

Chapter 7

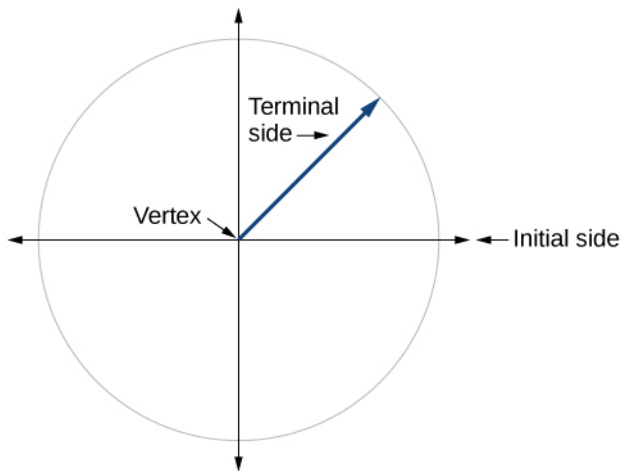
The Unit Circle: Sine and Cosine Functions

7.1 Angles

Section Exercises

Verbal

1. Draw an angle in standard position. Label the vertex, initial side, and terminal side.



2. -
3. State what a positive or negative angle signifies, and explain how to draw each.
Whether the angle is positive or negative determines the direction. A positive angle is drawn in the counterclockwise direction, and a negative angle is drawn in the clockwise direction.
4. -
5. Explain the differences between linear speed and angular speed when describing motion along a circular path.
Linear speed is a measurement found by calculating distance of an arc compared to time. Angular speed is a measurement found by calculating the angle of an arc compared to time.

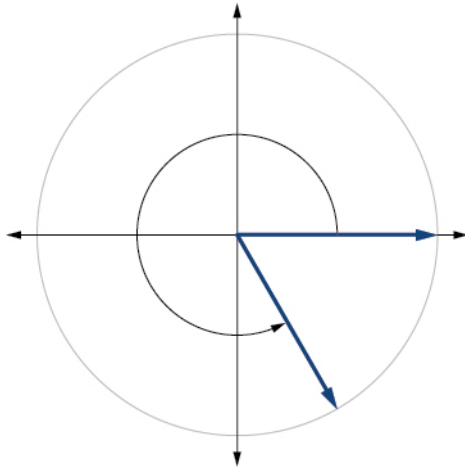
Graphical

For the following exercises, draw an angle in standard position with the given measure.

