

Reference \angle

Name:

6.1 Exercises

In Exercises 1-4, determine the quadrant in which angle lies.

- (a) 130° II (b) 285° IV
- (a) 8.3° I (b) $257^\circ 30'$ III
- (a) $-132^\circ 50'$ III (b) -336° I
- (a) -260° II (b) -3.4° IV

In Exercises 5-8, sketch each angle in standard position.

- (a) 30° I (b) 150° II
- (a) -270° axis (b) -120° III
- (a) 405° I (b) 480° II
- (a) -750° IV (b) -600° II

In Exercises 9-12, determine two coterminal angles (one positive and one negative) for each angle.

- (a) $\theta = 45^\circ$ 405, -315, 445 (b) $\theta = -36^\circ$ -396, 324
- (a) $\theta = 120^\circ$ 480, -240 (b) $\theta = -420^\circ$ -60, 300
- (a) $\theta = 300^\circ$ 660, -60 (b) $\theta = 740^\circ$ 380 or 20, -340
- (a) $\theta = -520^\circ$ 200, -160 (b) $\theta = 230^\circ$ -130, 590

In Exercises 13-16, convert each angle measure to decimal degree form.

- (a) $54^\circ 45'$ 54.75 (b) $-128^\circ 30'$ -128.5
- (a) $245^\circ 10'$ 245.17 (b) $2^\circ 12'$ 2.2
- (a) $85^\circ 18' 30''$ 85.308 (b) $330^\circ 25''$ 330.0069
- (a) $-135^\circ 36''$ -135.01 (b) $-408^\circ 16' 20''$ -408.2722

In Exercises 17-20, convert each angle to DMS form.

- (a) 240.6° 240° 36' (b) -145.8° -145° 48'
- (a) -345.12° -345° 7' 12'' (b) 0.45° 27'
- (a) 2.5° 2° 30' (b) -3.58° -3° 34' 48''
- (a) -0.355° -21' 18'' (b) 0.7865° 47' 11.4''

In Exercises 21-26, determine the quadrant in which angle lies. (The angle measure is given in radians.)

- (a) $\frac{\pi}{5}$ I (b) $\frac{7\pi}{5}$ III

21. I

22. (a) $\frac{11\pi}{8}$ III

(b) $\frac{9\pi}{8}$ III

23. (a) $\frac{-\pi}{12}$ IV

(b) $\frac{-11\pi}{9}$ II

24. (a) -1 IV

(b) -2 IV

25. (a) 3.5 III

(b) 2.25 II

26. (a) 6.02 IV

(b) -4.25 III

In Exercises 27-30, sketch each angle in standard position.

27. (a) $\frac{5\pi}{4}$ III

(b) $\frac{2\pi}{3}$ II

28. (a) $\frac{-7\pi}{4}$ I

(b) $\frac{-5\pi}{2}$ axis

29. (a) $\frac{11\pi}{6}$ IV

(b) 7π axis

30. (a) 4 III

(b) -3 II

In Exercises 31-34, determine two coterminal angles (one positive and one negative) for each angle. Give answer in radians.

31. (a) $\frac{\pi}{6} \pm \frac{12\pi}{6} = \frac{13\pi}{6}, \frac{-11\pi}{6}$ (b) $\frac{5\pi}{6} \pm \frac{12\pi}{6} = \frac{17\pi}{6}, \frac{-7\pi}{6}$

32. (a) $\frac{7\pi}{6}, \frac{19\pi}{6}, \frac{-5\pi}{6}$ (b) $\frac{-11\pi}{6} \pm \frac{12\pi}{6} = \frac{\pi}{6}, \frac{-23\pi}{6}$

33. (a) $\frac{-9\pi}{4}, \frac{7\pi}{4}, \frac{21\pi}{4}$ (b) $\frac{-2\pi}{15} \pm \frac{30\pi}{15} = \frac{28\pi}{15}, \frac{-32\pi}{15}$

34. (a) $\frac{8\pi}{9} = \frac{26\pi}{9}, \frac{-10\pi}{9}$ (b) $\frac{8\pi}{45} \pm \frac{90\pi}{45} = \frac{98\pi}{45}, \frac{-82\pi}{45}$

In Exercises 35-42, find (if possible) the complement and supplement of each angle.

