

Exercises 1–4

2. Use the unit circle to evaluate these expressions:

$$a. \sin\left(\frac{17\pi}{4}\right) \quad \sin\left(4\pi + \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$$

$$b. \sin\left(\frac{19\pi}{6}\right) \quad \sin\left(3\pi + \frac{\pi}{6}\right) = -\frac{1}{2}$$

$$c. \sin\left(\frac{10\pi}{3}\right) \quad \sin\left(3\pi + \frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$

$$d. \sin\left(\frac{13\pi}{4}\right) \quad \sin\left(3\pi + \frac{\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

$$e. \sin\left(\frac{11\pi}{3}\right) \quad \sin\left(3\pi + \frac{2\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$

$$f. \sin\left(\frac{21\pi}{4}\right) \quad \sin\left(5\pi + \frac{\pi}{4}\right) = -\frac{\sqrt{2}}{2}$$

$$g. \sin(450\pi) \quad \sin(450\pi) = 0$$

Shortcut?

Odd factors of π
make sign of sine
negative.

3. Use the identity $\sin(\pi + \theta) = -\sin(\theta)$ for all real-numbered values of θ to verify the identity $\sin(2\pi + \theta) = \sin(\theta)$ for all real-numbered values of θ .

$$\sin(\pi + \theta) = -\sin(\theta)$$

$$\sin(\pi + \theta + \pi) = -(-\sin(\theta))$$

$$\sin(2\pi + \theta) = \sin(\theta)$$

4. Use the above rule to determine these values.

a. $\sin\left(\frac{27\pi}{4}\right) = \sin\left(6\pi + \frac{3\pi}{4}\right) = \frac{\sqrt{2}}{2}$

b. $\sin\left(\frac{25\pi}{6}\right) = \sin\left(4\pi + \frac{\pi}{6}\right) = \frac{1}{2}$

5. Use your understanding of the symmetry of the sine and cosine functions to evaluate these functions for the given values of θ .

a. $\sin\left(-\frac{\pi}{2}\right) = -1$

$$-\sin\left(\frac{\pi}{2}\right) = -1$$

b. $\sin\left(-\frac{5\pi}{3}\right) = -\sin\left(\frac{5\pi}{3}\right) = \frac{\sqrt{3}}{2}$

$$c. \sin\left(-\frac{3\pi}{2}\right) = -\sin\left(\frac{3\pi}{2}\right) = 1$$

$$d. \sin\left(-\frac{5\pi}{6}\right) = -\sin\left(\frac{5\pi}{6}\right) = -\frac{1}{2}$$

$$e. \sin\left(\frac{16\pi}{3}\right) = \sin\left(5\pi + \frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$

$$f. \sin\left(-\frac{50\pi}{6}\right) = -\sin\left(\frac{50\pi}{6}\right) = -\sin\left(8\pi + \frac{2\pi}{6}\right) = -\sin\left(8\pi + \frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$$

$$g. \sin\left(\frac{17\pi}{2}\right) = \sin\left(8\pi + \frac{\pi}{2}\right) = 1$$

$$h. \sin\left(\frac{37\pi}{6}\right) = \sin\left(6\pi + \frac{\pi}{6}\right) = \frac{1}{2}$$

$$i. \sin\left(\frac{601\pi}{6}\right) = \sin\left(100\pi + \frac{\pi}{6}\right) = \frac{1}{2}$$

