Advanced Algebra 4 Name:_____

Intro to Cosine

So far, we have only being dealing with graphs and equations using sine. We will now start looking at cosine and how to represent it as a graph and as an equation.

Recall SOHCAHTOA from Geometry:

SOH	CAH	TOA
$Sin(x) = \frac{opposite}{hypotenuse}$	$Cos(x) = \frac{adjacent}{hypotenuse}$	$Tan(x) = \frac{opposite}{adjacent}$

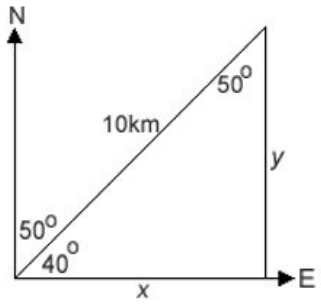
We will investigate Tangent later. For now, just focus on Sine and Cosine.

1. **Basic Trig Ratios**

Use the trigonometric ratios to determine the missing side lengths.

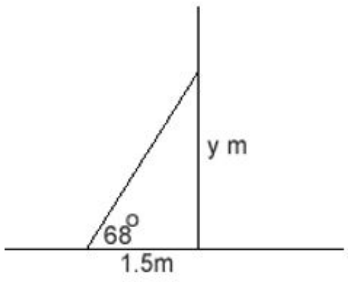
a.

A ship travels 10 km on a course heading 50º east of north.
How far north, and how far east has the ship travelled at this point?



b.

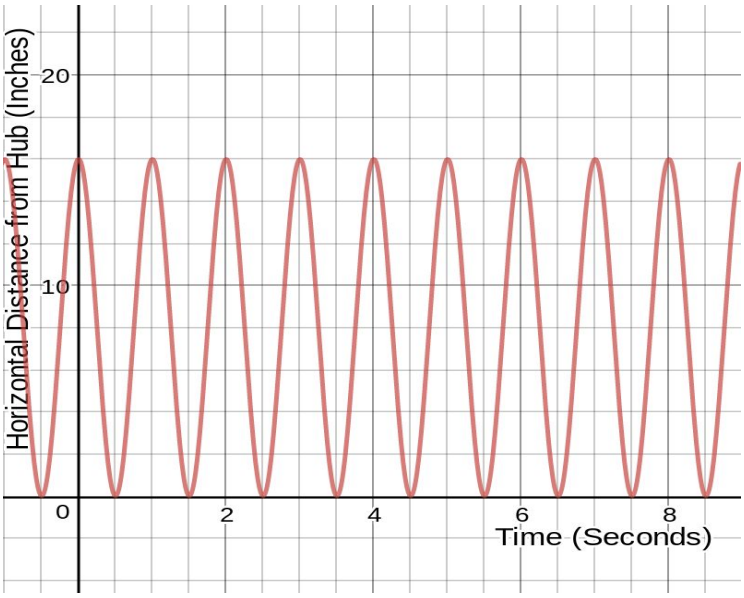
The foot of a ladder is 1.5 m from a vertical wall. The ladder makes an angle of 68° with the horizontal. How far up the wall does the ladder reach? How long is the ladder?



c. This wheel has a radius of 10 cm. The angle between two spokes (called the CENTRAL ANGLE) is 64 degrees. How high above the center of the wheel is the spoke pointing NE (clock direction of 1:00)? How far to the right of the center of the wheel is that spoke?

2. **Graph of Cosine**

Here's a graph of a rotating bike tire:



a. What is the diameter of the bike tire?

b. How long does it take the tire to complete one rotation?

c. How fast is the bike moving in miles per hour?

d. Pay close attention to the labels for each axis. What is different about this graph from the wheel graphs we saw on the first day of trig?

3. **Understanding Cosine**

Here's a picture of a wheel. Imagine it rotates <u>counterclockwise.</u>

a. Focus on a point on the right side of the wheel (pointing due east in red). As the wheel rotates, will the point move UP or DOWN?

b. Imagine the same point (due east of center). As the wheel rotates, will the point move LEFT or RIGHT?

c. In the first day, we learned that sin(x) represents the height of a point as a wheel rotates. This is because the height of a triangle is OPPOSITE to the central angle. Imagine the same point as in (a) and (b). Is the point at a peak, at a valley, or at the midline of a sine graph?

d. You can also graph the HORIZONTAL location of a point as a wheel spins. Cos(x) represents the HORIZONTAL location of a point, relative to the center of the wheel because the horizontal leg is ADJACENT to the central angle.. Imagine the same point. Is the point at a peak, valley, or midline of a cosine graph?

e. On a separate piece of paper, draw two graphs: one representing the height of the point as the wheel rotates counterclockwise, the other representing the horizontal location of the point. The radius of the wheel is 10cm.