

# October 11

## SWBAT:

*Draw and describe transformations of sine and cosine*

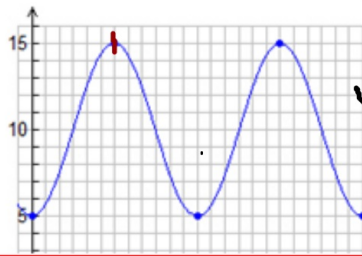
9. a. Write an equation for the sine function whose graph is shown in the figure below.

amplitude = 5

v. shift = 10

h. shift = 3

period = 12



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

$$y = 5 \sin(bx + c) + 10$$

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

$$12 = \frac{2\pi}{b}$$

$$12b = 2\pi$$

$$b = \frac{2\pi}{12} = \frac{\pi}{6}$$

$$y = 5 \sin\left(\frac{\pi}{6}x - \frac{\pi}{2}\right) + 10$$

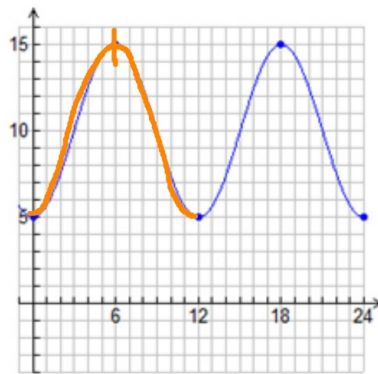
- b. Utilize a cosine function to write an equation for the same graph

$$\text{h. shift} = -\frac{c}{b}$$

$$3 = -\frac{c}{\frac{\pi}{6}} \rightarrow c = -\frac{3\pi}{6} = -\frac{\pi}{2}$$

9. a. Write an equation for the sine function whose graph is shown in the figure below.

amp = 5  
 v. shift = 10  
 period = 12  
 h. shift = 6



$$b = \frac{-c}{\frac{\pi}{6}}$$

$$-\pi = c$$

- b. Utilize a cosine function to write an equation for the same graph.

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

$$y = 5 \cos\left(\frac{\pi}{6}x - \pi\right) + 10$$

$$y = -5 \cos\left(\frac{\pi}{6}x\right) + 10$$

## Essential Learning Goals:

- 😊 Model periodic functions with specified amplitude, frequency, and midline
- 😊 Restrict the domain of a trigonometric function to allow its inverse to be constructed
- 😊 Use inverse functions to solve trigonometric equations in context

$$y = 4\sin(3x - \pi) + 7$$

$$-4 \leq y \leq 4$$

$$-4 + 7 \leq y \leq 4 + 7$$

Amplitude:

4

Vertical Shift:

7

Phase Shift:

$\frac{\pi}{3}$   $-\frac{c}{b}$

Period Change:

compress

Range:

$$3 \leq y \leq 11$$

Length of one period:

$$\frac{2\pi}{3} \quad \frac{2\pi}{b}$$

6  $\frac{1}{3}$   $3\pi$  9 2 up down  
1 3 expand right left

8  $\frac{1}{4}$  5  $\frac{2}{3}$

$$y = -6\cos\left(\frac{1}{5}x + \frac{2\pi}{15}\right) + 4$$

$$-6 \leq y \leq 6$$

$$-6 + 4 \leq y \leq 6 + 4$$

$$\frac{-\frac{2\pi}{15}}{\frac{1}{5}} = \frac{-2\pi}{15} \cdot \frac{5}{1} = \frac{-10\pi}{15}$$

Amplitude:

-6

Vertical Shift:

4

Phase Shift:

$-\frac{2\pi}{3}$

Period Change:

expand

Range:

$$-2 \leq y \leq 10$$

Length of one period:

$$10\pi = \frac{2\pi}{\frac{1}{5}} = 2\pi \cdot 5$$

$\frac{1}{3}$  2 left 7 down  $\frac{1}{5}$  right  
1 6 up  $\frac{\pi}{3}$  compress  $5\pi$   
3

Graph

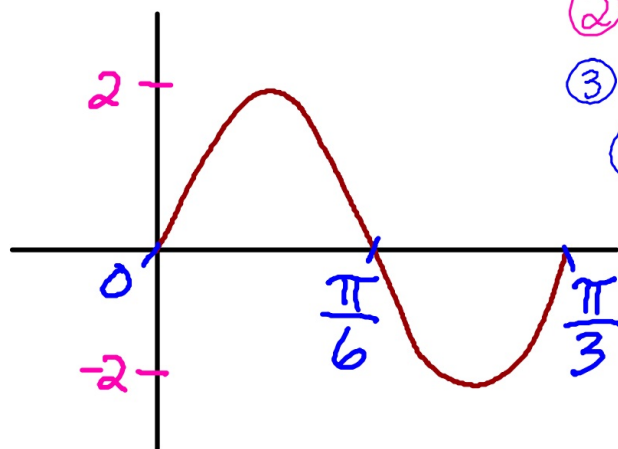
$$y = 2\sin(6x)$$

$$\text{Amplitude} = +2 \rightarrow -2 \leq y \leq 2$$

$$\text{Vertical Shift} = 0$$

$$\text{Phase Shift} = 0$$

$$\text{Period} = \frac{2\pi}{b} = \frac{2\pi}{6} = \frac{\pi}{3}$$



① sketch parent function

② label y-axis

③ label x-axis  
(beginning, middle, end)

