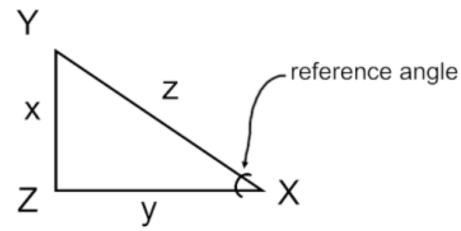
Trigonometry – Day 1 – Exploring the Ratios

Investigation #1



Open "Investigation 1" in the Gilbert folder on your S drive.
You should see a triangle labeled XYZ

For this investigation, our ***reference angle*** is Angle X.

Because angle X is our reference angle:

side x is the opposite side **side y is the adjacent side** **side z is the hypotenuse**

Grab the ***vertex*** marked 'X' (the vertex at angle X) and move it around.

1. What do you notice about the angles of your triangle?

2. What does this mean about the various triangles you are creating?

3. What do you notice about the ratios $\left(\frac{x}{z}, \frac{y}{z}\ and \frac{x}{y}\right)$ as you move X around?

The three ratios mentioned in question 3 are referred to as the ***sine***, ***cosine*** and ***tangent*** of angle X.

The sine, cosine and tangent of an angle are fancy names for the ratios of various sides of a right triangle.

The *sine* of an angle X, written as **sin(X)**, is the ratio of the length of the side opposite the angle to the length of the hypotenuse. (opposite divided by hypotenuse)

The *cosine* of an angle X, written as **cos(X)**, is the ratio of the length of the side adjacent the angle to the length of the hypotenuse. (adjacent divided by hypotenuse)

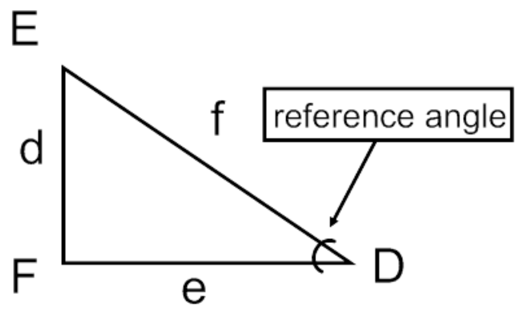
The *tangent* of an angle X, written as **tan(X)**, is the ratio of the length of the side opposite the angle to the length of the side adjacent the angle. (opposite divided by adjacent)

For any given angle (10°, 45°, 72°, …) no matter how large or small of a triangle it's in,
the value of that angle's **sine, cosine** and **tangent** will never change! Your investigation just proved this!

	sine	**cosine**	**tangent**
in general	$\sin(angle) = \left(\frac{opposite}{hypotenuse}\right)$	$\cos(angle) = \left(\frac{adjacent}{hypotenuse}\right)$	$\tan(angle) = \left(\frac{opposite}{adjacent}\right)$
in our example	$\sin(X) = \frac{x}{z}$	$\cos(X) = \frac{y}{z}$	$\tan(X) = \frac{x}{y}$

Follow-up questions

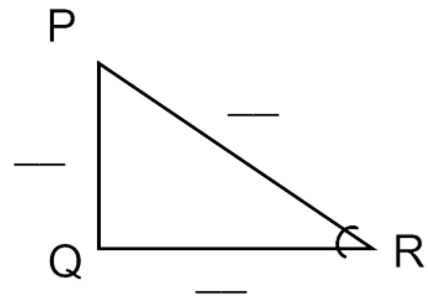
1. For each triangle below the reference angle has been marked. **Fill in the blanks.**



Reference Angle: D

opposite: d   adjacent: e   hypotenuse: f

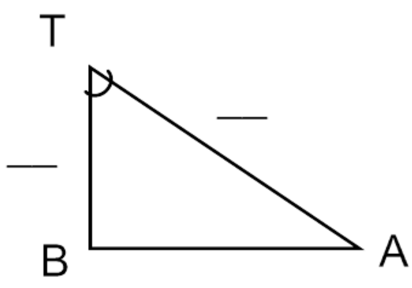
$\sin(D) = \frac{d}{f}$ $\cos(D) = \frac{e}{f}$ $\tan(D) = \frac{d}{e}$



Reference Angle: R

opposite: r   adjacent: p   hypotenuse: q

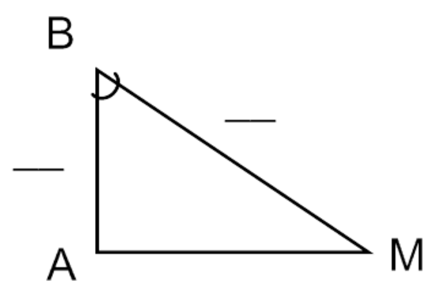
$\sin(R) = \frac{r}{\_\_}$ $\cos(R) = \frac{\_\_}{q}$ $\tan(R) = \frac{\_\_}{p}$



Reference Angle: T

opposite: ___   adjacent: ___   hypotenuse: ___

$\sin(T) = \_\_$ $\cos(T) = \_\_$ $\tan(T) = \_\_$

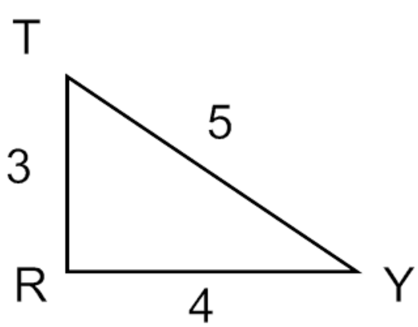


Reference Angle: ___

opposite: ___   adjacent: ___   hypotenuse: ___

$\sin(\quad) = \_\_$ $\cos(\quad) = \_\_$ $\tan(\quad) = \_\_$

2. For the triangle below, fill in the blanks.



If we use T as the reference angle:	**If we use Y as the reference angle:**
The opposite side is: ____	The opposite side is: ____
The adjacent side is: ____	The adjacent side is: ____
The hypotenuse is: ____	The hypotenuse is: ____

$\sin(T) = \frac{4}{\_\_}$	$\cos(T) = \frac{3}{\_\_}$	$\tan(T) = \frac{\_\_}{4}$	$\sin(Y) = \_\_$	$\cos(Y) = \_\_$	$\tan(Y) = \_\_$

Look at sin(T) and cos(Y). **What do you notice?**