

October 8

Use long division find the remainder of 260 divided by 7.

$$\begin{array}{r} 37 \text{ R } 1 \\ 7 \overline{) 260} \\ \underline{21} \\ 50 \\ \underline{49} \\ 1 \end{array}$$

If school starts on a Monday, 260 days later what day is it?

Mon \rightarrow Sun (37 times)

Monday (+ 1 day)

October 8

Students will verbally explain how to graph all six trig functions

(using the words:
zero, asymptote, undefined...)





Trigonometric Transformations Student Activity

Name _____
Class _____

Open the TI-Nspire document

Trigonometric_Transformations.tns.

In this activity, you will use an observation wheel to apply transformations to periodic functions and write an equation for a trigonometric function.



Move to page 1.2.

Press **[ctrl]** **[right arrow]** and **[ctrl]** **[left arrow]** to navigate through the lesson.

The London Eye is an observation wheel in London that can carry 800 passengers in 32 capsules. It turns continuously, completing a single rotation once every 30 minutes.

- On the screen, you see a model of the London Eye on the left side and a graph on the right. Click on the play button to start the animation. Click the button again to stop it. What type of function was created as a result of the animation?
- What does the changing measurement on the left screen represent as the capsule (represented by the open circle) moves around the observation wheel?
- What are the units of the x- and y-axes on the right?
- What is the maximum height a capsule reaches from the platform?
 - The horizontal line halfway between the maximum and minimum of the function is called the **midline** of the graph. What is the equation of the midline? Explain your reasoning.
- The function $y = -A \cdot \cos(Bx) + D$ can be used to model the capsule's height above the platform at time x . This is a transformation of a basic cosine curve.
 - Use your knowledge of transformations to explain why there is a negative sign in front of the variable A .



Trigonometric Transformations Student Activity

- The variable A represents the **amplitude**, which is the vertical distance between the midline and the maximum or the minimum. What is the amplitude of the "observation wheel" function, and how did you find the value?
 - Which variable of the equations represents the midline of the function? Explain your reasoning.
 - The **period** of a function is the time it takes to complete one cycle of a periodic function. What is the period of the "observation wheel" function, and how is it visible in the graph?
- What characteristic of the observation wheel does the amplitude represent? Explain your reasoning.
 - The variable B represents frequency. **Frequency** is the measure of the arc (in radians) traveled by the capsule divided by the time traveled (in minutes).

- What is the measure of the arc traveled by the capsule in one complete revolution?

- How long does it take for a capsule to complete one revolution?

- What is the frequency for the "observation wheel" function?

- Using $y = -A \cdot \cos(Bx) + D$ and the variable information found in Question 5, write the equation representing the height of a London Eye capsule at time x . Verify your answer by graphing the function.

- Imagine the boarding platform for the observation wheel stands 10 feet above the ground. If your function takes this height into consideration, what parameters of the equation would change? What parameters would stay the same?

distance from midline to max (or min)

