

Name:

Date:

Sec. 2.3 - Measuring an Inaccessible Height

Tree farmers use a *clinometer* to measure the angle between a horizontal line and the line of sight to the top of a tree. They measure the distance to the base of the tree. How can they then use the tangent ratio to calculate the height of the tree?

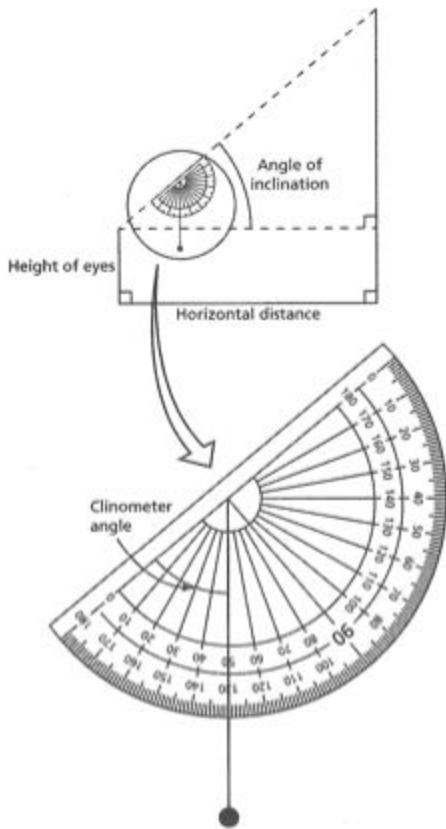
Part A - Make a drinking straw clinometer:

- 1) Glue or tape the paper protractor to the cardboard. Carefully cut it out.
- 2) Use the needle to pull the thread through the cardboard at the center of baseline of the protractor. Secure the thread to the back of the cardboard with tape. Attach the weight to the other end of the thread.
- 3) Tape the drinking straw along the baseline of the protractor for use as a sighting tube.

Part B - Taking measurements:

- 4) With your partner, choose a tall object whose height you cannot measure directly; for example, a flagpole, a totem pole, a tree, or a building.
- 5) One of you stands near the object on level ground. Your partner measures and records your distance from the object.
- 6) Hold the clinometer as shown, with the weight hanging down.
- 7) Look at the top of the object through the straw. Your partner records the acute angle indicated by the thread on the protractor.
- 8) Your partner measures and records how far your eye is above the ground.
- 9) Sketch a diagram with a vertical line segment representing the object you want to measure. Label:
 - your distance from the object
 - the vertical distance from the ground to your eyes
 - the angle of inclination of the straw
- 10) Change places with your partner. Repeat Steps B to G.
- 11) Use your measurements and the tangent ratio to calculate the height of the object.
- 12) Compare your results with those of your partner. Does the height of your eye affect the measurements? The final result? Explain.

Data Collection:



Object: _____

Horizontal distance: _____

Height of eyes: _____

Clinometer angle: _____

Angle of inclination: _____

Large Protractor:

