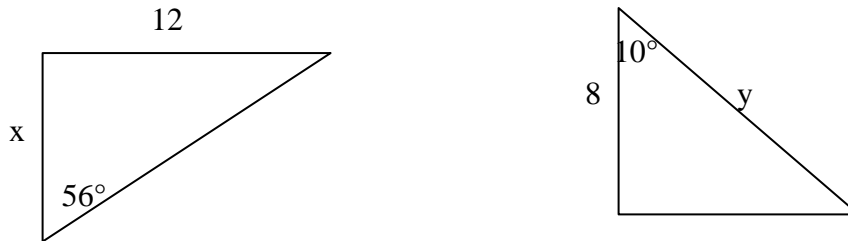


Task

Trigonometric Functions

How did right triangle trigonometry develop?

Begin lesson with organization. Give students a handout with several right triangles on it. The triangles should be in all different positions and have different information labeled on them. Each triangle will have two of the angles labeled—the right angle and one of the other acute angles. Each triangle will also have two of the sides labeled. One side will have a number measurement and the other will be labeled. One side will have a number measurement and the other will be labeled with a variable. See examples below:



Explain that each triangle has an unknown side length. **The task of finding that unknown is called “solving a right triangle”.** To do this, we first need to organize the given information. Review the terms: opposite, adjacent, and hypotenuse. Then go through an example with the first triangle on the handout. Show the students how they would organize the given information. For example, for the triangle on the left above, the given information would be 56° , adjacent = x , Opposite = 12. Ask the students to organize the given information for each triangle on the handout by making a list next to each triangle. Assign the student to their cooperative groups and have them compare their answers. Walk around the room and answer any questions.

Ask groups to look for similarities among the lists of given information and group similar triangles together. Then ask each group to share how many different groups they created and what the criteria for each group were.

- Students should develop three different groups: triangles with the opposite and hypotenuse sides labeled, triangles with the adjacent and hypotenuse sides labeled, and triangles with the opposite and adjacent sides labeled. Explain that by grouping the triangles with similar characteristics, they actually classified the different right triangles. Stress the fact that classification will be a very important skill as they learn how to solve trigonometry problems.
- Ask the class to see if they can make any connection between being able to classify the different triangles and the three trig ratios previously discussed. Give groups a couple of minutes to discuss the question posed to them. Then discuss as a class.

- Students should eventually make the connection between the three groups of triangles and the three ratios: **sine, cosine, and tangent**. Refer to the mnemonic device: **SOH-CAH-TOA**. Students should see that each type of triangle fits with a different ratio.
- Show the students how these classifications and the given information can help them find the missing side length in each triangle. For example if you know that triangle has an acute angle of 56° , opposite = 12, and adjacent = x , then you are able to set up tangent ratio (TOA). Therefore, $\tan 56^\circ = O/A = 12/x$. Cross multiply to solve so $x \cdot \tan 56^\circ = 12$. Divide both sides by $\tan 56^\circ$ and you get $x = 8.09$ after punching in calculator. You can also show students how they can use a trig table to find the decimal approximation for $\tan 56^\circ$. Tell them that the Greek mathematician Hipparchus recorded the first table of sine and cosine values in the 2nd century BC.
- Have students solve the remaining triangles in their groups. Remind the students to show all of their calculations. Walk around and monitor each group's progress. Ask each group to put a different triangle on the board to check answers. Review the entire process by through a new example from start to finish. Assign p. 650 1-5 and p.647 6-8, 12-20, 22 and 25 for homework.