

## 5.3A HW Answers

Friday, December 1, 2017 1:37 PM

39. Because  $15^\circ$  lies in quadrant I,  $\sin 15^\circ > 0$ .

$$\begin{aligned}\sin 15^\circ &= \sin \frac{30^\circ}{2} \\ &= \sqrt{\frac{1-\cos 30^\circ}{2}} = \sqrt{\frac{1-\frac{\sqrt{3}}{2}}{2}} \\ &= \sqrt{\frac{2-\sqrt{3}}{4}} = \frac{\sqrt{2-\sqrt{3}}}{2}\end{aligned}$$

40. Because  $22.5^\circ$  lies in quadrant I,  $\cos 22.5^\circ > 0$ .

$$\begin{aligned}\cos 22.5^\circ &= \cos \frac{45^\circ}{2} = \sqrt{\frac{1+\cos 45^\circ}{2}} \\ &= \sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} \\ &= \sqrt{\frac{2+\sqrt{2}}{4}} \\ &= \frac{\sqrt{2+\sqrt{2}}}{2}\end{aligned}$$

43. Because  $75^\circ$  lies in quadrant I,  $\tan 75^\circ > 0$ .

$$\begin{aligned}\tan 75^\circ &= \tan \frac{150^\circ}{2} = \frac{1-\cos 150^\circ}{\sin 150^\circ} \\ &= \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}} = 2+\sqrt{3}\end{aligned}$$

44. Because  $112.5^\circ$  lies in quadrant II,  $\tan 112.5^\circ < 0$ .

$$\begin{aligned}\tan 112.5^\circ &= \tan \frac{225^\circ}{2} \\ &= \frac{1-\cos 225^\circ}{\sin 225^\circ} \\ &= \frac{1-\left(-\frac{\sqrt{2}}{2}\right)}{-\frac{\sqrt{2}}{2}}\end{aligned}$$

41. Because  $157.5^\circ$  lies in quadrant II,  $\cos 157.5^\circ < 0$ .

$$\begin{aligned}\cos 157.5^\circ &= \cos \frac{315^\circ}{2} = -\sqrt{\frac{1+\cos 315^\circ}{2}} \\ &= -\sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = -\sqrt{\frac{2+\sqrt{2}}{4}} \\ &= -\frac{\sqrt{2+\sqrt{2}}}{2}\end{aligned}$$

42. Because  $105^\circ$  lies in quadrant II,  $\sin 105^\circ > 0$ .

$$\begin{aligned}\sin 105^\circ &= \sin \frac{210^\circ}{2} = \sqrt{\frac{1-\cos 210^\circ}{2}} \\ &= \sqrt{\frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{2}} \\ &= \sqrt{\frac{2+\sqrt{3}}{4}} \\ &= \frac{\sqrt{2+\sqrt{3}}}{2}\end{aligned}$$

45. Because  $\frac{7\pi}{8}$  lies in quadrant II,  $\tan \frac{7\pi}{8} < 0$ .

$$\begin{aligned}\tan \frac{7\pi}{8} &= \tan \left( \frac{\frac{7\pi}{4}}{2} \right) = \frac{1-\cos \frac{7\pi}{4}}{\sin \frac{7\pi}{4}} \\ &= \frac{1-\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}} = -\frac{2}{\sqrt{2}} + 1 \\ &= -\sqrt{2} + 1\end{aligned}$$

46. Because  $\frac{3\pi}{8}$  lies in quadrant I,  $\tan \frac{3\pi}{8} > 0$ .

$$\begin{aligned}\tan \frac{3\pi}{8} &= \tan \frac{\frac{3\pi}{4}}{2} \\ &= \frac{1-\cos \frac{3\pi}{4}}{\sin \frac{3\pi}{4}}\end{aligned}$$

$$\begin{aligned}& -\frac{\sqrt{2}}{2} \\& = \frac{2+\sqrt{2}}{-\sqrt{2}} \\& = -\frac{2}{\sqrt{2}} - 1 \\& = -\sqrt{2} - 1 \\& \quad \boxed{-\sqrt{2} - 1} \\& = \frac{1 - \cos \frac{3\pi}{4}}{\sin \frac{3\pi}{4}} \\& = \frac{1 - \left(-\frac{\sqrt{2}}{2}\right)}{\frac{\sqrt{2}}{2}} \\& = \frac{2}{\sqrt{2}} + 1 \\& = \boxed{\sqrt{2} + 1}\end{aligned}$$

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