6. -

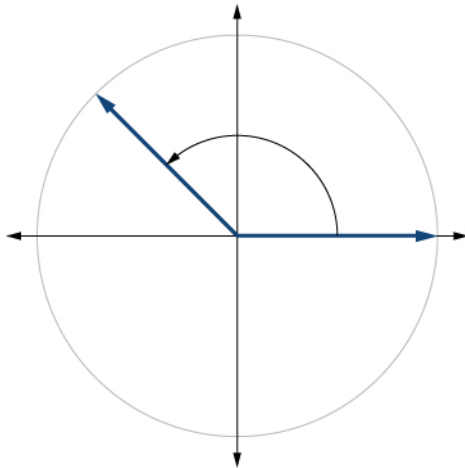
Section 7.1

7. 300°



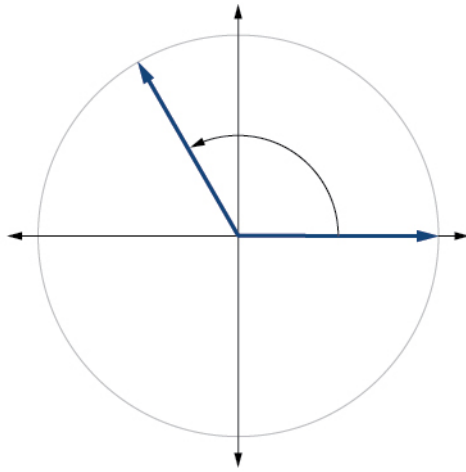
8. _

9. 135°



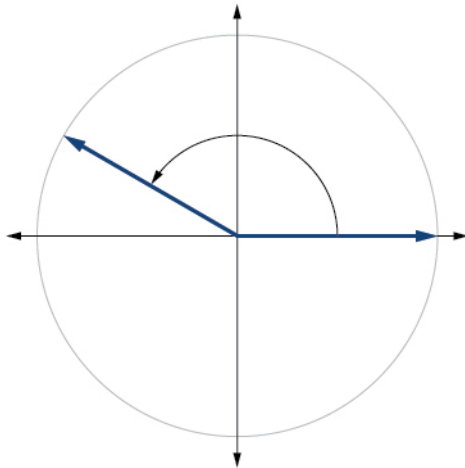
10. _

11. $\frac{2\pi}{3}$



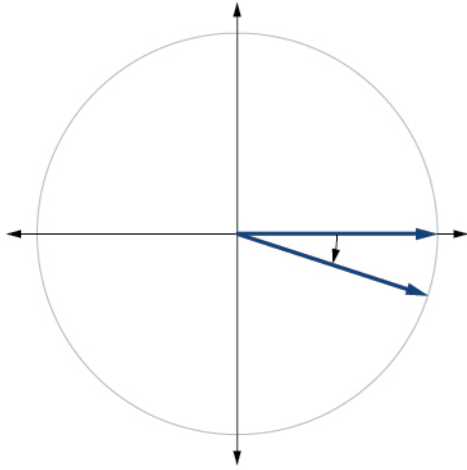
12. -

13. $\frac{5\pi}{6}$



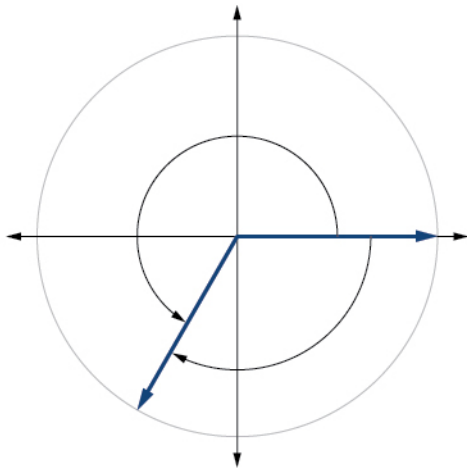
14. -

15. $-\frac{\pi}{10}$



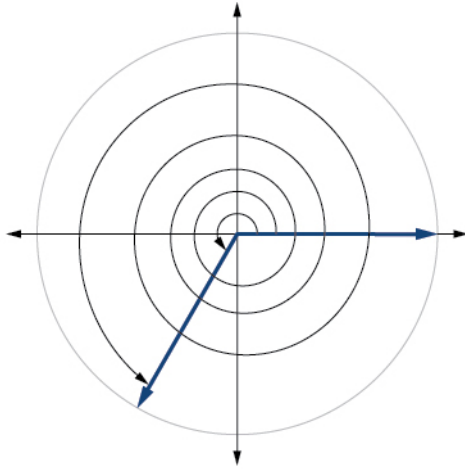
16. _

17. -120°



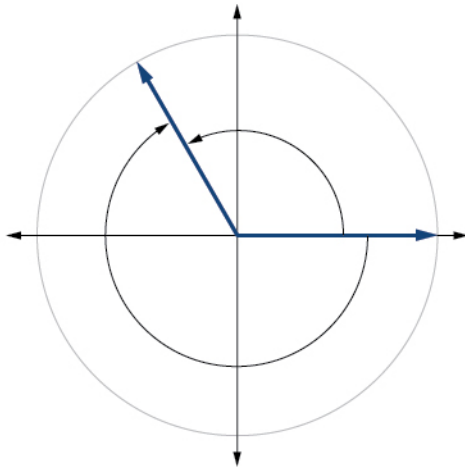
18. _

19. $\frac{22\pi}{3}$

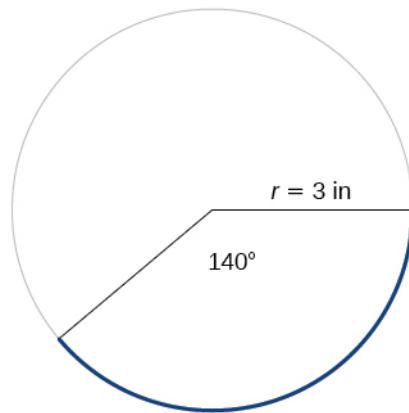


20. -

21. $-\frac{4\pi}{3}$



For the following exercises, refer to the figure. Round to two decimal places.

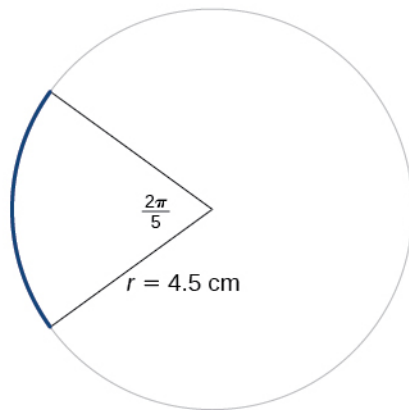


22. -

23. Find the area of the sector.

$$\frac{7\pi}{2} \approx 11.00 \text{ in}^2$$

For the following exercises, refer to the figure. Round to two decimal places.



24. -

25. Find the area of the sector.

$$\frac{81\pi}{20} \approx 12.72 \text{ cm}^2$$

Algebraic

For the following exercises, convert angles in radians to degrees.

26.

-

Section 7.1

27. $\frac{\pi}{9}$ radians

20°

28.

-

29. $\frac{\pi}{3}$ radians

60°

30.

-

31. $-\frac{5\pi}{12}$ radians

-75°

32.

-

For the following exercises, convert angles in degrees to radians.

33. 90°

$\frac{\pi}{2}$ radians

34. -

35. -540°

-3π radians

36. -

37. 180°

π radians

38. -

39. 150°

$\frac{5\pi}{6}$ radians

For the following exercises, use the given information to find the length of a circular arc. Round to two decimal places.

40. -

Section 7.1

41. Find the length of the arc of a circle of radius 5.02 miles subtended by the central angle of $\frac{\pi}{3}$.

$$\frac{5.02\pi}{3} \approx 5.26 \text{ miles}$$

42. -

43. Find the length of the arc of a circle of radius 10 centimeters subtended by the central angle of 50° .

$$\frac{25\pi}{9} \approx 8.73 \text{ centimeters}$$

44. -

45. Find the length of the arc of a circle of diameter 12 meters subtended by the central angle is 63° .

$$\frac{21\pi}{10} \approx 6.60 \text{ meters}$$

For the following exercises, use the given information to find the area of the sector. Round to four decimal places.

46. -

47. A sector of a circle has a central angle of 30° and a radius of 20 cm.

$$104.7198 \text{ cm}^2$$

48. -

49. A sector of a circle with radius of 0.7 inches and an angle of π radians.

$$0.7697 \text{ in}^2$$

For the following exercises, find the angle between 0° and 360° that is coterminal to the given angle.

50. -

51. -110°

$$250^\circ$$

52. -

53. 1400°

$$320^\circ$$

For the following exercises, find the angle between 0 and 2π in radians that is coterminal to the given angle.

54.

-

55. $\frac{10\pi}{3}$

$\frac{4\pi}{3}$

56.

-

57. $\frac{44\pi}{9}$

$\frac{8\pi}{9}$

Real-World Applications

58. -

59. A bicycle with 24-inch diameter wheels is traveling at 15 mi/h. Find the angular speed of the wheels in rad/min. How many revolutions per minute do the wheels make?

1320 rad/min; 210.085 RPM

60. -

61. A wheel of radius 14 inches is rotating 0.5 rad/s. What is the linear speed v , the angular speed in RPM, and the angular speed in deg/s?

7 in./s; 4.77 RPM ; 28.65 deg/s

62. -

63. When being burned in a writable CD-R drive, the angular speed of a CD is often much faster than when playing audio, but the angular speed still varies to keep the linear speed constant where the disc is being written. When writing along the outer edge of the disc, the angular speed of one drive is about 4800 RPM (revolutions per minute). Find the linear speed if the CD has diameter of 120 millimeters.

1,809,557.37 mm/min = 30.16 m/s

64. -

65. Find the distance along an arc on the surface of Earth that subtends a central angle of 5 minutes ($1 \text{ minute} = \frac{1}{60} \text{ degree}$). The radius of Earth is 3960 miles.

5.76 miles

66. -

67. Consider a clock with an hour hand and minute hand. What is the measure of the angle the minute hand traces in 20 minutes?

120°

Extensions

Section 7.1

68. -

69. A city is located at 40 degrees north latitude. Assume the radius of the earth is 3960 miles and the earth rotates once every 24 hours. Find the linear speed of a person who resides in this city.

794 miles per hour

70. -

71. Find the linear speed of the moon if the average distance between the earth and moon is 239,000 miles, assuming the orbit of the moon is circular and requires about 28 days.

Express answer in miles per hour.