$$y = -225 \cos\left(\frac{2\pi}{30}x\right) + 235$$

middle of max + min values

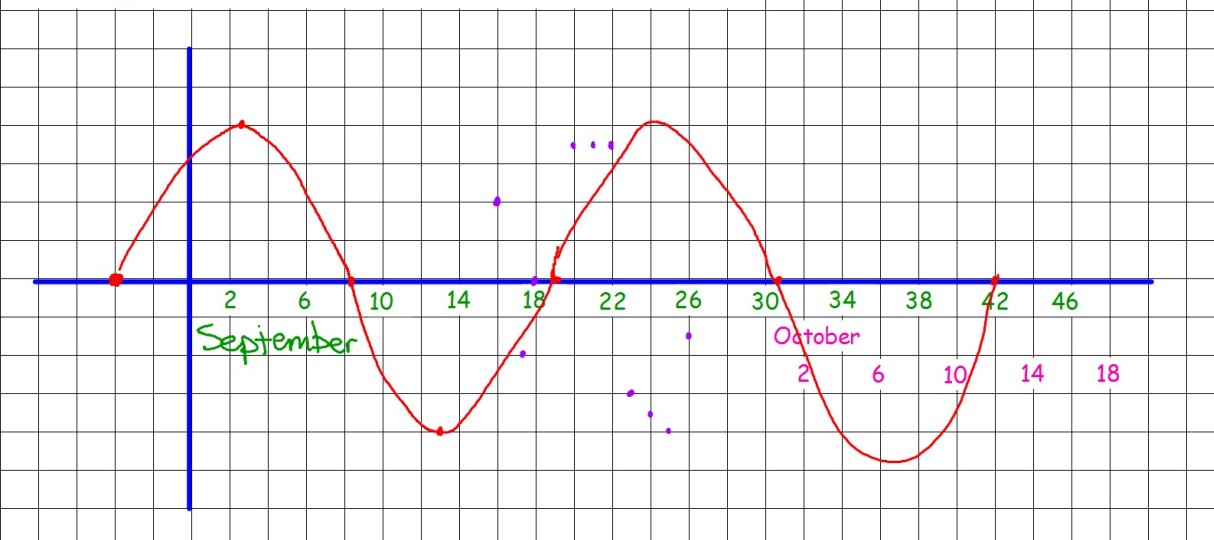
1. Determine the function that models your physical cycle.
 - a. For the start date, divide your age in days by 23 for the number of days in the cycle. You are only interested in the remainder. The value of the remainder tells you how many days ago your cycle started.
 - b. Counting forward 23 days from this date will give the end of the cycle.
 - c. Finding the halfway point gives the transition date. (add $11\frac{1}{2}$ days to the start date)
One fourth of the way gives the high point (add $5\frac{3}{4}$ days to the start date) and three fourths of the way gives the low point (add $16\frac{3}{4}$ days to the start date).

Ex. $5846 / 23 = 254 \text{ R } 4$ This cycle started 4 days ago on **August 27**. It will end on **September 19**. Halfway would be $11\frac{1}{2}$ days which will occur on **September 8**. One fourth of the way would be $5\frac{3}{4}$ days on **September 2** and three fourths of the way will be $16\frac{3}{4}$ days on **September 14**.

- d. Plot your points on a graph – use your ranking system to determine the high point (Sept 2), transition days (Start, middle and end), and the low point (Sept 14). Use **September 1** as day #1 on your graph.



- Continue as many cycles as you needed to reach October 20th.



- e. Determine the sine function that fits your data.

(Your ranking system will determine your amplitude and vertical shift)

- i. Amplitude =
- ii. Period =
- iii. Horizontal Shift =
- iv. Vertical Shift =

Function:

→ depend on your ranking system

→ depends on the length of the cycle (find B)

→ depends on the start day (find C)



Graphs of the OTHER Trig Functions Student Activity

Name _____

Class _____

Open the TI-Nspire document
Graphs_of_the_OTHER_Trig_Functions.tns.

You probably know a lot about sine, cosine and tangent, but you might not know as much about the other trigonometric functions, cotangent, secant, and cosecant. In this activity, you will explore those functions, learn what their graphs look like, and why they look the way they do.



Move to page 2.2

1. a. Recall that we can write the trig functions in terms of the sine and cosine functions.
What is the secant function in terms of the sine and cosine functions?

$$\sec \theta = \frac{1}{\cos \theta}$$

- b. Click to move the point around the circle. What does the bold line segment length represent? How is it determined?



$$\frac{x}{1} = \frac{1}{a} \rightarrow xa = 1 \rightarrow \frac{xa}{x} = \frac{1}{x}$$
$$a = \frac{1}{x} = \sec \theta$$

- c. For what values of θ is the secant 0? Undefined? Why?

$90^\circ = \frac{\pi}{2}$ The secant is undefined because $x(\cos \theta)$ equals zero + you can't divide by zero

- d. Describe or sketch what you think the graph of the secant function might look like.
Explain your thinking.