Graph

$$y = -3 + 5\cos\left(\frac{\pi x}{12}\right)$$

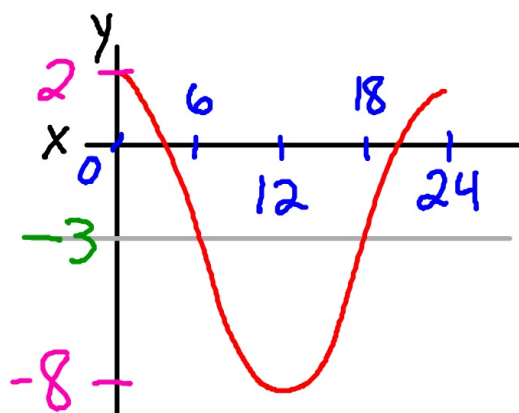
$$y = 5\cos\left(\frac{\pi}{12}x\right) - 3$$

$$\text{Amplitude} = 5 \rightarrow -5 \leq y \leq 5$$

$$\text{Vertical Shift} = -3 \rightarrow -5 - 3 \leq y \leq 5 - 3 \rightarrow -8 \leq y \leq 2$$

$$\text{Phase Shift} = 0$$

$$\text{Period} = \frac{2\pi}{\frac{\pi}{12}} = 2\pi \cdot \frac{12}{\pi} = 24$$





Graph

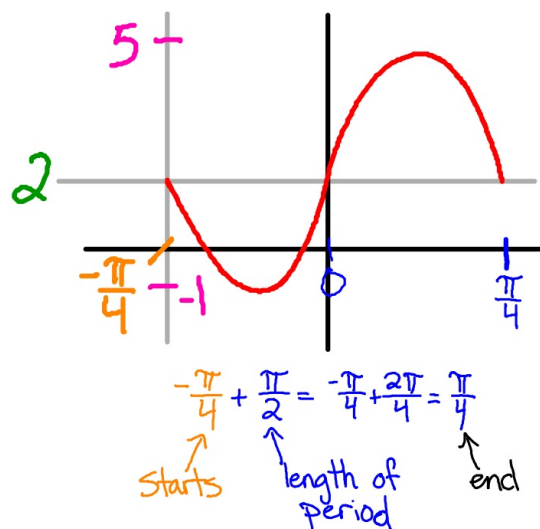
$$y = -3\sin(4x + \pi) + 2$$

Amplitude = <sup>flipped</sup>  $-3 \rightarrow -3 \leq y \leq 3$

Vertical Shift =  $2 \rightarrow -3 + 2 \leq y \leq 3 + 2 \rightarrow -1 \leq y \leq 5$

Phase Shift =  $-\frac{c}{b} = -\frac{\pi}{4}$  (starts at  $x = -\frac{\pi}{4}$ )

Period =  $\frac{2\pi}{b} = \frac{2\pi}{4} = \frac{\pi}{2}$



find middle

$$\frac{-\frac{\pi}{4} + \frac{\pi}{4}}{2} = \frac{0}{2} = 0$$

beg. + end  
2

## Biorhythm Project

According to a theory called biorhythm, everyone has three inner rhythms that start at birth: a 23 day physical cycle, a 28 day emotional cycle, and a 33 day intellectual cycle. Each cycle consists of a high period, a low period, and a critical transition day when a person moves from one period to the other. These three cycles can be graphed so that a person can determine in advance when "good" and "bad" days will occur. The graph of each biorhythm cycle is a sine wave.

You will rank each category, each day for the next 33 days. You can choose your ranking system.

You will also need to know how many days old you are.

Calculate the number of days you have lived as of **October 11**.

- Multiply your age times 365.
- Add the number of leap years you have lived through (they occur every 4 years; the last one was in 2012).
- Add the number of days since your last birthday till today.
- The final figure will be the number of days you have been alive.

Ex. Born **September 23, 1996**:

$$16 \times 365 = 5840 \rightarrow 5840 + 4 = 5844 \rightarrow 5844 + 18 = 5862$$