2,234 miles per hour

72. -

73. A car travels 3 miles. Its tires make 2640 revolutions. What is the radius of a tire in inches?

11.5 inches

74. -

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Chapter 7

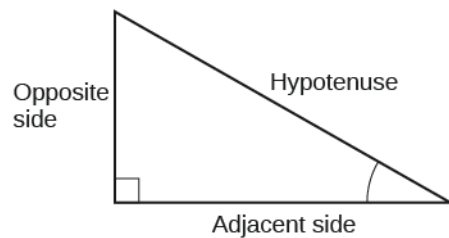
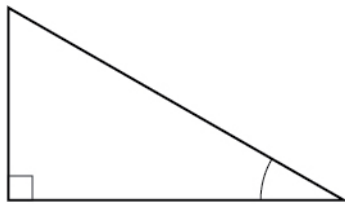
The Unit Circle: Sine and Cosine Functions

7.2 Right Triangle Trigonometry

Section Exercises

Verbal

- For the given right triangle, label the adjacent side, opposite side, and hypotenuse for the indicated angle.



-
- The tangent of an angle compares which sides of the right triangle?
The tangent of an angle is the ratio of the opposite side to the adjacent side.
-
- Explain the cofunction identity.
For example, the sine of an angle is equal to the cosine of its complement; the cosine of an angle is equal to the sine of its complement.

Algebraic

For the following exercises, use cofunctions of complementary angles.

6. -

7. $\cos\left(\frac{\pi}{3}\right) = \sin(\text{---})$

$$\frac{\pi}{6}$$

8. -

9. $\tan\left(\frac{\pi}{4}\right) = \cot(\text{---})$

$$\frac{\pi}{4}$$

For the following exercises, find the lengths of the missing sides if side a is opposite angle A , side b is opposite angle B , and side c is the hypotenuse.

10.

-

11. $\sin B = \frac{1}{2}$, $a = 20$

$$b = \frac{20\sqrt{3}}{3}, c = \frac{40\sqrt{3}}{3}$$

12.

-

13. $\tan A = 100$, $b = 100$

$$a = 10,000, c = 10,000.5$$

14.

-

15. $a = 5$, $\angle A = 60^\circ$

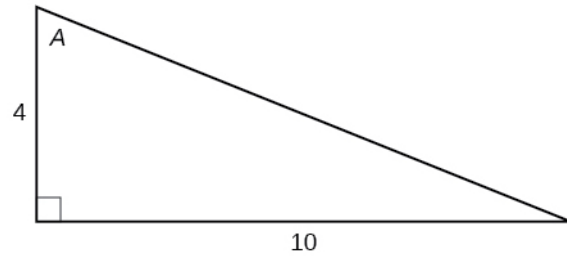
$$b = \frac{5\sqrt{3}}{3}, c = \frac{10\sqrt{3}}{3}$$

16. -

Graphical

For the following exercises, use the figure to evaluate each trigonometric function of angle A .

Section 7.2



17. $\sin A$

$$\frac{5\sqrt{29}}{29}$$

18. -

19. $\tan A$

$$\frac{5}{2}$$

20. -

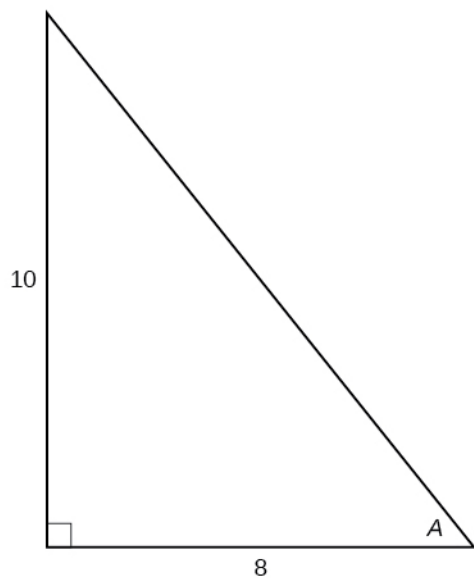
21. $\sec A$

$$\frac{\sqrt{29}}{2}$$

22. -

Section 7.2

For the following exercises, use the figure to evaluate each trigonometric function of angle A .



23. $\sin A$

$$\frac{5\sqrt{41}}{41}$$

24. _

25. $\tan A$

$$\frac{5}{4}$$

26. _

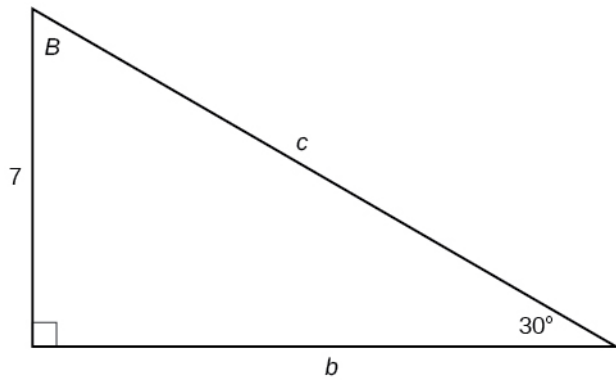
27. $\sec A$

$$\frac{\sqrt{41}}{4}$$

28. _

For the following exercises, solve for the unknown sides of the given triangle.

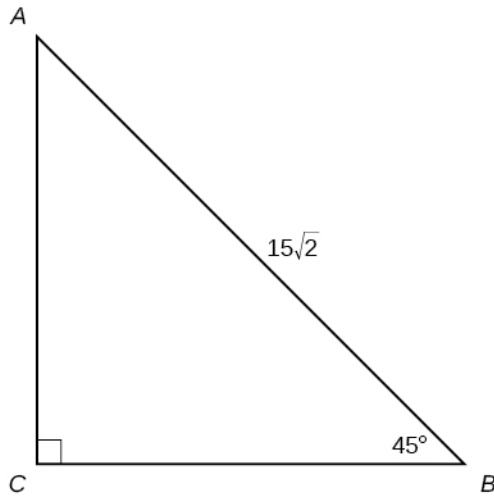
29.



$$c = 14, b = 7\sqrt{3}$$

30. -

31.



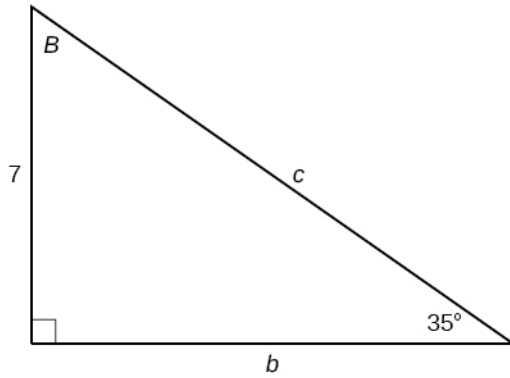
$$a = 15, b = 15$$

Technology

For the following exercises, use a calculator to find the length of each side to four decimal places.

