

1–6 ■ Find the reference angle for the given angle.

1. (a) 225° (b) -35° (c) 181°
2. (a) 290° (b) 750° (c) 570°
3. (a) 335° (b) -95° (c) 165°
4. (a) $\frac{3\pi}{5}$ (b) $\frac{7\pi}{6}$ (c) $-\frac{2\pi}{3}$
5. (a) $\frac{17\pi}{3}$ (b) $-\frac{\pi}{4}$ (c) 3
6. (a) $\frac{23\pi}{11}$ (b) $\frac{23}{11}$ (c) $\frac{17\pi}{7}$

7–30 ■ Find the exact value of the trigonometric function.

7. $\sin 150^\circ$ 8. $\cos 225^\circ$ 9. $\sin 135^\circ$
10. $\tan 330^\circ$ 11. $\sin(-60^\circ)$ 12. $\sec(-60^\circ)$
13. $\csc(-630^\circ)$ 14. $\cot 210^\circ$ 15. $\cos 570^\circ$
16. $\sec 120^\circ$ 17. $\tan 750^\circ$ 18. $\cos 660^\circ$
19. $\sin \frac{2\pi}{3}$ 20. $\sin \frac{5\pi}{3}$ 21. $\sin \frac{3\pi}{2}$
22. $\cos \frac{7\pi}{3}$ 23. $\cos\left(-\frac{7\pi}{3}\right)$ 24. $\tan \frac{5\pi}{6}$
25. $\sec \frac{17\pi}{3}$ 26. $\csc \frac{5\pi}{4}$ 27. $\cot\left(-\frac{\pi}{4}\right)$
28. $\cos \frac{7\pi}{4}$ 29. $\tan \frac{5\pi}{2}$ 30. $\sin \frac{11\pi}{6}$

31–34 ■ Find the quadrant in which θ lies from the information given.

31. $\sin \theta < 0$ and $\cos \theta < 0$
32. $\tan \theta < 0$ and $\sin \theta < 0$
33. $\sec \theta > 0$ and $\tan \theta < 0$
34. $\csc \theta > 0$ and $\cos \theta < 0$

35–40 ■ Write the first trigonometric function in terms of the second for θ in the given quadrant.

35. $\tan \theta$, $\cos \theta$; θ in quadrant III
36. $\cot \theta$, $\sin \theta$; θ in quadrant II
37. $\cos \theta$, $\sin \theta$; θ in quadrant IV
38. $\sec \theta$, $\sin \theta$; θ in quadrant I
39. $\sec \theta$, $\tan \theta$; θ in quadrant II
40. $\csc \theta$, $\cot \theta$; θ in quadrant III

41–48 ■ Find the values of the trigonometric functions of θ from the information given.

41. $\sin \theta = \frac{3}{5}$, θ in quadrant II
42. $\cos \theta = -\frac{7}{12}$, θ in quadrant III
43. $\tan \theta = -\frac{3}{4}$, $\cos \theta > 0$
44. $\sec \theta = 5$, $\sin \theta < 0$
45. $\csc \theta = 2$, θ in quadrant I
46. $\cot \theta = \frac{1}{4}$, $\sin \theta < 0$
47. $\cos \theta = -\frac{2}{7}$, $\tan \theta < 0$
48. $\tan \theta = -4$, $\sin \theta > 0$

49. If $\theta = \pi/3$, find the value of each expression.

- (a) $\sin 2\theta$, $2 \sin \theta$ (b) $\sin \frac{1}{2}\theta$, $\frac{\sin \theta}{2}$
- (c) $\sin^2 \theta$, $\sin(\theta^2)$



DISCOVERY • DISCUSSION

57. **Using a Calculator** To solve a certain problem, you need to find the sine of 4 rad. Your study partner uses his calculator and tells you that $\sin 4$ is 0.0697564737. On your calculator you get -0.7568024953 . What is wrong? What mistake did your partner make?

58. **Viète's Trigonometric Diagram** In the 16th century, the French mathematician François Viète (see page 154) published the following remarkable diagram. Each of the six trigonometric functions of θ is equal to the length of a line segment in the figure. For instance, $\sin \theta = |PR|$, since from $\triangle OPR$ we see that

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{|PR|}{|OR|} = \frac{|PR|}{1}$$

For each of the five other trigonometric functions, find a line segment in the figure whose length equals the value of the function at θ . (Note that the radius of the circle is 1, the center is O , segment QS is tangent to the circle at R , and $\angle SOQ$ is a right angle.)

