5.6 - Modeling Periodic Phenomena Notes
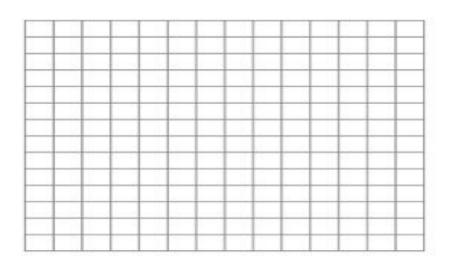
In order to write an equation to model a situation, you need to find:

1. The amplitude $|a|$: $a = \frac{|max-min|}{2}$
2. The period to find b: $period = \frac{2\pi}{|b|}$
3. The midline k: $k = \frac{max+min}{2}$
4. Then sub in a, b, and k to the equations

$$f(x) = a\sin(bx) + k \qquad \text{and} \qquad f(x) = a\cos(bx) + k$$

Example 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.

Example 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.