32. -

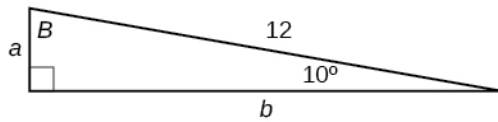
33.



$$b = 9.9970, c = 12.2041$$

34. -

35.



$$a = 2.0838, b = 11.8177$$

36. -

$$37. b = 15, \angle B = 15^\circ$$

$$a = 55.9808, c = 57.9555$$

38. _

$$39. c = 50, \angle B = 21^\circ$$

$$a = 46.6790, b = 17.9184$$

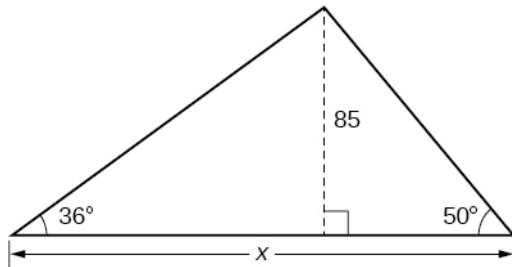
40. _

41. $b = 3.5$, $R A = 78^\circ$

$a = 16.4662$, $c = 16.8341$

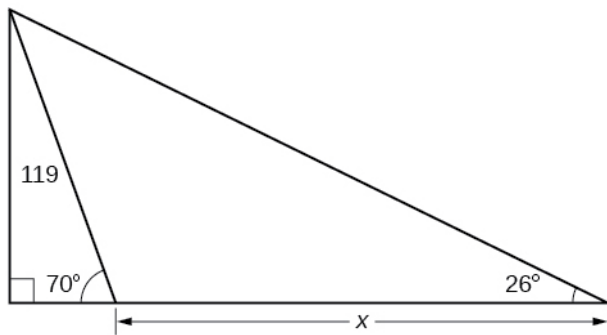
Extensions

42. -

43. Find x .

188.3159

44. -

45. Find x .

200.6737

46. -

47. A radio tower is located 325 feet from a building. From a window in the building, a person determines that the angle of elevation to the top of the tower is 43° , and that the angle of depression to the bottom of the tower is 31° . How tall is the tower?

498.3471 ft

48. -

Section 7.2

49. A 400-foot tall monument is located in the distance. From a window in a building, a person determines that the angle of elevation to the top of the monument is 18° , and that the angle of depression to the bottom of the tower is 3° . How far is the person from the monument?

1060.09 ft

50. -

51. There is lightning rod on the top of a building. From a location 500 feet from the base of the building, the angle of elevation to the top of the building is measured to be 36° . From the same location, the angle of elevation to the top of the lightning rod is measured to be 38° . Find the height of the lightning rod.

27.372 ft

Real-World Applications

52. -

53. A 23-ft ladder leans against a building so that the angle between the ground and the ladder is 80° . How high does the ladder reach up the side of the building?

22.6506 ft

54. -

55. The angle of elevation to the top of a building in Seattle is found to be 2 degrees from the ground at a distance of 2 miles from the base of the building. Using this information, find the height of the building.

368.7633 ft

56. -

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Chapter 7
The Unit Circle: Sine and Cosine Functions
7.3 Unit Circle

Section Exercises**Verbal**

1. Describe the unit circle.
The unit circle is a circle of radius 1 centered at the origin.
2. -
3. Discuss the difference between a coterminal angle and a reference angle.
Coterminal angles are angles that share the same terminal side. A reference angle is the size of the smallest acute angle, t , formed by the terminal side of the angle t and the horizontal axis.
4. -
5. Explain how the sine of an angle in the second quadrant differs from the sine of its reference angle in the unit circle.
The sine values are equal.

Algebraic

For the following exercises, use the given sign of the sine and cosine functions to find the quadrant in which the terminal point determined by t lies.

6. -
7. $\sin(t) > 0$ and $\cos(t) > 0$
I
8. -
9. $\sin(t) < 0$ and $\cos(t) > 0$
IV

For the following exercises, find the exact value of each trigonometric function.

10. -
11. $\sin \frac{\pi}{3}$
 $\frac{\sqrt{3}}{2}$
12. -

Section 7.3

13. $\cos \frac{\pi}{3}$

$$\frac{1}{2}$$

14.

-

15. $\cos \frac{\pi}{4}$

$$\frac{\sqrt{2}}{2}$$

16.

-

17. $\sin \pi$

$$0$$

18.

-

19. $\cos \pi$

$$-1$$

20. _

21. $\cos \frac{\pi}{6}$

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

22. _

Numeric

For the following exercises, state the reference angle for the given angle.

23. 240°

$$60^\circ$$

24. _

25. 100°

$$80^\circ$$

26. _

27. 135°

$$45^\circ$$

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28.

-

29. $\frac{2\pi}{3}$

$\frac{\pi}{3}$

30.

-

31. $\frac{-11\pi}{3}$

$\frac{\pi}{3}$

32.

-

33. $\frac{-\pi}{8}$

$\frac{\pi}{8}$

For the following exercises, find the reference angle, the quadrant of the terminal side, and the sine and cosine of each angle. If the angle is not one of the angles on the unit circle, use a calculator and round to three decimal places.

34. _

35. 300°

$$60^\circ, \text{ Quadrant IV, } \sin(300^\circ) = -\frac{\sqrt{3}}{2}, \cos(300^\circ) = \frac{1}{2}$$

36. _

37. 135°

$$45^\circ, \text{ Quadrant II, } \sin(135^\circ) = \frac{\sqrt{2}}{2}, \cos(135^\circ) = -\frac{\sqrt{2}}{2}$$

38. _

39. 120°

$$60^\circ, \text{ Quadrant II, } \sin(120^\circ) = \frac{\sqrt{3}}{2}, \cos(120^\circ) = -\frac{1}{2}$$

40. _

Section 7.3

41. 150°

$$30^\circ, \text{ Quadrant II, } \sin(150^\circ) = \frac{1}{2}, \cos(150^\circ) = -\frac{\sqrt{3}}{2}$$

42. -

43. $\frac{7\pi}{6}$

$$\frac{\pi}{6}, \text{ Quadrant III, } \sin\left(\frac{7\pi}{6}\right) = -\frac{1}{2}, \cos\left(\frac{7\pi}{6}\right) = -\frac{\sqrt{3}}{2}$$

44. -

45. $\frac{3\pi}{4}$

$$\frac{\pi}{4}, \text{ Quadrant II, } \sin\left(\frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}, \cos\left(\frac{3\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

46. -

47. $\frac{2\pi}{3}$

$$\frac{\pi}{3}, \text{ Quadrant II, } \sin\left(\frac{2\pi}{3}\right) = \frac{\sqrt{3}}{2}, \cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$$

48. -

49. $\frac{7\pi}{4}$

$$\frac{\pi}{4}, \text{ Quadrant IV, } \sin\left(\frac{7\pi}{4}\right) = -\frac{\sqrt{2}}{2}, \cos\left(\frac{7\pi}{4}\right) = \frac{\sqrt{2}}{2}$$

For the following exercises, find the requested value.

