

A background image of many pumpkins in various shades of orange and yellow, some with green stems, arranged in rows.

November 45

SWBAT:

Simplify and solve trig equations

### Essential Learning Goals:

- ☺ Prove trig identities and formulas and use them to solve problems.

Find all solutions

$$2\cos^2(4x) - 1 = 0$$

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$$\begin{array}{r} +1 \quad +1 \\ \hline 2\cos^2(4x) = 1 \\ \hline 2 \quad 2 \end{array}$$

$$\cos^2(4x) = \frac{1}{2}$$

$$\sqrt{\cos^2(4x)} = \sqrt{\frac{1}{2}}$$

$$\cos(4x) = \pm \frac{1}{\sqrt{2}} = \pm \sqrt{\frac{1}{2}} \rightarrow \pm \sqrt{\frac{2}{4}}$$

$$\cos^{-1}(\cos 4x) = \cos^{-1}\left(\pm \sqrt{\frac{1}{2}}\right) = \cos^{-1}\left(\pm \frac{\sqrt{2}}{2}\right)$$

$$\frac{4x}{4} = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}, \frac{9\pi}{4} \dots$$

$$x = \frac{\pi}{16}, \frac{3\pi}{16}, \frac{5\pi}{16}, \frac{7\pi}{16}, \dots, \frac{(2n+1)\pi}{16}$$

Find all solutions on  
the interval  $[0, 2\pi)$

$$\tan(x)(\tan x - 1) = 0$$

$$\tan(x)(\tan(x) - 1) = 0$$

$$\tan(x) = 0$$

$$\tan^{-1}(\tan x) = \tan^{-1}(0)$$

$$x = 0, \pi$$

$$\tan(x) - 1 = 0$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \tan(x) = 1 \end{array}$$

$$\tan^{-1}(\tan x) = \tan^{-1}(1)$$

$$x = \frac{\pi}{4}, \frac{5\pi}{4}$$

Find all solutions on the interval  $[0, 2\pi)$

$$\cos^3(x) = \cos(x)$$

$$\begin{array}{r} \cos^3(x) = \cos(x) \\ -\cos(x) \quad -\cos(x) \\ \hline \end{array}$$

$$\cos^3(x) - \cos(x) = 0$$

$$\cos(x)(\cos^2(x) - 1) = 0$$

$$\cos(x) = 0$$

$$\cos^{-1}(\cos x) = \cos^{-1}(0)$$

$$x = \frac{\pi}{2}, \frac{3\pi}{2}$$

$$\cos^2(x) - 1 = 0$$

$$\begin{array}{r} +1 \quad +1 \\ \hline \sqrt{\cos^2(x)} = \sqrt{1} \end{array}$$

$$\cos(x) = \pm 1$$

$$\cos^{-1}(\cos x) = \cos^{-1}(\pm 1)$$

$$x = 0, \pi$$

$$\begin{array}{l} y^3 - y = 0 \\ y(y^2 - 1) = 0 \end{array}$$

Find all solutions on the interval  $[0, 2\pi)$

$$2\sin^2 x + 3\sin x + 1 = 0$$

$$2\sin^2 x + 3\sin x + 1 = 0$$

$$(2\sin x + 1)(\sin x + 1) = 0$$

$$2\sin x + 1 = 0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline 2\sin x = -1 \\ \frac{2\sin x}{2} = \frac{-1}{2} \end{array}$$

$$\sin x = -\frac{1}{2}$$

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

$$x = \frac{7\pi}{6}, \frac{11\pi}{6}$$

$$\sin x + 1 = 0$$

$$\begin{array}{r} -1 \quad -1 \\ \hline \sin x = -1 \end{array}$$

$$\sin^{-1}(\sin x) = \sin^{-1}(-1)$$

$$x = \frac{3\pi}{2}$$

$$\begin{array}{l} 2y^2 + 3y + 1 = 0 \\ (2y+1)(y+1) = 0 \\ \frac{1}{2} + \frac{1}{2} = 3 \\ \frac{1}{2} \times \frac{1}{2} = 2 \\ 2y^2 + 1y + 2y + 1 \\ y(2y+1) + 1(2y+1) \\ (2y+1)(y+1) \end{array}$$