Modeling Periodic Phenomena

**CORE STANDARDS**

F.TF.2

F.TF.5

LESSON

**6-1**

 Secondary Math 3

OBJECTIVE **1. I can model periodic event using trigonometry.**

NOTES Typically when working with trigonometric functions we work in radians.

 Phase Shift-

 $f\left(x\right)=a\sin(\left(b(x-h)\right))+k$ and $f\left(x\right)=a\cos((b(x-h)))+k$

 Where h is the phase shift (horizontal shift) of the function.

 Models of periodic events.

 Many events in the world are periodic in nature, such as:

* Tides
* Biorythms
* Sound waves
* Length of the day
* Average temperature
* Height of a person on a Ferris Wheel.
* And more.

EXAMPLES

1. Identify the amplitude, period, and phase shift, then sketch one period of the graph.
	1. $f\left(x\right)=2\cos((2(x-\frac{π}{4})))+3$ b. $f\left(x\right)=\cos(\left(\frac{1}{3}x-\frac{2π}{3}\right))+2$



1. The Ferris wheel at Lagoon has a diameter of 21.8 meters. It rotates on a platform that is 3 meters above the ground. The Ferris wheel completes one revolution in 40 seconds. Write an equation to model the situation. Then sketch a graph of height versus time, extending the graph for more than one revolution.
2. In Salt Lake City, Utah, at the spring equinox (March 20, 2013) there were 12 hours and 9 minutes of daylight. The longest day (June 20, 2013) and shortest day (December 21, 2013) of the year vary from the equinox by approximately 3 hours. Write a sine function that relates the number of days to the variation of daylight hours in Salt Lake City. Graph the model, showing at least one year.

PRACTICE **6-1** NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 [SHOW YOUR WORK]

Identify the amplitude, period, and phase shift, then sketch one period of the graph.

1. $f\left(x\right)=\sin(\left(x-\frac{π}{2}\right))+2$
2. $f\left(x\right)=-2\sin(\left(x-π\right))$
3. $f\left(x\right)=3\sin(\left[2\left(x-\frac{3π}{2}\right)\right])+1$
4. A buoy oscillates up and down as waves go past. The buoy moves a total of 3.6 feet from its low point to its high point, and then returns to its high point every 8 seconds. Write a cosine function modeling the buoy’s vertical position at any time t.
5. A Ferris wheel 50 feet in diameter makes one revolution every 40 seconds. The center of the wheel is 30 feet above the ground. Write a cosine function to model the height of a car on the Ferris wheel at any time t.
6. Low tide is at 10:15 am and high tide is at 4:15 pm. The water level varies 64 inches between low and high tide. Write a cosine function to represent the change in water level.
7. The lowest pitch a human can easily hear has a frequency of 30 cycles per second. Write a sine function representing the sound wave of the pitch. (Amplitude is 1)
8. The highest pitch a human can easily hear has a frequency of 20,000 cycles per second. Write a sine function representing the sound wave of the pitch. (Amplitude is 1)
9. In Buenos Aires, Argentina, the average monthly temperature is the highest in January and the lowest in July. It ranges from 76°F to 51°F. Write a cosine function that models the change in temperature according to the month of the year.