50. -

51. If $\cos(t) = \frac{2}{9}$ and t is in the first quadrant, find $\sin(t)$.

$$\frac{\sqrt{77}}{9}$$

52. -

53. If $\sin(t) = -\frac{1}{4}$ and t is in the third quadrant, find $\cos(t)$.

$$-\frac{\sqrt{15}}{4}$$

54. -

Section 7.3

55. Find the coordinates of the point on a circle with radius 20 corresponding to an angle of 120° .

$$(-10, 10\sqrt{3})$$

56. -

57. Find the coordinates of the point on a circle with radius 16 corresponding to an angle of

$$\frac{5\pi}{9}.$$

$$(-2.778, 15.757)$$

58. -

59. State the range of the sine and cosine functions.

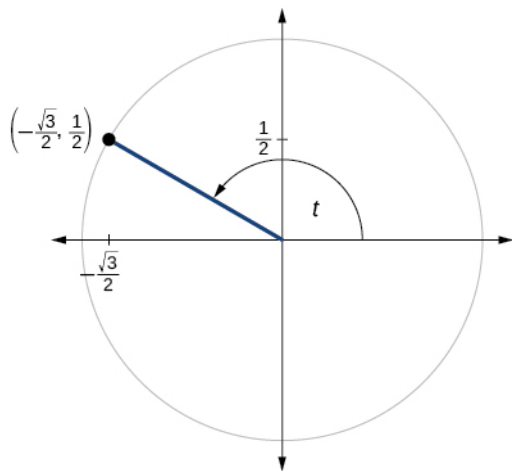
$$[-1, 1]$$

Graphical

For the following exercises, use the given point on the unit circle to find the value of the sine and cosine of t .

60. -

61.

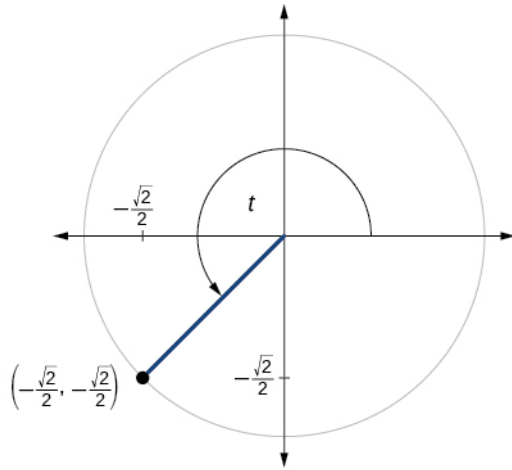


$$\sin t = \frac{1}{2}, \cos t = -\frac{\sqrt{3}}{2}$$

62. -

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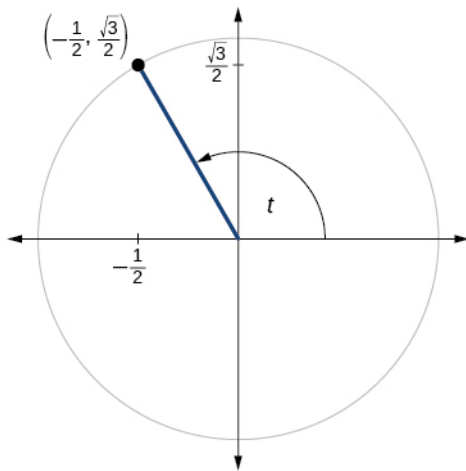
63.



$$\sin t = -\frac{\sqrt{2}}{2}, \cos t = -\frac{\sqrt{2}}{2}$$

64. -

65.

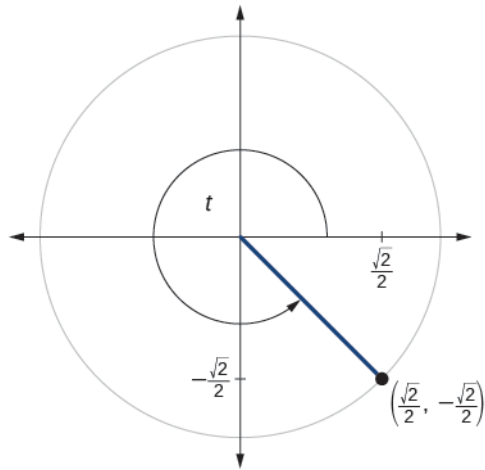


$$\sin t = \frac{\sqrt{3}}{2}, \cos t = -\frac{1}{2}$$

66. -

Section 7.3

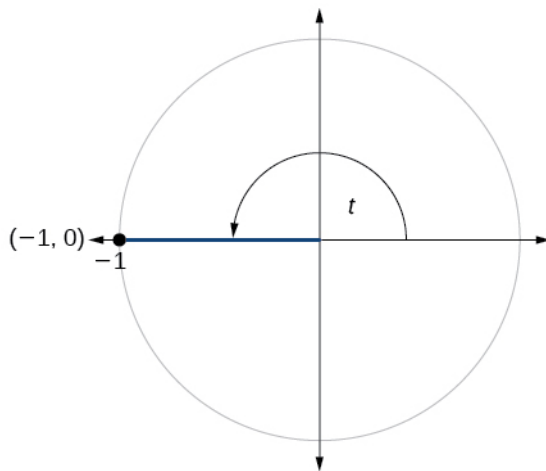
67.



$$\sin t = -\frac{\sqrt{2}}{2}, \cos t = \frac{\sqrt{2}}{2}$$

68. -

69.

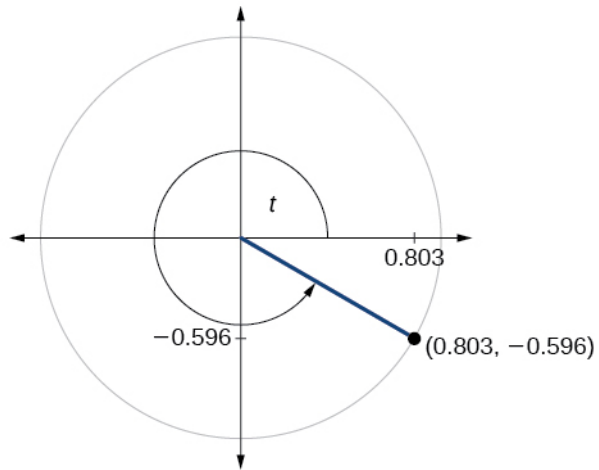


$$\sin t = 0, \cos t = -1$$

70. -

Section 7.3

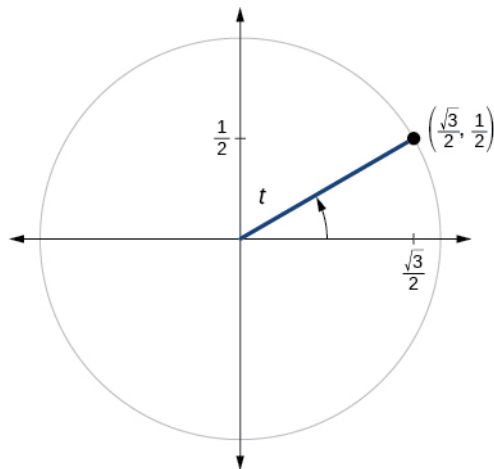
71.



$$\sin t = -0.596, \cos t = 0.803$$

72. -

73.

