

# Tree Measuring 3

These activities are aimed at the third and fourth level of Curriculum for Excellence (about 11 to 16 years old). They involve children developing a simple tool for measuring tree height, using angles and simple formulae. In looking at tree spread and crown measuring, children will use a compass (to mark north, south, east and west) and calculate averages. Discussions on the accuracy of their measurements and how they might be used, can take place. The information gathered can also be used to consider real-life situations, like developing a tree planting scheme.

## CURRICULUM LINKS

### Mathematics

- Number, money and measure
  - *Estimation and rounding*
  - *Number and number processes*
  - *Measurement*
- Shape, position and movement
  - *Angle, symmetry and transformation*
- Information handling
  - *Data and analysis*

### Languages

- Literacy and English
  - *Listening and talking*

### Health and wellbeing

- Physical education, physical activity and sport
  - *Physical activity and health*



## TREE HEIGHT

### Making and using a Clinometer

A clinometer relies on maths rules to calculate the height of a tree. It is useful to discuss with the children how the care taken in marking and cutting the clinometer, will affect the accuracy of the results.

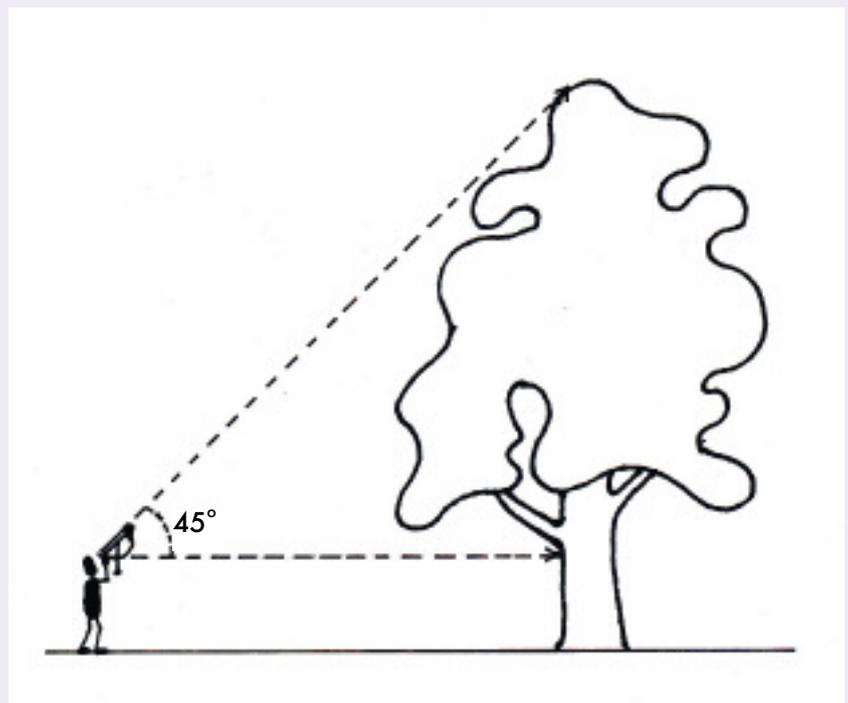
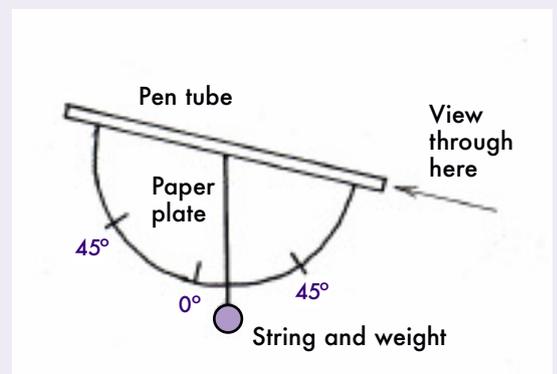
To make the clinometer cut a plate in half and exactly half way along this cut edge stick a piece of string with a weight on the end, so that it dangles beyond the edge of the plate.

