NAME _____   DATE _____

Cooperative Learning Activity

For use with pages 558–566

GOAL **To find the height of a difficult to measure object using trigonometric ratios**

Materials: protractor, measuring tape or meter stick, calculator or trigonometric tables, drinking straw, plumb line, tape

Exploring Trigonometric Ratios

Trigonometric ratios can be used to determine the height of objects. Foresters use an instrument called a clinometer to measure the angle of elevation from the ground to the top of a tree. With this information, along with the distance to the tree, it is possible to use trigonometric ratios to solve for the height of the tree. This same technique can be used to find the height of many objects.

Instructions

❶ Construct the clinometer. Tape the string end of the plumb line to the vertex point of the protractor. Attach the straw to the straight edge of the protractor using the tape. Hold the device in such a way that when the top of the object is sighted through the viewing tube (straw), the plumb line crosses the angle measurements on the protractor (point *C* in the diagram below) forming an acute angle (∠*AOC*). This angle is the complement of the angle of elevation (see diagram below).
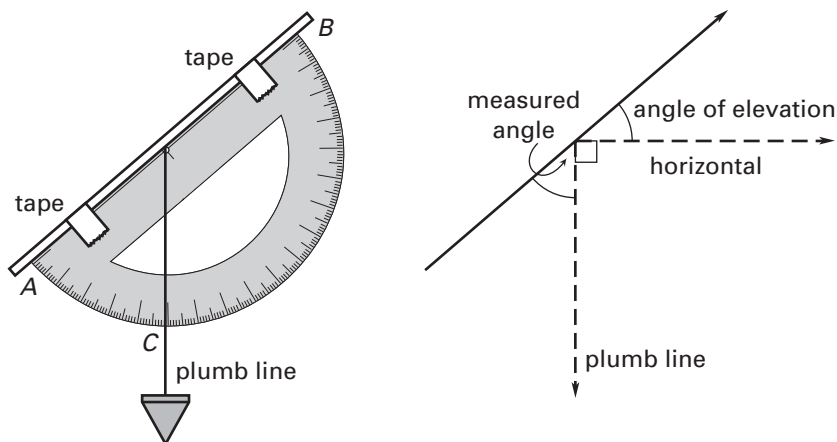
❷ Measure the eye height of the observer in the group.

❸ Locate the tall object that would be difficult to measure directly.

❹ Using the clinometer, measure the observer's viewing angle from the horizontal to the top of the object to be measured.

❺ Measure the distance to the base of the object.

Analyzing the Results

1. What is the height of the tall object?

2. Which trigonometric ratio was used to solve for the height?

3. Why is it impossible for the angle of elevation to be 90°?