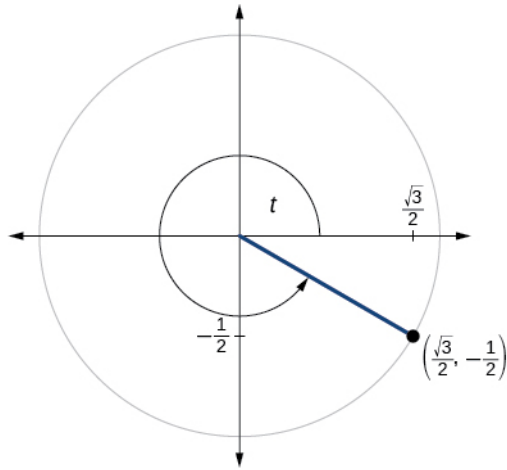


$$\sin t = \frac{1}{2}, \cos t = \frac{\sqrt{3}}{2}$$

74. -

Section 7.3

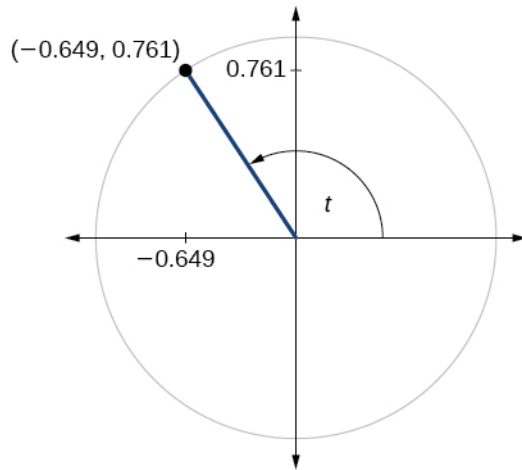
75.



$$\sin t = -\frac{1}{2}, \cos t = \frac{\sqrt{3}}{2}$$

76. -

77.

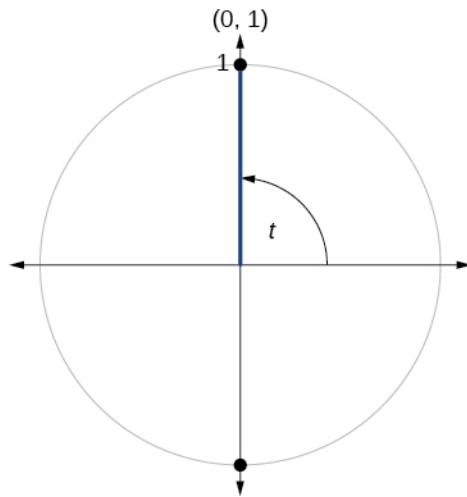


$$\sin t = 0.761, \cos t = -0.649$$

78. -

Section 7.3

79.



$$\sin t = 1, \cos t = 0$$

Technology

For the following exercises, use a graphing calculator to evaluate.

80.

-

81. $\cos \frac{5\pi}{9}$

-0.1736

82.

-

83. $\cos \frac{\pi}{10}$

0.9511

84.

-

85. $\cos \frac{3\pi}{4}$

-0.7071

86. _

87. $\cos 98^\circ$

-0.1392

88. _

$$89. \sin 310^\circ$$

$$-0.7660$$

Extensions

For the following exercises, evaluate.

90.

-

$$91. \sin\left(\frac{3\pi}{4}\right)\cos\left(\frac{5\pi}{3}\right)$$

$$\frac{\sqrt{2}}{4}$$

92.

-

$$93. \sin\left(\frac{-9\pi}{4}\right)\cos\left(\frac{-\pi}{6}\right)$$

$$-\frac{\sqrt{6}}{4}$$

94.

-

$$95. \sin\left(\frac{7\pi}{4}\right)\cos\left(\frac{-2\pi}{3}\right)$$

$$\frac{\sqrt{2}}{4}$$

96.

-

$$97. \cos\left(\frac{-\pi}{3}\right)\cos\left(\frac{\pi}{4}\right)$$

$$\frac{\sqrt{2}}{4}$$

98.

-

$$99. \sin(\pi)\sin\left(\frac{\pi}{6}\right)$$

$$0$$

Section 7.3

Real-World Applications

For the following exercises, use this scenario: A child enters a carousel that takes one minute to revolve once around. The child enters at the point $(0, 1)$, that is, on the due north position.

Assume the carousel revolves counter clockwise.

100. -

101. What are the coordinates of the child after 90 seconds?

$(0, -1)$

102. -

103. When will the child have coordinates $(0.707, -0.707)$ if the ride lasts 6 minutes?

(There are multiple answers.)

37.5 seconds, 97.5 seconds, 157.5 seconds, 217.5 seconds, 277.5 seconds, 337.5 seconds

104. -

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Chapter 7
The Unit Circle: Sine and Cosine Functions
7.4 The Other Trigonometric Functions

Section Exercises**Verbal**

1. On an interval of $[0, 2\pi)$, can the sine and cosine values of a radian measure ever be equal? If so, where?

Yes, when the reference angle is $\frac{\pi}{4}$ and the terminal side of the angle is in quadrants I

and III. Thus, at $x = \frac{\pi}{4}, \frac{5\pi}{4}$, the sine and cosine values are equal.

2. -

3. For any angle in quadrant II, if you knew the sine of the angle, how could you determine the cosine of the angle?

Substitute the sine of the angle in for y in the Pythagorean Theorem $x^2 + y^2 = 1$. Solve for x and take the negative solution.

4. -

5. Tangent and cotangent have a period of π . What does this tell us about the output of these functions?

The outputs of tangent and cotangent will repeat every π units.

Algebraic

For the following exercises, find the exact value of each expression.

6. -

7. $\sec \frac{\pi}{6} = \frac{2\sqrt{3}}{3}$

8. -

9. $\cot \frac{\pi}{6} = \sqrt{3}$

10. -

11. $\sec \frac{\pi}{4} = \sqrt{2}$

12. -

13. $\cot \frac{\pi}{4} = 1$

14. -

Section 7.4

15. $\sec \frac{\pi}{3} = 2$

16. -

17. $\cot \frac{\pi}{3} = \frac{\sqrt{3}}{3}$

For the following exercises, use reference angles to evaluate the expression.

