

## Large Outside Angular Measurement

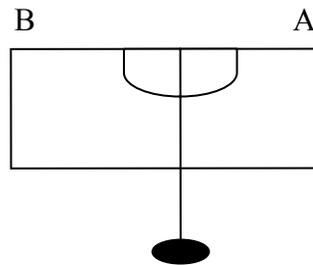
Students of all ages enjoy going outside and doing Mathematics, and one of the activities that they enjoy the most is “Large Outside Angular Measurement”. This can be done with a simple device called a [Clinometer](#) which is used by companies for surveying or navigation. Such enterprises as Public Road Construction use it to measure slope and inclines, Building Construction uses it to measure for landscaping, all sorts of Navigation in the air and sea uses it to measure angles to the sun and stars for determination of a specific location.

An Clinometer can be simply constructed using a protractor and connecting it to a rectangular piece of poster board or masonite. The protractor is attached in an upside down orientation and a piece of string with a weight at one end is attached at the center point of the protractor.

When a student sights along the edge of the attached rectangle at a point above the ground such as the top of a pole, tree, or building then the weight on the string causes it to stay in a perpendicular orientation with the ground and an angle can be measured equal an angular rotation of the Clinometer. Using this angle and a simple proportion along with a basic table of Trigonometric values, students can easily determination the height of a measured object.

Even though this is a simple device to use it allows students to complete real-life activities and really get an idea of how surveying and navigation devices work in the world of work.

A simple Clinometer looks like this picture:



A student would sight a A and point B.

The rectangle would rotate but the string with the weight would remain perpendicular to the ground yielding an angle equal to the rotated rectangle called an angle of elevation.

A typical outside situation or problem would be for students in a team to determine the height of a tree, telephone pole, or building. If it is a school building and some how before the activity has begun and it can be done safely with permission a tape measure can easily be dropped from the roof of the school building and the exact measure of the height can be measured to compare with the student calculations done with a Clinometer and proportion.

