. 168° 12°

6. Using the diagram at right, find the exact values of the six trigonometric functions of θ .

$$\sin \theta = \frac{3\sqrt{34}}{34} \quad \cos \theta = -\frac{5\sqrt{34}}{34} \quad \tan \theta = -\frac{3}{5}$$

$$\csc \theta = \frac{\sqrt{34}}{3} \quad \sec \theta = -\frac{\sqrt{34}}{5} \quad \cot \theta = -\frac{5}{3}$$



7. The terminal side of θ lies in Quadrant IV and $\cos \theta = \frac{5}{13}$.
Find $\sin \theta$ and $\tan \theta$. $\sin \theta = -\frac{12}{13}$ $\tan \theta = -\frac{12}{5}$

8. Give two positive and two negative angles that are coterminal with 112° .
 $472^\circ, 832^\circ, -248^\circ, -608^\circ$



Quick Warm-Up: Assessing Prior Knowledge

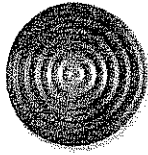
13.3 Trigonometric Functions of Any Angle

Find the reference angle, θ_{ref} , for each angle.

1. $\theta = 163^\circ$ _____ 2. $\theta = -163^\circ$ _____ 3. $\theta = -280^\circ$ _____ 4. $\theta = 311^\circ$ _____

The point $(1, -2)$ is located on the terminal side of θ . Find the exact value of each trigonometric function of θ .

5. $\sin \theta$ _____ 6. $\cos \theta$ _____ 7. $\tan \theta$ _____
 8. $\csc \theta$ _____ 9. $\sec \theta$ _____ 10. $\cot \theta$ _____



Lesson Quiz

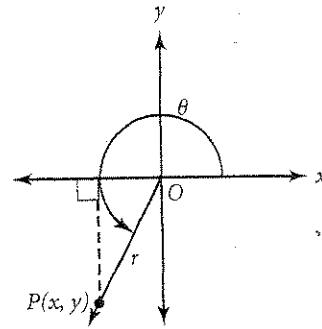
13.3 Trigonometric Functions of Any Angle

Find the exact values of the sine and the cosine of each angle.

1. 750° $\sin 750^\circ = \frac{1}{2}$ $\cos = \frac{\sqrt{3}}{2}$ 2. -945° $\sin = \frac{\sqrt{2}}{2}$ $\cos = -\frac{\sqrt{2}}{2}$
 3. -1260° $\sin = 0$ $\cos = -1$ 4. 1140° $\sin = \frac{\sqrt{3}}{2}$ $\cos = \frac{1}{2}$

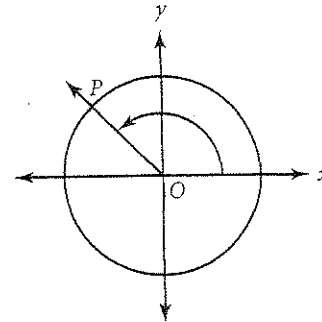
5. In the diagram at right, $\theta = 240^\circ$ and $x = -8$. Find exact values for r and the coordinates of P .

$r = 16 ; P(-8, -8\sqrt{3})$

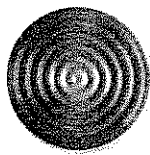


6. In the illustration at right, point P is the intersection of a circle with a radius of 7 and the terminal side of a 135° angle. Find the exact coordinates of P .

$P = \left(-\frac{7\sqrt{2}}{2}, \frac{7\sqrt{2}}{2} \right)$



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**Quick Warm-Up: Assessing Prior Knowledge****13.4 Radian Measure and Arc Length**

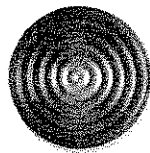
Find each trigonometric value. Give exact answers.

1. $\sin 60^\circ$ _____ 2. $\cos 135^\circ$ _____ 3. $\tan(-30^\circ)$ _____ 4. $\sin(-150^\circ)$ _____

5. $\cos 360^\circ$ _____ 6. $\sin(-90^\circ)$ _____ 7. $\tan(-180^\circ)$ _____ 8. $\tan 270^\circ$ _____

Find the number of rotations represented by each angle.

