

Solving Trig Equations #1

Solve each equation for $0 \leq \theta < 360$.

1) $\frac{0}{-2} = \frac{-2\cos\theta}{-2}$

$0 = \cos\theta$

$90^\circ = \theta$

3) $\frac{4\sqrt{3}}{-8} = \frac{-8\sin\theta}{-8}$

$-\frac{\sqrt{3}}{2} = \sin\theta$

$240^\circ = \theta_1, 300^\circ = \theta_2$

5) $-4 + \frac{1}{5} \tan\theta = \frac{-20 - \sqrt{3}}{5} + 4$

$5 \cdot (\frac{1}{5} \tan\theta) = (\frac{-20 - \sqrt{3}}{5} + 4) \cdot 5$

$6 \tan\theta = -20 - \sqrt{3} + 20$

Solve each equation for $0 \leq \theta < 2\pi$.

$\tan\theta = -\sqrt{3}$
 $\theta_1 = 120^\circ, \theta_2 = 300^\circ$

7) $\frac{4 - \sqrt{3}}{2} = 2 + \cos\theta$

$\frac{4 - \sqrt{3}}{2} - 2 = \cos\theta$

$\frac{4 - \sqrt{3} - 4}{2} = -\frac{\sqrt{3}}{2} = \cos\theta$

9) $-\frac{8}{4} = \frac{-4}{4} - 8\cos\theta$
 $\theta_1 = \frac{5\pi}{6}, \theta_2 = \frac{7\pi}{6}$

$-\frac{4}{-8} = \frac{-8\cos\theta}{-8}$

$\frac{1}{2} = \cos\theta$
 $\theta_1 = \frac{\pi}{3}, \theta_2 = \frac{5\pi}{3}$

11) $-1 - \sin\theta = -4 - 7\sin\theta$

$-1 + 6\sin\theta = -4$
 $6\sin\theta = -3$
 $\sin\theta = -\frac{1}{2}$
 $\theta_1 = \frac{7\pi}{6}, \theta_2 = \frac{11\pi}{6}$

13) $\frac{-6 - \sqrt{3}}{2} - 3\sin\frac{\theta}{4} = -3 - 2\sin\frac{\theta}{4}$

$3\sin\frac{\theta}{4} = \frac{-6 - \sqrt{3}}{2} + 3$
 $3\sin\frac{\theta}{4} = \frac{-6 - \sqrt{3} + 6}{2}$
 $3\sin\frac{\theta}{4} = \frac{-\sqrt{3}}{2}$
 $\sin\frac{\theta}{4} = \frac{-\sqrt{3}}{6}$
 $\theta/4 = \frac{4\pi}{3} \rightarrow \theta = \frac{16\pi}{3}$
 $\theta/4 = \frac{5\pi}{3} \rightarrow \theta = \frac{20\pi}{3}$

2) $0 = \frac{-1}{3} \cdot \tan\theta \cdot -3$

$0 = \tan\theta$

$0^\circ = \theta$

4) $\frac{4\cos\theta}{4} = \frac{-4\sqrt{2}}{4}$

$\cos\theta = -\sqrt{2}$

No solution.
 $\cos\theta > -\sqrt{2}$

6) $-1 + \frac{3}{2} \tan\theta = \frac{-2 + \sqrt{3}}{2} + 1$

$2(\frac{3}{2} \tan\theta) = (\frac{-2 + \sqrt{3}}{2} + 1) \cdot 2$

$3 \tan\theta = -2 + \sqrt{3} + 2$

$\tan\theta = \frac{\sqrt{3}}{3}$

$\theta_1 = 30^\circ, \theta_2 = 210^\circ$

8) $0 = \frac{-4\sin\theta}{-4}$

$0 = \sin\theta$

$\theta = 0$

10) $-5 + 2\cos\theta = -6$

$2\cos\theta = -1$

$\cos\theta = -\frac{1}{2}$

$\theta_1 = \frac{2\pi}{3}, \theta_2 = \frac{4\pi}{3}$

12) $2\sqrt{2} - 1 = -1 - 4\sin\theta$

$2\sqrt{2} = -4\sin\theta$
 $-\frac{\sqrt{2}}{2} = \sin\theta$
 $\theta_1 = \frac{5\pi}{4}, \theta_2 = \frac{7\pi}{4}$

14) $-3 - 3\cos(\theta + \frac{3\pi}{4}) = -5 - \cos(\theta + \frac{3\pi}{4})$

$3\cos(\theta + \frac{3\pi}{4}) = \frac{-3 - 3\cos(\theta + \frac{3\pi}{4})}{3}$
 $\frac{-3 - 3\cos(\theta + \frac{3\pi}{4})}{3} = \frac{-5 - \cos(\theta + \frac{3\pi}{4})}{3}$
 $-3 - 3\cos(\theta + \frac{3\pi}{4}) = -5 - \cos(\theta + \frac{3\pi}{4})$
 $2 = 2\cos(\theta + \frac{3\pi}{4})$
 $\cos(\theta + \frac{3\pi}{4}) = 1$
 $\theta + \frac{3\pi}{4} = 0$
 $\theta = -\frac{3\pi}{4}$

Answers to Solving Trig Equations #1

1) $\{90, 270\}$
5) $\{120, 300\}$

9) $\left\{\frac{\pi}{3}, \frac{5\pi}{3}\right\}$
13) No solution.

2) $\{0, 180\}$
6) $\{30, 210\}$

10) $\left\{\frac{2\pi}{3}, \frac{4\pi}{3}\right\}$
14) $\left\{\frac{5\pi}{4}\right\}$

3) $\{240, 300\}$
7) $\left\{\frac{5\pi}{6}, \frac{7\pi}{6}\right\}$

11) $\left\{\frac{7\pi}{6}, \frac{11\pi}{6}\right\}$

4) No solution.
8) $\{0, \pi\}$

12) $\left\{\frac{5\pi}{4}, \frac{7\pi}{4}\right\}$