18. -

19. $\sec \frac{7\pi}{6} = -\frac{2\sqrt{3}}{3}$

20. -

21. $\cot \frac{13\pi}{6} = \sqrt{3}$

22. -

23. $\sec \frac{3\pi}{4} = -\sqrt{2}$

24. -

25. $\cot \frac{11\pi}{4} = -1$

26. -

27. $\sec \frac{4\pi}{3} = -2$

28. -

29. $\cot \frac{5\pi}{3} = -\frac{\sqrt{3}}{3}$

30. -

31. $\sec 300^\circ = 2$

32. -

33. $\cot 240^\circ = \frac{\sqrt{3}}{3}$

34. -

35. $\sec 120^\circ = -2$

36. -

37. $\cot 315^\circ = -1$

38. -

Section 7.4

39. If $\cos t = -\frac{1}{3}$, and t is in quadrant III, find $\sin t$, $\sec t$, $\csc t$, $\tan t$, and $\cot t$.

$$\sin t = -\frac{2\sqrt{2}}{3}, \sec t = -3, \csc t = -\frac{3\sqrt{2}}{4}, \tan t = 2\sqrt{2}, \cot t = \frac{\sqrt{2}}{4}$$

40. -

41. If $\sin t = \frac{\sqrt{3}}{2}$ and $\cos t = \frac{1}{2}$, find $\sec t$, $\csc t$, $\tan t$, and $\cot t$.

$$\sec t = 2, \csc t = \frac{2\sqrt{3}}{3}, \tan t = \sqrt{3}, \cot t = \frac{\sqrt{3}}{3}$$

42. -

43. If $\sin t = \frac{\sqrt{2}}{2}$, what is the $\sin(-t)$?

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

44. -

45. If $\sec t = 3.1$, what is the $\sec(-t)$?

$$3.1$$

46. -

47. If $\tan t = -1.4$, what is the $\tan(-t)$?

$$1.4$$

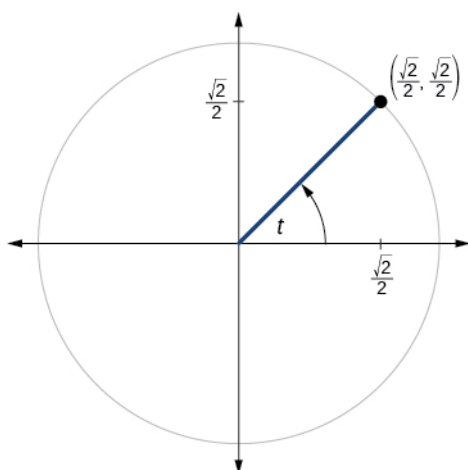
48. -

Graphical

For the following exercises, use the angle in the unit circle to find the value of the each of the six trigonometric functions.

Section 7.4

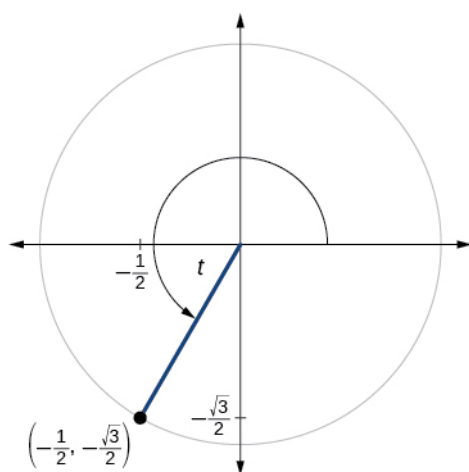
49.



$$\sin t = \frac{\sqrt{2}}{2}, \cos t = \frac{\sqrt{2}}{2}, \tan t = 1, \cot t = 1, \sec t = \sqrt{2}, \csc t = \sqrt{2}$$

50. -

51.



$$\sin t = -\frac{\sqrt{3}}{2}, \cos t = -\frac{1}{2}, \tan t = \sqrt{3}, \cot t = \frac{\sqrt{3}}{3}, \sec t = -2, \csc t = -\frac{2\sqrt{3}}{3}$$

Technology

For the following exercises, use a graphing calculator to evaluate to three decimal places.

52. -

53. $\cot \frac{4\pi}{7} = -0.228$

Section 7.4

54. -

$$55. \tan \frac{5\pi}{8} = -2.414$$

56. -

$$57. \csc \frac{\pi}{4} = 1.414$$

58. -

$$59. \cot 33^\circ = 1.540$$

60. -

$$61. \sec 310^\circ = 1.556$$

Extensions

For the following exercises, use identities to evaluate the expression.

62. -

$$63. \text{ If } \tan(t) \approx 1.3, \text{ and } \cos(t) \approx 0.61, \text{ find } \sin(t).$$

$$\sin(t) \approx 0.79$$

64. -

$$65. \text{ If } \cot(t) \approx 0.58, \text{ and } \cos(t) \approx 0.5, \text{ find } \csc(t).$$

$$\csc t \approx 1.16$$

66. -

$$67. \text{ Determine whether the function } f(x) = 3\sin^2 x \cos x + \sec x \text{ is even, odd, or neither.}$$

even

68. -

$$69. \text{ Determine whether the function } f(x) = \csc^2 x + \sec x \text{ is even, odd, or neither.}$$

even

For the following exercises, use identities to simplify the expression.

70. -

$$71. \frac{\sec t}{\csc t} \\ \frac{\sin t}{\cos t} = \tan t$$

Real-World Applications

72. -

Section 7.4

73. The amount of sunlight in a certain city can be modeled by the function

$$h = 16 \cos\left(\frac{1}{500}d\right),$$
 where h represents the hours of sunlight, and d is the day of the year.

Use the equation to find how many hours of sunlight there are on September 24, the 267th day of the year. State the period of the function.

13.77 hours, period: 1000π

74. -

75. The height of a piston, h , in inches, can be modeled by the equation $y = 2 \cos x + 6$, where x represents the crank angle. Find the height of the piston when the crank angle is 55° .

7.73 inches

76. -

Chapter 7 Review Exercises

Section 7.1

For the following exercises, convert the angle measures to degrees.

1. $\frac{\pi}{4} = 45^\circ$

2. -

For the following exercises, convert the angle measures to radians.

3. -210°

$-\frac{7\pi}{6}$

4. -

5. Find the length of an arc in a circle of radius 7 meters subtended by the central angle of 85° .

10.385 meters

6. -

For the following exercises, find the angle between 0° and 360° that is coterminal with the given angle.

7. 420°
 60°

8. -

For the following exercises, find the angle between 0 and 2π in radians that is coterminal with the given angle.