9. 720° _____ 10. 90° _____ 11. -60° _____ 12. -540° _____

**Lesson Quiz****13.4 Radian Measure and Arc Length**

Convert each degree measure to radian measure. Give exact answers.

1. 135° $\frac{3\pi}{4}$ 2. 450° $\frac{5\pi}{2}$

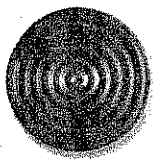
Convert each radian measure to degree measure. Round answers to the nearest tenth.

3. $\frac{2\pi}{3}$ 120.0° 4. 2.5π ~~450^\circ~~ 450°

Evaluate each expression. Round answers to the nearest ten-thousandth.

5. $\sin 3.5$ -0.3508 6. $\tan\left(\frac{5\pi}{6}\right)$ -0.5774

7. A central angle in a circle with a radius of 20 meters measures 1.6 radians. Find the length of the arc on the circle that this angle intercepts. 328. A central angle in a circle with a diameter of 30 meters measures 60° . To the nearest tenth, find the length of the arc on the circle that this angle intercepts. 15.79. A central angle in a circle with a radius of 50 meters intercepts an arc 12 meters long. Find the measure of the central angle in radians. 0.24 radians10. Find the radius of a circle if the length of the arc intercepted by a 45° central angle is π meters. 4

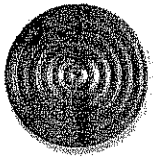


Quick Warm-Up: Assessing Prior Knowledge

13.5 Graphing Trigonometric Functions

Identify the transformation(s) applied to the parent function $f(x) = \sqrt{x}$.

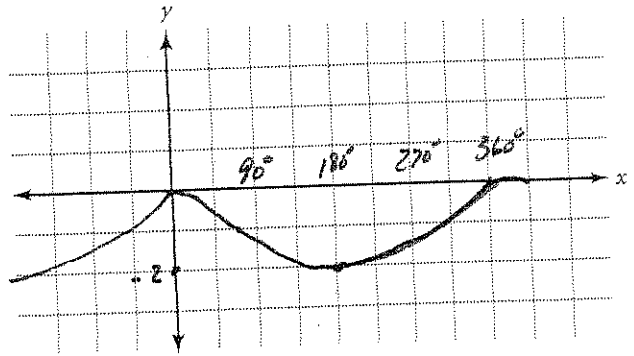
1. $f(x) = \sqrt{x - 2}$ _____
2. $f(x) = \sqrt{x} - 2$ _____
3. $f(x) = -3\sqrt{x}$ _____
4. $f(x) = \sqrt{-x}$ _____
5. $f(x) = \sqrt{6x + 1}$ _____



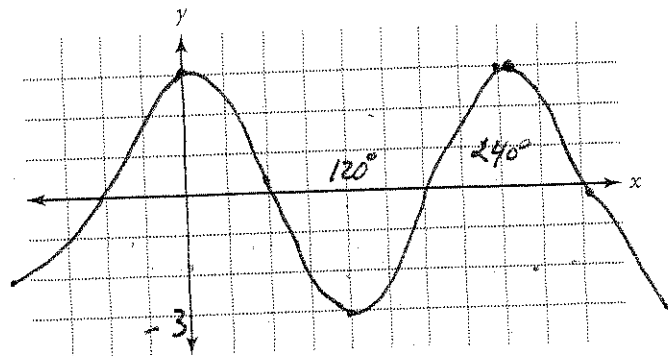
Lesson Quiz

13.5 Graphing Trigonometric Functions

1. Graph one period of $y = \sin(x + 90^\circ) - 1$.



2. Graph one period of $y = 3 \cos\left(\frac{3}{2}x\right)$.



3. Find the phase shift, vertical translation, amplitude, and period of the function $y = 2.5 \cos[3(\theta - 20^\circ)] + 6$.

phase shift 20° right, ~~6~~ vertical translation 6

amplitude = 2.5 period 120°



Quick Warm-Up: Assessing Prior Knowledge

13.6 Inverses of Trigonometric Functions

Find the inverse of each function.

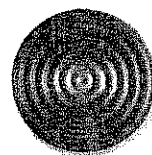
1. $f(x) = x - 4$ _____

2. $g(x) = -5x$ _____

3. $h(x) = 2x + 6$ _____

4. $j(x) = 3^x$ _____

5. $k(x) = \ln x$ _____



Lesson Quiz

13.6 Inverses of Trigonometric Functions

Evaluate each trigonometric expression. Give answers in degrees rounded to the nearest hundredth.