Find the middle of the plate's curved edge (marked  $0^\circ$  in the picture). A position exactly half way between  $0^\circ$  and the cut edge of the plate is  $45^\circ$ . For accuracy, use a protractor to mark  $45^\circ$ . (Place the protractor's straight edge along the plate's cut edge, with its centre exactly half way along.) Glue a straw or an empty pen tube along the cut edge.

Work in pairs. One partner looks through the straw so that the treetop is visible. Then walk backwards, away from the tree, keeping the top in the sights. The other person follows and notes when the weighted string lines up with the  $45^\circ$  line. Stop when this happens and measure your distance from the tree.

This distance is equal to the height of the tree minus your height. So find out how tall you are, add this to the distance from the tree and you have an accurate measurement of the tree height. (For example – if the distance from the tree is 4 metres and the child with the clinometer is 1 metre tall, the height of the tree is  $4\text{m} + 1\text{m} = 5\text{m}$ .)

**You will need:** a paper plate, a straw (or empty pen tube), some string, a weight (like plasticine), glue or sticky tape, scissors and a measuring tape. (Optional – protractor).



## TREE SPREAD AND CROWN MEASURING

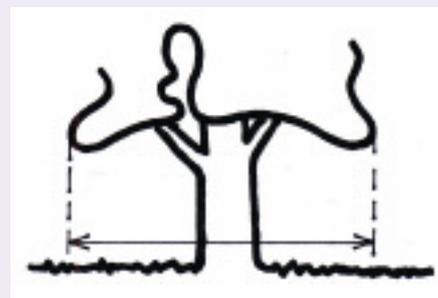
How far do your trees spread? Did you know that the spread of the branches gives a good indication of how far the roots spread underground.

**You will need:** a compass, chalk and a measuring tape.

To look at **tree spread**, each child uses a compass to chalk mark north, south east and west on the trunk of a tree. Then walk in the four directions in turn, counting the paces until they reach the end of the branch tips each time. Note the distance paced. Discuss if the tree spreads evenly in all directions? (Is it symmetrical?) If not, discuss the possible reasons? For example the growth of the branches may favour the sunnier/ less windy/ more open side etc.

The **crown spread** of a tree is the distance its branches spread away from its trunk.

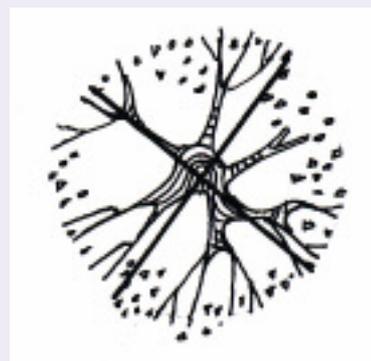
To calculate the crown spread, work in threes. Find the branch that sticks out the farthest from the tree trunk. One person stands directly under the tip of the branch. Another person goes to the opposite side of the tree, and finds the branch that sticks out the farthest on that side and stands under its tip.



While they are both facing the tree, have each person take one or two steps to the side of the trunk so that the distance can be measured between them without having the tree trunk in the way. (If one person steps to their right, and the other to their left they should both be on the same side of the tree.) The third person measures the distance between them. Repeat this, looking this time for the shortest branches. To get the average crown spread, the two distances are added together and divided by two.

Sometimes the second measurement is taken at 90° from the first measurement.

The spread and eventual height of trees is important to consider when planning what to plant in your school grounds. Books on planting trees or nursery suppliers will provide this information. Is there room or need for a wide spreading tree to provide shade and shelter, or do you need to allow sunlight to reach other plants? How far apart should you plant your trees so they don't crowd each other when fully grown? If a tree reaches its full height or falls down, would it damage overhead cables? Remember, some trees can be pruned or coppiced to restrict their growth, or contained as a hedge.



**Tree Measuring - 1** and **Tree Measuring - 2** are also available for lower levels of Curriculum for Excellence. The **DIY tree measurement kit** outlines more advanced tree measuring techniques. These are all available on the Outdoor & Woodland Learning Scotland website.