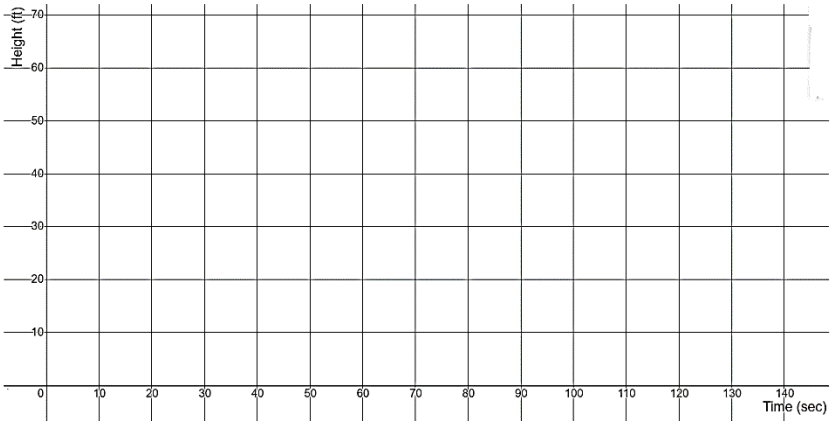
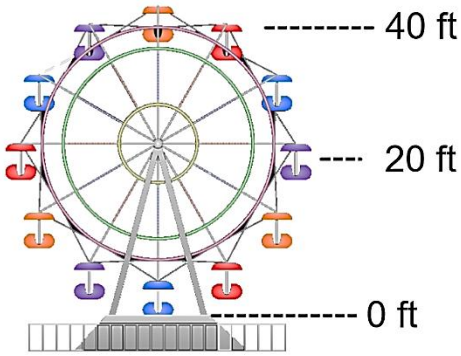
Name: _____ Per: _____

Intro Investigation of the Graphs of Sine and Cosine

1. Consider the Ferris wheel shown below. Sketch a graph for a rider's height above the loading platform as they make two revolutions, assuming one revolution takes one minute and they start at the bottom. *You don't need to be super precise, just looking for the **general** shape of the graph.





2. When you finished your sketch, go to desmos.com/calculator/w056gaotqj and check how you did.
   a. Was yours different in any way? If yes, explain how and why you originally had it different/what your thinking was.

   b. Leave your original idea/graph in, but go back in and sketch the correct one over it if your original was noticeably different.

We call the graph created by the path of a rider on a Ferris wheel a sinusoidal or sine curve. Go to https://en.wikipedia.org/wiki/Sine_wave and write down the first sentence on that web page. It turns out that any motion that is periodic will make this type of graph.

3. State whether you believe the graphs of each of the following situations would make a sinusoidal curve and why.
   a. The height above the ground for a baseball tossed into the air.

   b. Distance from center for the pendulum of a grandfather clock.

   c. The height above the ground for someone jumping on a trampoline.

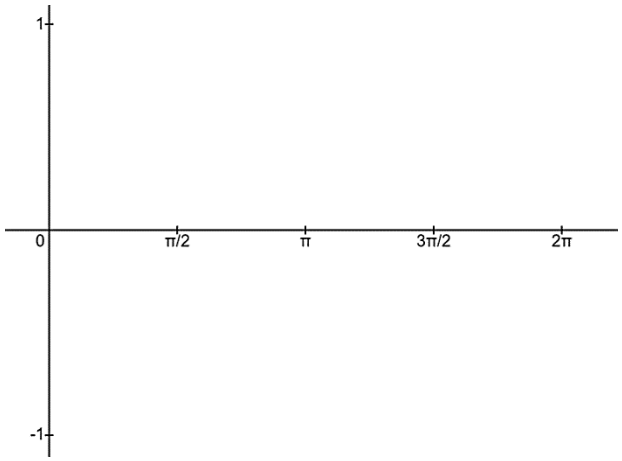
4. We are now going to look at the mathematical equations for these functions and what their graphs look like.
    a. Fill in the table for the sine function.

x	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	π
$f(x) = \sin(x)$									
x	$7\pi/6$	$5\pi/4$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$7\pi/4$	$11\pi/6$	2π	$13\pi/6$
$f(x) = \sin(x)$									

    b. Plot the points and sketch in the graph.

    c. What is the range for the function $f(x) = \sin(x)$?

    d. What would happen if you continued the table and plotting points?



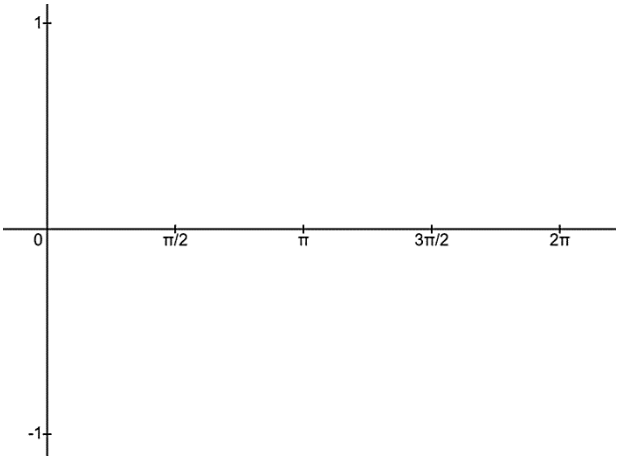
    e. Fill in the table for the cosine function.

x	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	$2\pi/3$	$3\pi/4$	$5\pi/6$	π
$f(x) = \cos(x)$									
x	$7\pi/6$	$5\pi/4$	$4\pi/3$	$3\pi/2$	$5\pi/3$	$7\pi/4$	$11\pi/6$	2π	$13\pi/6$
$f(x) = \cos(x)$									

    f. Plot the points and sketch in the graph.

    g. What is the range for the function $f(x) = \cos(x)$?

    h. What would happen if you continued the table and plotting points?



5. List two similarities and one difference between the graphs for $\sin(x)$ and $\cos(x)$.

6. Go to desmos.com and graph the following two equations: $f(x) = \sin(x)$ and $\cos\left(x - \frac{\pi}{2}\right)$. What do you notice?

7. Go to desmos.com/calculator/uv40xpnhen make sure the "Sine" folder is turned on in cell 6 and then click the play button for "t" in cell 3. Watch the animation.
    a. As you watch the animation play, what do you notice about the point on the circle's y-coordinate and the graph of sine's output (y-coordinate)?

    b. The graph of sine appears to trace out the point's _____ coordinate over time.

    c. Now, reset the "t" back to 0. Turn off the sine folder in cell 6 and turn on the cosine folder. Then hit play. As you watch the animation play, what do you notice about the point on the circle's x-coordinate and the graph of cosine's output (y-coordinate)?

    d. The graph of cosine appears to trace out the point's _____ coordinate over time.

8. Now, go to student.desmos.com and complete the investigation (or get as far as you can by the end of the period) "Exploring Sine and Cosine Graphs" with the class code shared by the teacher.