1. $\sin^{-1}\left(\frac{3}{4}\right)$ 48.59° 2. $\tan^{-1} 7.5$ 82.41°

Evaluate each trigonometric expression. Give answers in radians rounded to the nearest hundredth.

3. $\cos^{-1}(-0.27)$ 1.84 4. $\tan^{-1}(\sqrt{3})$ 1.05

Evaluate each composite trigonometric expression.

5. $\sin\left[\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)\right]$ $\frac{1}{2}$ 6. $\tan\left[\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)\right]$ -1

7. $\tan^{-1}(\sin 330^\circ)$ - .4636 radians or -26.5651° 8. $\cos^{-1}(\cos 225^\circ)$ 2.3562 radians or 135°

9. A 30-foot-tall building casts a 40-foot-long shadow on the ground.

Find the angle of elevation of the sun to the nearest tenth of a

degree. 36.9°



Chapter Assessment

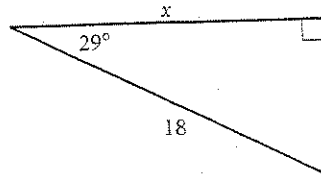
Chapter 13, Form A, page 1

Write the letter that best answers the question or completes the statement.

D

1. Find the value of x in the figure at right.

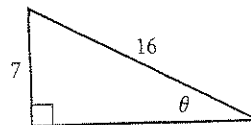
- a. 8.73 b. 9.98
c. 12.42 d. 15.74



B

2. Find the value of θ in the figure at right.

- a. 23.6° b. 25.9°
c. 64.1° d. 66.4°



D

3. Which of the following is coterminal with 112° ?

- a. 148° b. 68° c. -22° d. -248°

B

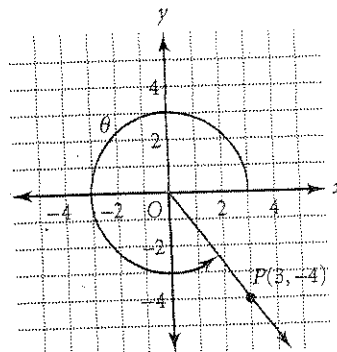
4. Which of the following is the reference angle for 230° ?

- a. 40° b. 50° c. 130° d. 180°

A

5. Using the diagram at right, find $\csc \theta$.

- a. $-\frac{5}{4}$ b. $-\frac{3}{4}$
c. $\frac{5}{3}$ d. $\frac{3}{7}$



~~B~~ C

6. If θ is an angle in standard position with its terminal side in Quadrant III and $\cot \theta = \frac{15}{8}$, find $\cos \theta$.

- a. $-\frac{17}{8}$ b. $-\frac{17}{15}$ c. $-\frac{15}{17}$ d. $-\frac{8}{17}$

D

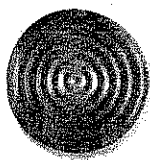
7. Point P is the intersection of a circle with a radius of 15 and the terminal side of a 200° angle in standard position. Find the coordinates of P .

