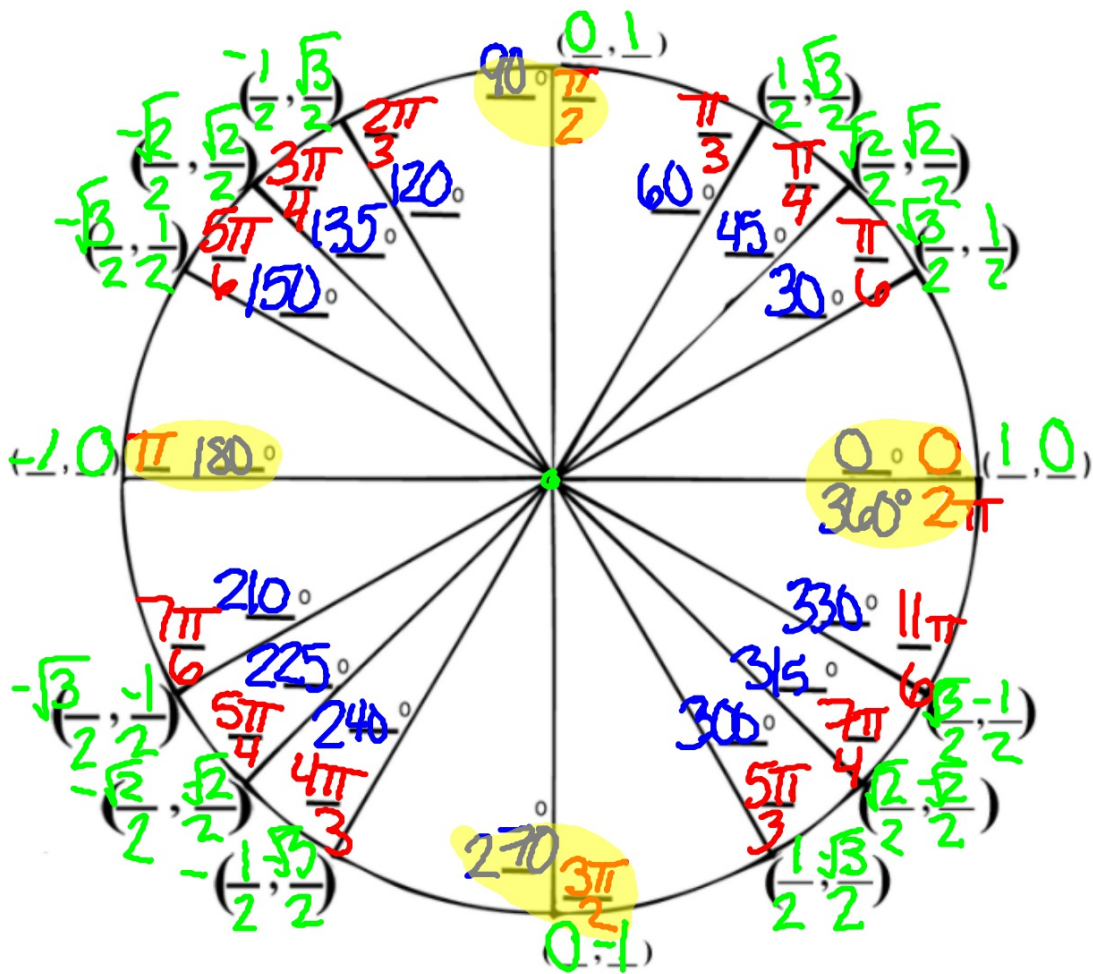


# The Unit Circle



## Sine Graph - y coordinates on Unit Circle



$$y = a \cdot \sin bx + d$$

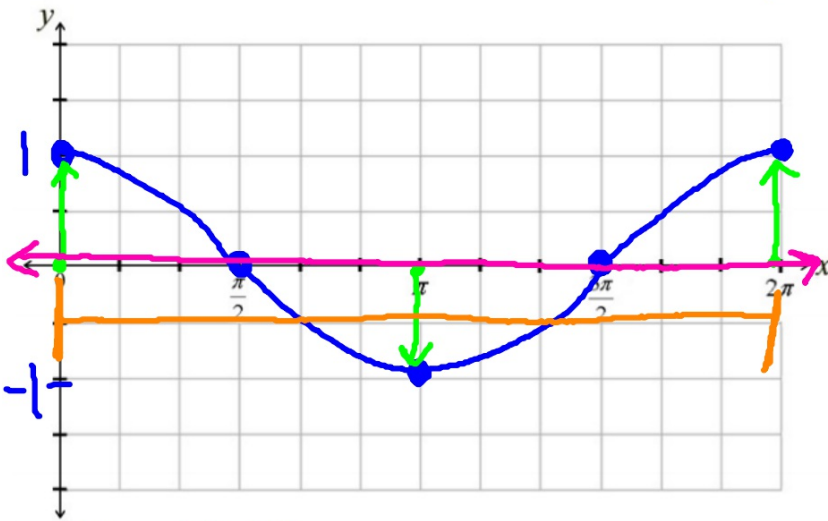
**Amplitude:** height from middle of graph to min/max  
\* Always positive

**Period:** how long until the graph repeats

Frequency: # of cycles over time { ~~Not~~ on graph }

**Vertical Shift:** where middle of graph is moved

## Cosine Graph - X coordinates on Unit Circle



$$y = a \cdot \cos bx + d$$

Amplitude:

Period:

Frequency:

Vertical Shift:

$$y = a \cdot \sin(bx) + d$$

$$\text{amp} = |a|$$

$$\text{period} = \frac{2\pi}{b}$$

$$\text{frequency} = \frac{b}{2\pi}$$

$$y = a \cdot \cos(bx) + d$$

$$\text{V.S.} = \begin{matrix} +d & \text{up} \\ -d & \text{down} \end{matrix}$$

Determine the amplitude, period, frequency & vertical shift:

Ex 1:  $y = 6 \cdot \sin(10x) - 8$

$$\text{amplitude} = 6$$

$$\text{Period} = \frac{2\pi}{10} = \frac{\pi}{5}$$

$$\text{frequency} = \frac{5}{\pi}$$

$$\text{V.S.} = -8$$

down 8

Ex 2:  $y = \frac{-4}{3} \cos(5x) + 0$

amplitude =  $\frac{4}{3}$

period =  $\frac{2\pi}{5}$

frequency =  $\frac{5}{2\pi}$

$\downarrow$   $S = 0$

Ex 3:  $y = \cos\left(\frac{1}{3}x\right) + 4$