4.1 EXERCISES

See www.CalcChat.com for worked-out solutions to odd-numbered exercises.

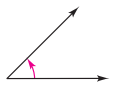
VOCABULARY: Fill in the blanks.

1. _____ means "measurement of triangles."
2. An _____ is determined by rotating a ray about its endpoint.
3. Two angles that have the same initial and terminal sides are _____.
4. One _____ is the measure of a central angle that intercepts an arc equal to the radius of the circle.
5. Angles that measure between 0 and $\pi/2$ are _____ angles, and angles that measure between $\pi/2$ and π are _____ angles.
6. Two positive angles that have a sum of $\pi/2$ are _____ angles, whereas two positive angles that have a sum of π are _____ angles.
7. The angle measure that is equivalent to a rotation of $\frac{1}{360}$ of a complete revolution about an angle's vertex is one _____.
8. 180 degrees $=$ _____ radians.
9. The _____ speed of a particle is the ratio of arc length to time traveled, and the _____ speed of a particle is the ratio of central angle to time traveled.
10. The area A of a sector of a circle with radius r and central angle θ, where θ is measured in radians, is given by the formula _____.

SKILLS AND APPLICATIONS

In Exercises 11–16, estimate the angle to the nearest one-half radian.

11.



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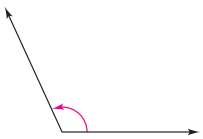

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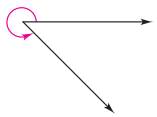

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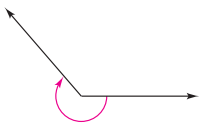

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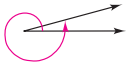


In Exercises 17–22, determine the quadrant in which each angle lies. (The angle measure is given in radians.)

17. (a) $\frac{\pi}{4}$ (b) $\frac{5\pi}{4}$

18. (a) $\frac{11\pi}{8}$ (b) $\frac{9\pi}{8}$

19. (a) $-\frac{\pi}{6}$ (b) $-\frac{\pi}{3}$

20. (a) $-\frac{5\pi}{6}$ (b) $-\frac{11\pi}{9}$

21. (a) 3.5 (b) 2.25

22. (a) 6.02 (b) -4.25

In Exercises 23–26, sketch each angle in standard position.

23. (a) $\frac{\pi}{3}$ (b) $-\frac{2\pi}{3}$

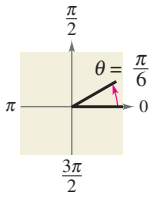
24. (a) $-\frac{7\pi}{4}$ (b) $\frac{5\pi}{2}$

25. (a) $\frac{11\pi}{6}$ (b) -3

26. (a) 4 (b) 7π

In Exercises 27–30, determine two coterminal angles (one positive and one negative) for each angle. Give your answers in radians.

27. (a)



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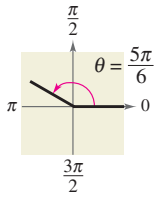
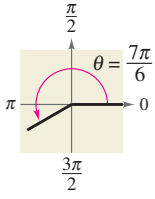


28. (a)



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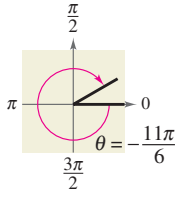


29. (a) $\theta = \frac{2\pi}{3}$ (b) $\theta = \frac{\pi}{12}$

30. (a) $\theta = -\frac{9\pi}{4}$ (b) $\theta = -\frac{2\pi}{15}$

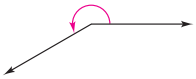
In Exercises 31–34, find (if possible) the complement and supplement of each angle.

31. (a) $\pi/3$ (b) $\pi/4$ **32.** (a) $\pi/12$ (b) $11\pi/12$

33. (a) 1 (b) 2 **34.** (a) 3 (b) 1.5

In Exercises 35–40, estimate the number of degrees in the angle. Use a protractor to check your answer.

35.



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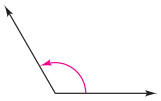

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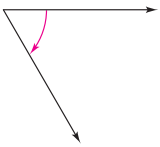

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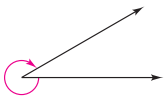

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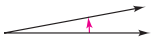


In Exercises 41–44, determine the quadrant in which each angle lies.

41. (a) 130° (b) 285°

42. (a) 8.3° (b) 257° 30′

43. (a) −132° 50′ (b) −336°

44. (a) −260° (b) −3.4°

In Exercises 45–48, sketch each angle in standard position.

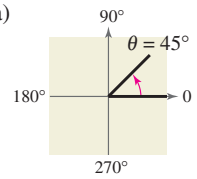
45. (a) 90° (b) 180° **46.** (a) 270° (b) 120°

47. (a) −30° (b) −135°

48. (a) −750° (b) −600°

In Exercises 49–52, determine two coterminal angles (one positive and one negative) for each angle. Give your answers in degrees.

49. (a)



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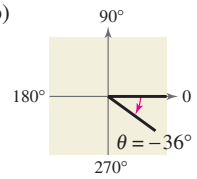
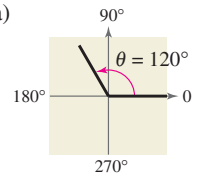
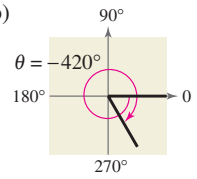


50. (a)



(b)



51. (a) $\theta = 240°$ (b) $\theta = -180°$

52. (a) $\theta = -390°$ (b) $\theta = 230°$

In Exercises 53–56, find (if possible) the complement and supplement of each angle.

53. (a) 18° (b) 85° **54.** (a) 46° (b) 93°

55. (a) 150° (b) 79° **56.** (a) 130° (b) 170°

In Exercises 57–60, rewrite each angle in radian measure as a multiple of π. (Do not use a calculator.)

57. (a) 30° (b) 45° **58.** (a) 315° (b) 120°

59. (a) −20° (b) −60° **60.** (a) −270° (b) 144°

In Exercises 61–64, rewrite each angle in degree measure. (Do not use a calculator.)

61. (a) $\frac{3\pi}{2}$ (b) $\frac{7\pi}{6}$ **62.** (a) $-\frac{7\pi}{12}$ (b) $\frac{\pi}{9}$

63. (a) $\frac{5\pi}{4}$ (b) $-\frac{7\pi}{3}$ **64.** (a) $\frac{11\pi}{6}$ (b) $\frac{34\pi}{15}$

In Exercises 65–72, convert the angle measure from degrees to radians. Round to three decimal places.

65. 45° **66.** 87.4°

67. −216.35° **68.** −48.27°

69. 532° **70.** 345°

71. −0.83° **72.** 0.54°

In Exercises 73–80, convert the angle measure from radians to degrees. Round to three decimal places.

73. $\pi/7$ **74.** $5\pi/11$

75. $15\pi/8$ **76.** $13\pi/2$

77. -4.2π **78.** 4.8π

79. −2 **80.** −0.57

In Exercises 81–84, convert each angle measure to decimal degree form without using a calculator. Then check your answers using a calculator.

81. (a) 54° 45′ (b) −128° 30′

82. (a) 245° 10′ (b) 2° 12′

83. (a) 85° 18′ 30″ (b) 330° 25″

84. (a) −135° 36″ (b) −408° 16′ 20″

In Exercises 85–88, convert each angle measure to degrees, minutes, and seconds without using a calculator. Then check your answers using a calculator.

85. (a) 240.6° (b) −145.8°

86. (a) −345.12° (b) 0.45°

87. (a) 2.5° (b) −3.58°

88. (a) −0.36° (b) 0.79°