35. (a) 18°
 $72^\circ, 162^\circ$

(b) 115° no comp, 65°

36. (a) 79°
 $11^\circ, 101^\circ$

(b) 150° no comp, 30°

37. (a) 3°
 $87^\circ, 177^\circ$

(b) 64° $26^\circ, 116^\circ$

38. (a) 130°
no comp, 50°

(b) 170° no comp, 10°

$$\frac{\pi - \pi}{12} = \frac{11\pi}{12}$$

$$39. (a) \frac{\pi}{12}$$

$$(b) \frac{11\pi}{12}$$

$$\frac{\pi - 11\pi}{12} = \frac{10\pi}{12} - \frac{11\pi}{12} \text{ no comp}$$

$$\frac{\pi}{12} - \frac{\pi}{12} = \frac{2\pi}{12} - \frac{\pi}{12} = \frac{\pi}{12}$$

$$40. (a) \frac{3\pi}{6} - \frac{2\pi}{6} = \frac{\pi}{6}$$

$$\frac{3\pi}{3} - \pi = \frac{2\pi}{3}$$

$$(b) \frac{3\pi}{4}$$

no comp ; $\frac{\pi}{4}$

more, .142

$$42. (a) 1$$

$$(b) 2$$

.571, 2.142

no comp ; 1.142

In Exercises 43-46, express each angle in radian measure. (Do not use a calculator.)

$$43. (a) 30^\circ = \frac{3\pi}{18} = \frac{\pi}{6}$$

$$(b) 150^\circ = \frac{5\pi}{6}$$

$$44. (a) 315^\circ = \frac{7\pi}{4}$$

$$(b) 120^\circ = \frac{2\pi}{3}$$

$$45. (a) -20^\circ = -\frac{\pi}{9}$$

$$(b) -240^\circ = -\frac{4\pi}{3}$$

$$46. (a) -270^\circ = -\frac{3\pi}{2}$$

$$(b) 144^\circ = \frac{4\pi}{5}$$

In Exercises 47-50, express each angle in degree measure. (Do not use a calculator.)

$$47. (a) \frac{3\pi}{2} \cdot \frac{180}{\pi} = 270^\circ$$

$$(b) \frac{7\pi}{6} = 210^\circ$$

$$48. (a) \frac{-7\pi}{12} = -105^\circ$$

$$(b) \frac{\pi}{9} = 20^\circ$$

$$49. (a) \frac{7\pi}{3} = 420^\circ$$

$$(b) \frac{-11\pi}{30} = -66^\circ$$

$$50. (a) \frac{11\pi}{6} = 330^\circ$$

$$(b) \frac{34\pi}{15} = 408^\circ$$

In Exercises 51-58, convert the measure from degrees to radians. Round to three decimal places.

$$51. 115^\circ \cdot \frac{\pi}{180} = 2.007$$

$$52. 87.4^\circ \cdot \frac{\pi}{180} = 1.525$$

$$53. -216.35^\circ \cdot \frac{\pi}{180} = -3.776$$

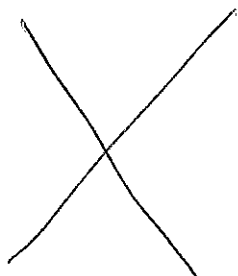
$$54. -48.27^\circ \cdot \frac{\pi}{180} = .842$$

$$55. 532^\circ \cdot \frac{\pi}{180} = 9.285$$

$$56. 345^\circ \cdot \frac{\pi}{180} = 6.021$$

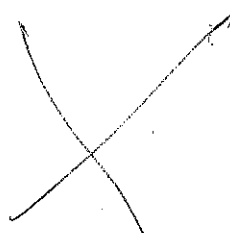
$$57. -0.83^\circ \cdot \frac{\pi}{180} = -.014$$

$$58. 0.54^\circ \cdot \frac{\pi}{180} = .009$$



In Exercises 59-66, convert the measure from radians to degrees. Round to three decimal places.

$$59. \frac{\pi}{7} \cdot \frac{180}{\pi} = 25.714^\circ$$



60. $\frac{5\pi}{11}$ 81.818°
 61. $\frac{15\pi}{8}$ 337.5°
 62. $\frac{13\pi}{2}$ 1170°
 63. -4.2π -756°
 64. 4.8π 864°
 65. -2 -114.592°
 66. -0.57 -32.659°

In Exercises 67-70, find the radian measure of the central angle of a circle of radius r that intercepts an arc of length s .

67. Radius: 27 inches, Arc Length: 6 inches $\theta = .222$
 68. Radius: 14 feet, Arc Length: 8 feet $.571$
 69. Radius: 14.5 centimeters, Arc Length: 25 centimeters 1.724
 70. Radius: 80 kilometers, Arc Length: 160 kilometers 2

In Exercises 71-74, find the length of the arc on a circle of radius r intercepted by a central angle θ .

71. Radius: 15 inches, Central Angle: 180°
 72. Radius: 9 feet, Central Angle: 60°
 73. Radius: 3 meters, Central Angle: 1 radian
 74. Radius: 20 centimeters, Central Angle: $\frac{\pi}{4}$ radian

$$s = 15\pi$$

$$9\left(\frac{\pi}{3}\right) = 3\pi$$

$$3$$

$$\frac{20\pi}{4} = 5\pi$$