

## Skill Building

Problems 11–20, a point on the terminal side of an angle  $\theta$  is given. Find the exact value of each of the six trigonometric functions of  $\theta$ .

11.  $(-3, 4)$       12.  $(5, -12)$       13.  $(2, -3)$       14.  $(-1, -2)$       15.  $(-3, -3)$   
 16.  $(2, -2)$       17.  $\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$       18.  $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$       19.  $\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$       20.  $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

Problems 21–32, use a coterminal angle to find the exact value of each expression. Do not use a calculator.

21.  $\sin 405^\circ$       22.  $\cos 420^\circ$       23.  $\tan 405^\circ$       24.  $\sin 390^\circ$       25.  $\csc 450^\circ$       26.  $\sec 540^\circ$   
 27.  $\cot 390^\circ$       28.  $\sec 420^\circ$       29.  $\cos \frac{33\pi}{4}$       30.  $\sin \frac{9\pi}{4}$       31.  $\tan(21\pi)$       32.  $\csc \frac{9\pi}{2}$

Problems 33–40, name the quadrant in which the angle  $\theta$  lies.

33.  $\sin \theta > 0, \cos \theta < 0$       34.  $\sin \theta < 0, \cos \theta > 0$       35.  $\sin \theta < 0, \tan \theta < 0$   
 36.  $\cos \theta > 0, \tan \theta > 0$       37.  $\cos \theta > 0, \cot \theta < 0$       38.  $\sin \theta < 0, \cot \theta > 0$   
 39.  $\sec \theta < 0, \tan \theta > 0$       40.  $\csc \theta > 0, \cot \theta < 0$

Problems 41–58, find the reference angle of each angle.

41.  $-30^\circ$       42.  $-60^\circ$       43.  $120^\circ$       44.  $210^\circ$       45.  $300^\circ$       46.  $330^\circ$   
 47.  $\frac{5\pi}{4}$       48.  $\frac{5\pi}{6}$       49.  $\frac{8\pi}{3}$       50.  $\frac{7\pi}{4}$       51.  $-135^\circ$       52.  $-240^\circ$   
 53.  $-\frac{2\pi}{3}$       54.  $-\frac{7\pi}{6}$       55.  $440^\circ$       56.  $490^\circ$       57.  $\frac{15\pi}{4}$       58.  $\frac{19\pi}{6}$

Problems 59–82, use the reference angle to find the exact value of each expression. Do not use a calculator.

59.  $\sin 150^\circ$       60.  $\cos 210^\circ$       61.  $\sin 510^\circ$       62.  $\cos 600^\circ$       63.  $\cos(-45^\circ)$       64.  $\sin(-240^\circ)$   
 65.  $\sec 240^\circ$       66.  $\csc 300^\circ$       67.  $\cot 330^\circ$       68.  $\tan 225^\circ$       69.  $\sin \frac{3\pi}{4}$       70.  $\cos \frac{2\pi}{3}$   
 71.  $\cos \frac{13\pi}{4}$       72.  $\tan \frac{8\pi}{3}$       73.  $\sin\left(-\frac{2\pi}{3}\right)$       74.  $\cot\left(-\frac{\pi}{6}\right)$       75.  $\tan \frac{14\pi}{3}$       76.  $\sec \frac{11\pi}{4}$   
 77.  $\sin(8\pi)$       78.  $\cos(-2\pi)$       79.  $\tan(7\pi)$       80.  $\cot(5\pi)$       81.  $\sec(-3\pi)$       82.  $\csc\left(-\frac{5\pi}{2}\right)$

Problems 83–100, find the exact value of each of the remaining trigonometric functions of  $\theta$ .

83.  $\sin \theta = \frac{12}{13}$ ,  $\theta$  in quadrant II      84.  $\cos \theta = \frac{3}{5}$ ,  $\theta$  in quadrant IV      85.  $\cos \theta = -\frac{4}{5}$ ,  $\theta$  in quadrant III  
 86.  $\sin \theta = -\frac{5}{13}$ ,  $\theta$  in quadrant III      87.  $\sin \theta = \frac{5}{13}$ ,  $90^\circ < \theta < 180^\circ$       88.  $\cos \theta = \frac{4}{5}$ ,  $270^\circ < \theta < 360^\circ$   
 89.  $\cos \theta = -\frac{1}{3}$ ,  $180^\circ < \theta < 270^\circ$       90.  $\sin \theta = -\frac{2}{3}$ ,  $180^\circ < \theta < 270^\circ$       91.  $\sin \theta = \frac{2}{3}$ ,  $\tan \theta < 0$   
 92.  $\cos \theta = -\frac{1}{4}$ ,  $\tan \theta > 0$       93.  $\sec \theta = 2$ ,  $\sin \theta < 0$       94.  $\csc \theta = 3$ ,  $\cot \theta < 0$   
 95.  $\tan \theta = \frac{3}{4}$ ,  $\sin \theta < 0$       96.  $\cot \theta = \frac{4}{3}$ ,  $\cos \theta < 0$       97.  $\tan \theta = -\frac{1}{3}$ ,  $\sin \theta > 0$   
 98.  $\sec \theta = -2$ ,  $\tan \theta > 0$       99.  $\csc \theta = -2$ ,  $\tan \theta > 0$       100.  $\cot \theta = -2$ ,  $\sec \theta > 0$

101. Find the exact value of  $\sin 40^\circ + \sin 130^\circ + \sin 220^\circ + \sin 310^\circ$ .

102. Find the exact value of  $\tan 40^\circ + \tan 140^\circ$ .