- a. $P(12.7, -6.4)$ b. $P(-5.1, -14.1)$
c. $P(6.4, -12.7)$ d. $P(-14.1, -5.1)$

A

8. Convert 38° to radian measure.

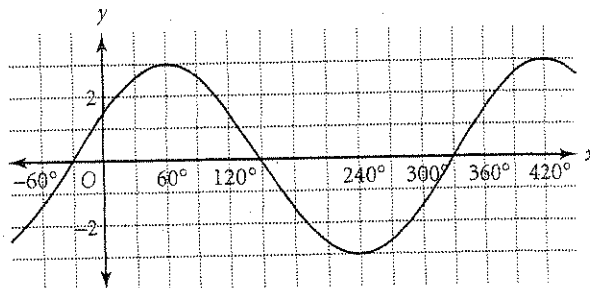
- a. 0.66 b. 12.10 c. 320.86 d. 2177.24



Chapter Assessment

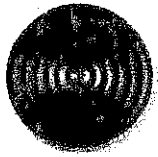
Chapter 13, Form A, page 2

- B 9. Convert $\frac{5\pi}{4}$ radians to degree measure.
 a. 115° b. 225° c. 315° d. 405°
- C 10. A central angle in a circle with a radius of 80 meters intercepts an arc that is 120 meters long. What is the measure of the central angle?
 a. 40° b. 15° c. 1.5 radians d. 0.67 radians
- D 11. A central angle in a circle with a radius of 20 meters measures 43° . Find the length of the arc on the circle that the angle intercepts.
 a. 860 meters b. 430 meters c. 65 meters d. 15 meters
- C 12. Find the amplitude and period of the function $y = 4 \sin(2\theta) + 3$.
 a. amplitude: 4; period: 720° b. amplitude: 3; period: 180°
 c. amplitude: 4; period: 180° d. amplitude: 2; period: 90°
- C 13. Identify the phase shift and the vertical translation in the function $y = 5 \cos[3(\theta - 20^\circ)] + 7$.
 a. phase shift: 20° ; vertical translation: -7
 b. phase shift: -20° ; vertical translation: 7
 c. phase shift: 20° ; vertical translation: 7
 d. phase shift: -20° ; vertical translation: -7
- B 14. Which of the following equations is graphed at right?
 a. $y = \cos(x + 60^\circ) - 3$
 b. $y = 3\cos(x - 60^\circ)$
 c. $y = \cos(x + 60^\circ) + 3$
 d. $y = \cos(3x) - 60^\circ$



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- B 15. Which of the following is $\cos\left[\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right)\right]$?
 a. $\frac{1}{2}$ b. $\frac{\sqrt{3}}{2}$ c. $-\frac{1}{2}$ d. $-\frac{\sqrt{3}}{2}$
- A 16. Which of the following is $\sin^{-1}(\cos 30^\circ)$?
 a. 60° b. 30° c. 0.5 d. -0.5
- D 17. The angle of depression from the top of a cliff to a ship is 12° . If the cliff is 50 feet high, about how far from the bottom of the cliff is the ship?
 a. 10 feet b. 50 feet c. 125 feet d. 235 feet



Chapter Assessment

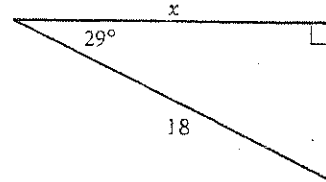
Chapter 13, Form A, page 1

Write the letter that best answers the question or completes the statement.

D

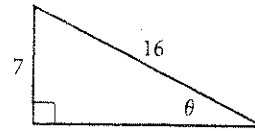
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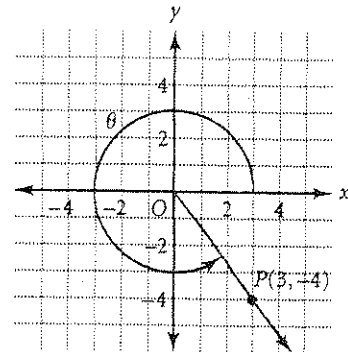
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c. $\frac{5}{3}$ d. $\frac{3}{7}$

C

6. If θ is an angle in standard position with its terminal side in Quadrant III and $\cot \theta = \frac{15}{8}$, find $\cos \theta$.

- a. $-\frac{17}{8}$ b. $-\frac{17}{15}$ c. $-\frac{15}{17}$ d. $-\frac{8}{17}$

D

7. Point P is the intersection of a circle with a radius of 15 and the terminal side of a 200° angle in standard position. Find the coordinates of P .

- a. $P(12.7, -6.4)$ b. $P(-5.1, -14.1)$
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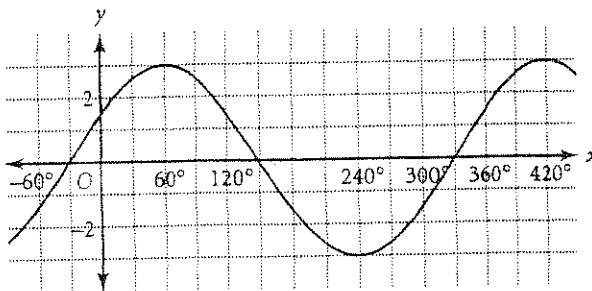
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Chapter Assessment

Chapter 13, Form A, page 2

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