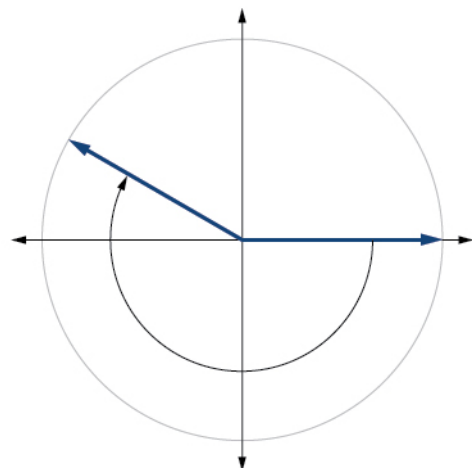
9. $-\frac{20\pi}{11}$

$\frac{2\pi}{11}$

10. -

For the following exercises, draw the angle provided in standard position on the Cartesian plane.

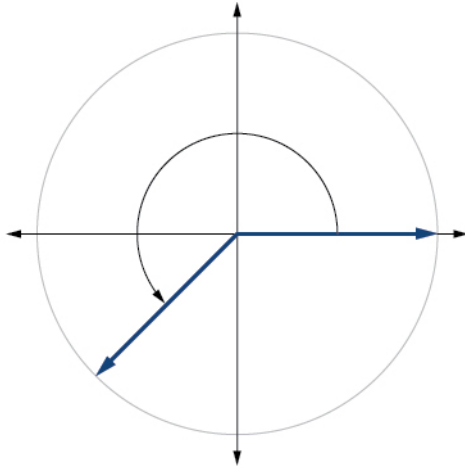
11. -210°



12. -

Chapter 7 Review Exercises

13. $\frac{5\pi}{4}$



14. -

15. Find the linear speed of a point on the equator of the earth if the earth has a radius of 3,960 miles and the earth rotates on its axis every 24 hours. Express answer in miles per hour. Round to the nearest hundredth.

1036.73 miles per hour

16. -

Section 7.2

For the following exercises, use side lengths to evaluate.

17. $\cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

18. -

19. $\tan \frac{\pi}{6} = \frac{\sqrt{3}}{3}$

20. -

21. $\csc(18^\circ) = \sec(\underline{\hspace{1cm}}^\circ)$
 72°

For the following exercises, use the given information to find the lengths of the other two sides of the right triangle.

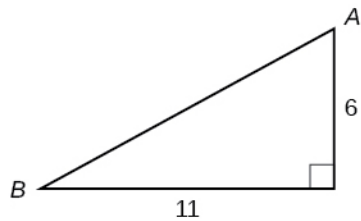
22. -

Chapter 7 Review Exercises

23. $\tan A = \frac{5}{9}, b = 6$

$$a = \frac{10}{3}, c = \frac{2\sqrt{106}}{3}$$

For the following exercises, use the figure to evaluate each trigonometric function.



24. -

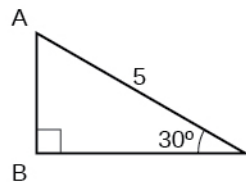
25. $\tan B$

$$\frac{6}{11}$$

For the following exercises, solve for the unknown sides of the given triangle.

26. -

27.



$$a = \frac{5\sqrt{3}}{2}, b = \frac{5}{2}$$

28. -

29. The angle of elevation to the top of a building in Baltimore is found to be 4 degrees from the ground at a distance of 1 mile from the base of the building. Using this information, find the height of the building. Find the answer to four decimal places. 369.2136 ft

Section 7.3

30. -

31. Find the exact value of $\cos \frac{\pi}{4}$.

$$\frac{\sqrt{2}}{2}$$

32. -

Chapter 7 Review Exercises

33. State the reference angle for 300° .

$$60^\circ$$

34. -

35. Compute cosine of 330° .

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

36. -

37. State the domain of the sine and cosine functions.

all real numbers

38. -

Section 7.4

For the following exercises, find the exact value of the given expression.

39. $\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$

40. -

41. $\csc \frac{\pi}{3} = \frac{2\sqrt{3}}{3}$

42. -

For the following exercises, use reference angles to evaluate the given expression.

43. $\sec \frac{11\pi}{3} = -2$

44. -

45. If $\sec(t) = -2.5$, what is the $\sec(-t)$?

$$-2.5$$

46. -

47. If $\tan(t) = \frac{1}{3}$, find $\tan(t - \pi)$.

$$\frac{1}{3}$$

48. -

49. Which trigonometric functions are even?

cosine, secant

50. -

Chapter 7 Practice Test

1. Convert $\frac{5\pi}{6}$ radians to degrees.

150°

2. -

3. Find the length of a circular arc with a radius 12 centimeters subtended by the central angle of 30°.

6.283 centimeters

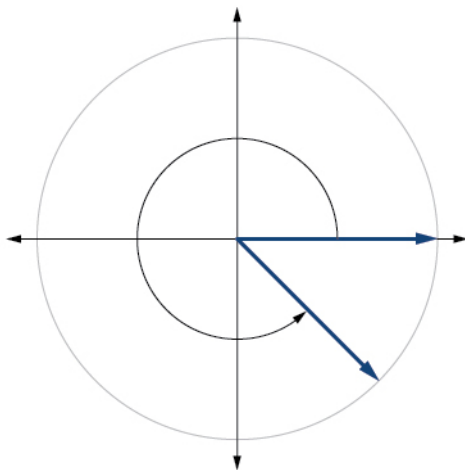
4. -

5. Find the angle between 0° and 360° that is coterminal with 375°.

15°

6. -

7. Draw the angle 315° in standard position on the Cartesian plane.



8. -

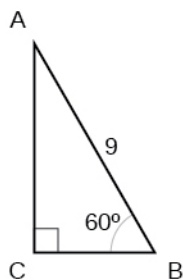
9. A carnival has a Ferris wheel with a diameter of 80 feet. The time for the Ferris wheel to make one revolution is 75 seconds. What is the linear speed in feet per second of a point on the Ferris wheel? What is the angular speed in radians per second?

3.351 feet per second, $\frac{2\pi}{75}$ radians per second

10. -

Chapter 7 Practice Test

11. Find the missing sides of the triangle.



$$a = \frac{9}{2}, b = \frac{9\sqrt{3}}{2}$$

12. -

13. Find the exact value of $\sin \frac{\pi}{6}$.

$$\frac{1}{2}$$

14. -

15. State the domain of the sine and cosine functions.
real numbers

16. -

17. Find the exact value of $\cot \frac{\pi}{4}$.

$$1$$

18. -

19. Use reference angles to evaluate $\tan 210^\circ$.

$$\frac{\sqrt{3}}{3}$$

20. -

21. If $\cos t = \frac{\sqrt{3}}{2}$, find $\cos(t - 2\pi)$.

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

22. -

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