Trigonometric Ratios
Student Activity

Problem 1 – Exploring trigonometric ratios

In right triangles, there is a relationship between the ratios of the side lengths and the trigonometric functions.

1. Using the triangle on page 1.4, find the following ratios and trig values to three decimal place.

Ratio	Value
$\dfrac{a}{c}$	
$\dfrac{b}{a}$	
$\dfrac{b}{c}$	

Trig Function	Value
$\sin(B)$	
$\cos(B)$	
$\tan(B)$	

2. Move to **page 1.5**. Based upon your answers, match each ratio with its correct trigonometric operation.

$\dfrac{b}{a}$ $\sin(B)$

$\dfrac{b}{c}$ $\tan(B)$

$\dfrac{a}{c}$ $\cos(B)$

3. Move to **page 2.1**. Test your hypothesis to see if your chosen relationships holds true. To do this, drag point *A* of each triangle on **pages 2.2**, **3.1** and **4.1**. Pick one value after you have dragged point *A* for each triangle and record the values in the table below.

Ratio	Value
$\dfrac{b}{c}$	
$\dfrac{a}{c}$	
$\dfrac{b}{a}$	

Trig Function	Value
$\sin(B)$	
$\cos(B)$	
$\tan(B)$	

Trigonometric Ratios

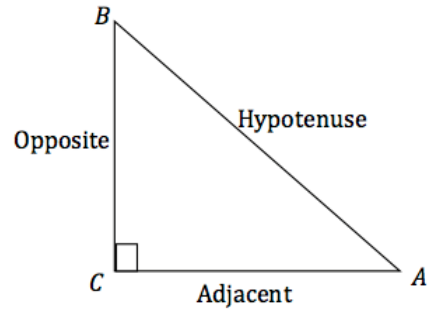Based upon your answers hypothesize which ratio goes with each trigonometric function.

4. $\sin B =$ _____ ; $\cos B =$ _____ ; $\tan B =$ _____

Move to **page 5.1**. A good acronym to use to help remember these relationships is SOHCAHTOA.

$$\sin A = \frac{Opposite}{Hypotenuse}$$

$$\cos A = \frac{adjacent}{hypotenuse}$$

$$\tan A = \frac{opposite}{adjacent}$$

Problem 2 – Trigonometry, what is it good for?

5. Move to **page 5.2**. One of the uses of trigonometry is finding missing side lengths of a triangle. On **pages 5.3-5.5**, use either sine, cosine, or tangent to find the length of the missing side. In the table below, write down the trig function relationship and then find the length of the missing side. Then, verify your answer by measuring the side.

Page	Trig Function Relationship	Length of Missing Side
5.3		
5.4		
5.5		

6. Move to **page 6.1**. Find the length of AC in each of three triangles. Record your answers on the screenshot below.
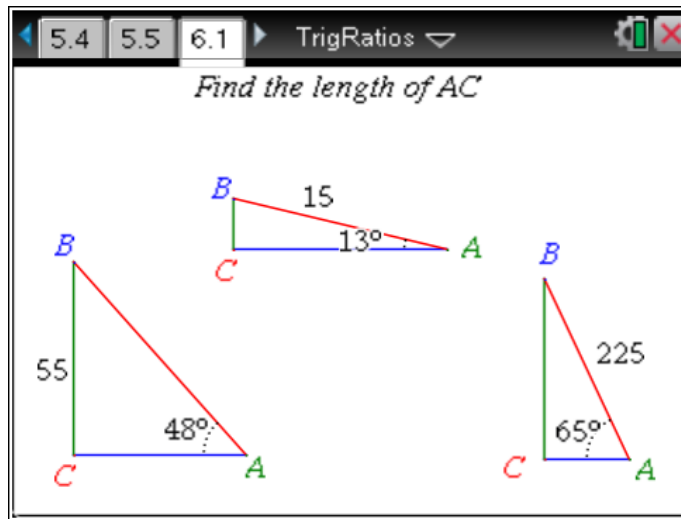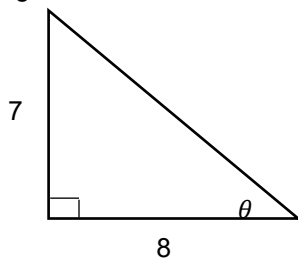

Further IB Extension

Another use of trigonometry is to use the ratio of sides of a right triangle to find the acute angles of a right triangle. In the following problem, you will not only find missing sides, but also missing angles of a right triangle.

First, let's do an example of finding a missing angle of a right triangle given its sides.

Find angle θ:

Since the sides given with respect to angle θ are the opposite side and the adjacent side, you will need to use tangent.

$$\tan \theta = \frac{7}{8}$$

How do we find the missing angle θ, given the sides? We will use The inverse tangent function $(tan^{-1} \text{ or } arctan)$.

$$tan^{-1}\left(\frac{7}{8}\right) = 41.2°$$

Problem

Suzie has realized that there is a problem with her dog. She loves to sleep in the bed with her, but she is too small to jump up on the bed or jump down off the bed. Being handy, she decides to construct a ramp that will allow her dog to easily get on and off the bed. Suzie realizes that she needs to do a little trigonometry to make this work. Unfortunately her bedroom is not very large so she does not have unlimited space for the ramp. She measures the height of the bed to be 3 feet high and that there is 5 feet of floor space for the ramp.

Using the trigonometric relationships discussed earlier in the activity, in parts (a) and (b) find:

      (a) The angle of the ramp created with the floor, also known as the angle of elevation.

      (b) The length of the ramp.

      (c) With a classmate, discuss other ways to find the length in part (b) and what other considerations you must think of for the ramp.