Measurement and Geometry - Units of Measurement

Aims:

• Solve problems involving the comparison of lengths and areas using appropriate units;

• Investigate, with and without digital technologies, angles on a straight line, angles at a point and vertically opposite angles. Use results to find unknown angles.

Resources:

• Sticks

• Clipboards, paper and pencils (1 per group)

• A protractor with a small hole on the centre spot (1 per group)

• Poster board or card board (can be from a box) to back the protractor

• String

• Weights (paper clips or small pieces of clay)

• Glue and Scissors

• A drinking straw

• Clear tape

• Helium balloon

Introduction: (15 mins)

Ask children in groups of 4 or 5 to create an isosceles right-angled triangle out of sticks. Discuss the shape's properties (one right angle, two other angles always 45 degrees and 2 equal sides).

Ask the children how they could use this knowledge to measure the height of a tree.

Main Activity: (30 mins)

Explain to the class that they will be trialling two methods to discover the height of a large tree (encourage children to choose a tree with a clear space surrounding it).

In groups of 4 or 5, the children must first choose a tree and record their estimate of its height.

Next, explain to the class that we will be using their knowledge of the geometry of an isosceles right-angled triangle and using a clinometer to measure the height of their tree.

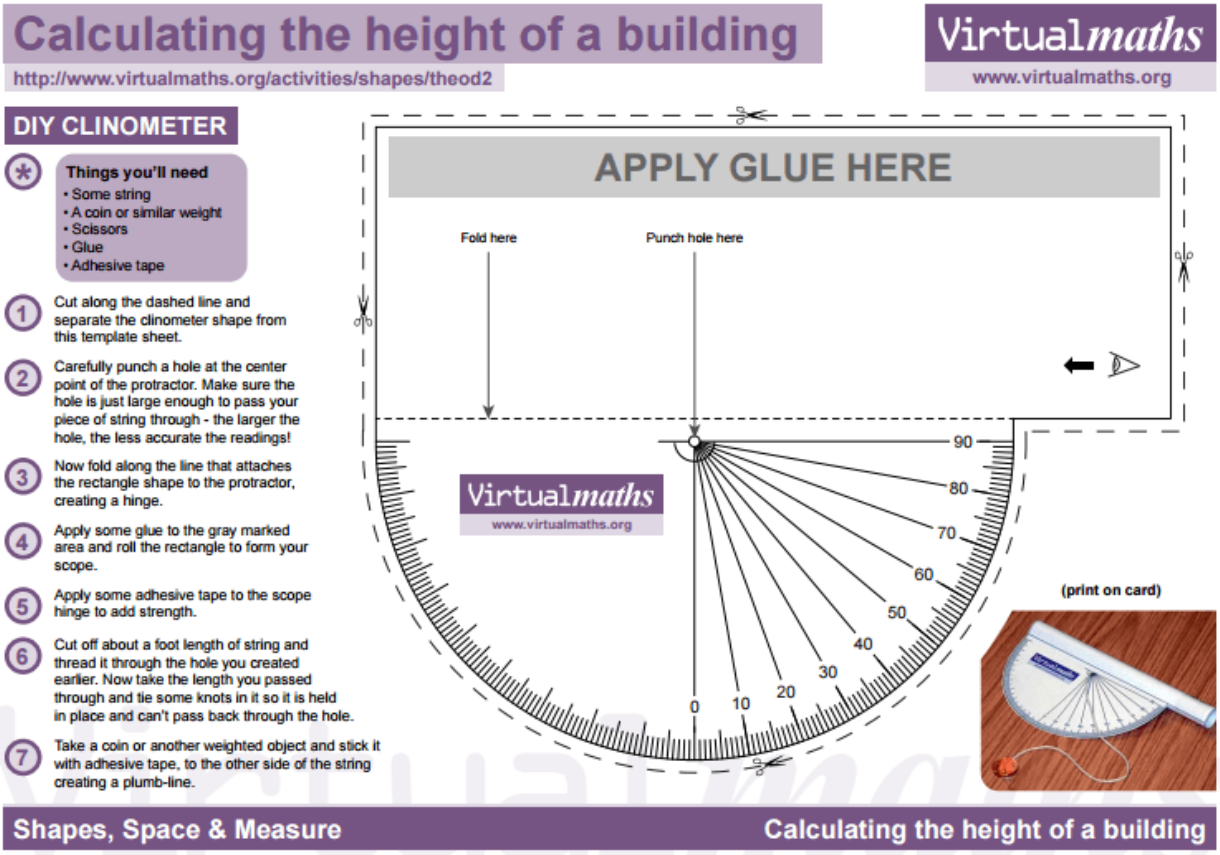
Hand out the resources and some simple instructions (over page) to each group to make their own clinometer.

Allow children the time and space to discover how to follow the simple instructions and record the height of their trees.

Once the groups have made and used their clinometer, ask them to trial using a helium balloon, tape and a tape measure to measure the height of their tree. Encourage children to think for themselves about how they can use these resources to accurately measure their tree's height.

Discussion: (5 mins)

Ask the class to compare their tree height estimates under method 1 and then with the recorded heights of method 2. Ask the children: Are they similar? Which method do they think is the most accurate? Why?



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https://web.archive.org/web/20151027195844/http://www.virtualmaths.org/activities/topic_shapes/theod2/resources/height-of-building.pdf

One for each group of 4 or 5 students

How to make a Clinometer:

A clinometer is a tool that is used to measure the angle of elevation, or angle from the ground, in a right - angled triangle. You can use a clinometer to measure the height of tall things that you can't possibly reach to the top of, flag poles, buildings, trees. Follow the directions below to create your own clinometer.

Directions:

• If you are making a protractor, cut out the copy of the protractor.
• Get the piece of poster board or an empty box. Stick the paper protractor on top of the card and cut the joined pieces.
• Get the straw and tape it to the straight edge of your protractor that you made above.
• With your pen or pencil, poke a hole through the center of the protractor where it meets the straw. Push the string through the hole and tie a large knot on the other side so it won't pull through.
• Tie your weight to the other end of the string.

To use the clinometer:

The diagram shows what the assembled clinometer will look like when laying an a flat surface. When using it, the straw will be on the top.
You will need two people: one to look through the straw and site the top of an object and one to read the degrees that the string makes with the protractor.

• Find a tall tree (or building, flag pole etc.) in a place where there is plenty of space to move away from the object that you are measuring.
• Look through the staw and find the top of the tree.
• Ask your friend to read the angle being recorded on the clinometer. This is read where the string or cotton is touching the protractor.
• Keep moving back (or forward if you've gone too far) until you have the clinometer angle measuring 45 degrees. With a 45 degree angle your job will be much easier as the distance from you to the tree will be equal to the distance from the ground to the top of the tree.
• Measure the distance between where you are standing and the base of the tree.
• Measure the distance from your eyes to the ground (this is where your partner is indispensible!)
• Add these two distances together - because to be most accurate the triangle has to finish at your feet not your eyes.
• You now have a very close approximation of the height of the tree, building or other tall structure. You, the base of the tree and the top of the tree, form an isosceles triangle meaning the distance from you to the base of the tree is equal to the height of the tree (from the viewer's eyes to the top).