Hamilton Hardison

Activity One Procedure

Begin by opening the GSP Sketch “A1S”.

When you open document, you will see two right triangles, ABC and ADE.
You can change angle A by dragging the point labeled angle. You can change the size of triangle ADE by dragging point D.

1. Describe how the figure changes when you drag point angle.

2. Describe how the figure changes when you drag point D.

3. Are the two triangles similar (If you need to, measure the angles)? Why or why not?

A good way to check for similarity, (if you recall), is to compare the ratios of corresponding sides. Use the measure and calculate features of GSP to investigate the ratios of corresponding sides.

4. What do you notice about the ratios of corresponding sides?

In trigonometry we are more concerned with the ratios involving the sides of one right triangle. Click on the tab labeled “Hyp., Opp., Adj.”

This sketch contains only one triangle. An angle x is marked in green in the triangle. We will start this investigate with some terminology:
When investigating a right triangle, we can think of the sides in terms of their location to an angle x.

- The side of a right triangle across from the right angle is called the hypotenuse.
- The leg of a right triangle across from the angle x is called the opposite side.
- The leg of a right triangle next to the angle x, (but not the hypotenuse), is called the adjacent side.

The sides in this sketch are labeled in terms of the marked angle x and the side lengths have been measured for you.

Investigate the ratio $\frac{opposite}{hypotenuse}$ by using the calculate feature of GSP. Leave the angle fixed and manipulate the size of the triangle.

5. What do you notice about the ratio $\frac{opposite}{hypotenuse}$ as you change the size of the triangle? Can you explain why this happens (think about triangle similarity)?

6. Investigate the ratio $\frac{adjacent}{hypotenuse}$ and manipulate the size of the triangle. What do you notice and why does this happen (this may be very similar to your answer above)?

Maybe the angle you have picked is special. Try changing dragging the angle point and then retesting your conjectures from 5 and 6. Do they hold?

Click the "O/H to 0.5" button to move the $\frac{opposite}{hypotenuse}$ ratio to 0.5. Measure the angle x and manipulate the size of the triangle while watching the angle measure and ratio measure. Terminology:

- Given a right triangle with a non-right angle x, The ratio $\frac{opposite}{hypotenuse}$ is called the **sine** of the angle x and is written **sin(x) =** $\frac{opposite}{hypotenuse}$.
- Given a right triangle with non-right angle x, The ratio $\frac{adjacent}{hypotenuse}$ is called the **cosine** of the angle x and is written **cos(x) =** $\frac{adjacent}{hypotenuse}$.

7. If you are given a right triangle that has a sin(x) = 0.5, what can you say about the measures of the angles of the triangle? Draw an example triangle and be sure to label the angle of reference x, the sides, and the measures of the angles.

8. If you are given a right triangle that has a cos(x) = 0.87, what can you say about the measures of the angles of the triangle? Draw an example triangle and be sure to label the angle of reference x, the sides, and the measures of the angles.

Click on the sine and cosine tab. Here you will notice a right triangle, ABC, with non-right angles x and y. Using the measure and calculate features determine the sin(x), cos(x), sin(y), and cos(y).   Change the angles of the triangle to see if the relationship holds.

9. Do you notice anything interesting about the ratios you've examined? State your conjecture and explain why this happens (think about what opposite and adjacent mean).

10. Did you discover any thing interesting that you haven't written down yet? If so, write about it here.