Maths – Measuring the height of trees Stage 2 / Stage 3

Learning Intention	Maths Stage 2 & 3
How tall is a tree? How can it be measured?	**Problem Solving** MA2-2WM selects and uses appropriate mental or written strategies, or technology, to solve problems MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations. **Multiplication and Division** MA2-6NA uses mental and informal written strategies for multiplication and division MA3-6NA selects and applies appropriate strategies for multiplication and division, and applies the order of operations to calculations involving more than one operation

Lesson 1 – How to measure the height of trees

Content- How to find the height of a tree.

Tree height is an important ecological trait, as the competition for sunlight determines which trees flourish, and which trees become suppressed and eventually die out. It also influences how much shade is along our creeks and rivers, changes in understory vegetation over time and habitat for wildlife. As such, it is an important part of many natural resource data collections.

Here are some examples of where height measurements are used:

- How tall trees are helps us understand what forest type we are in. Tree height can help us understand, forest structure, and condition for a variety of forest management uses, ranging from wildlife habitat to timber production.
- Riparian*/creek surveys. Height of the trees is measured along creeks to predict the amount of shade a creek will receive throughout the day and year.
- Nesting sites. Some birds and cavity nesters prefer to nest and/or feed at particular heights in the forest canopy. Assessing tree and snag heights can help determine nesting suitability of trees.

There are a variety of methods to do this using the skill processes of **estimating, measuring** and **calculating**.

*Riparian – Land close to waterways

Activities

1A- Estimate the height of a tree in your garden or street based on your knowledge of how high structures are near it. E.g. power poles, double story houses, etc.

1B- Measure a tree with Trigonometry and suppleness.

2A –make a clinometer to measure the height of the tree.

2B –Calculate the tree height with your homemade clinometer

How to find the height of a tree.

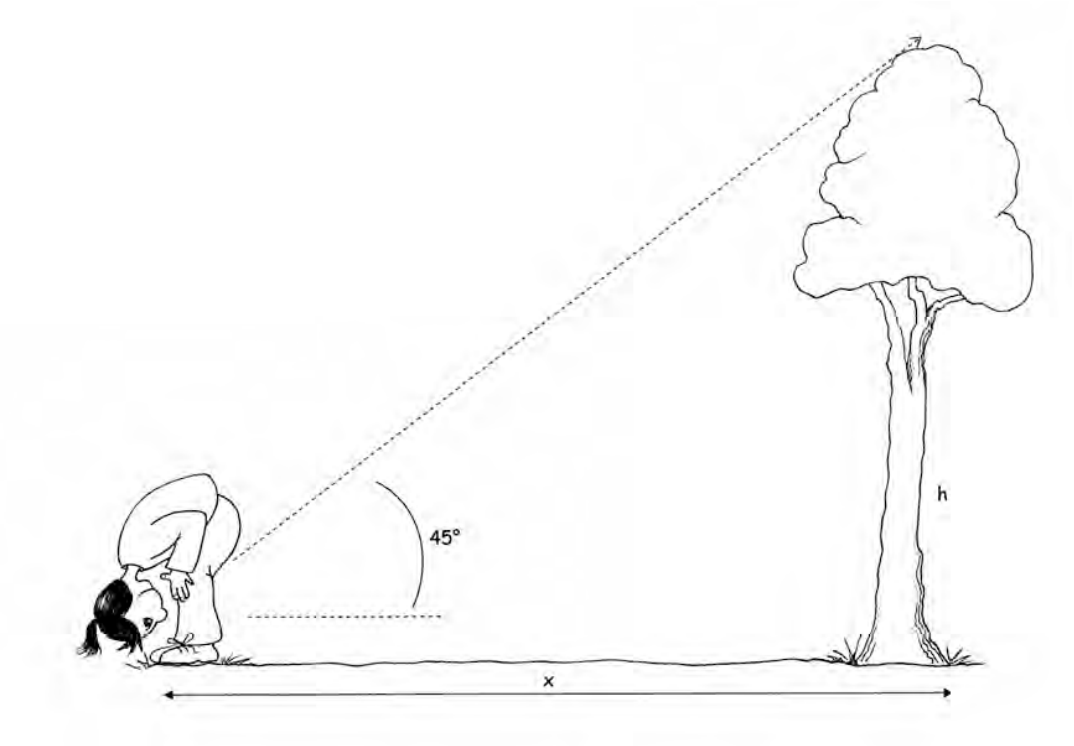
1A- Estimate

The simplest way is by **estimating** the height just by looking at the tree from a distance or comparing it with surrounding structures whose height is known. You can do this initially and it will indicate how aware they are of scale of the size of objects.
Once estimated you can check your results by using the increasingly sophisticated methods here to improve your **accuracy**.

1B-This relies on trigonometry (and suppleness!) and the fact that if you view a tree top at a 45 degree angle then the height of the tree is equivalent to the distance that you are from that tree.

Walk away from the tree but at regular intervals bend forward and look through your legs back to the tree. Stop when you are at a point where you can just see the top of the tree and measure the distance along the ground from the tree to you. This is roughly equal to the tree's height.

(If you choose to stand upright then you need to add your height onto the calculation)



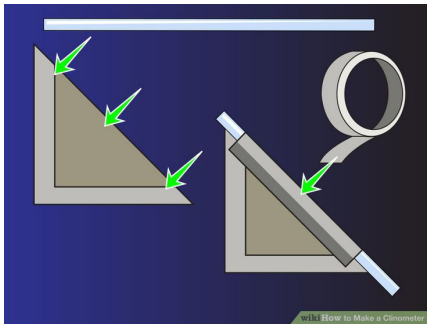
If you have a square and fold it in half diagonally, the triangle you get has two angles of 45^0

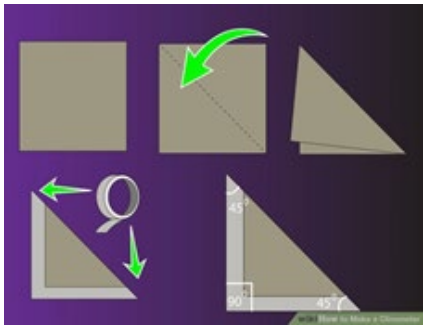
2A Measure the height of a tree using a homemade clinometer.

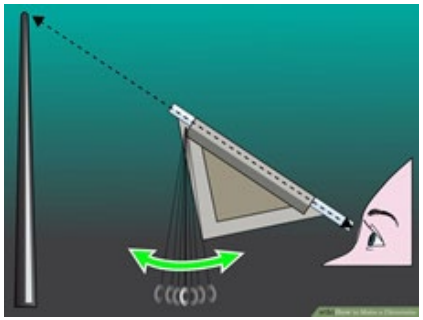
Part 1. Make your own clinometer!

1. Take a square piece of paper and fold it in half along the diagonal.
2. Tape a straw along the longest side. You will look through the straw later.
3. Take a piece of string about 10 cm long and tie a small rock or twig to it.
4. Tape this piece of string to one of the pointy ends of the triangular piece of paper so that the rock or twig hangs down.

Congratulations! You have are now ready to measure your tree height!

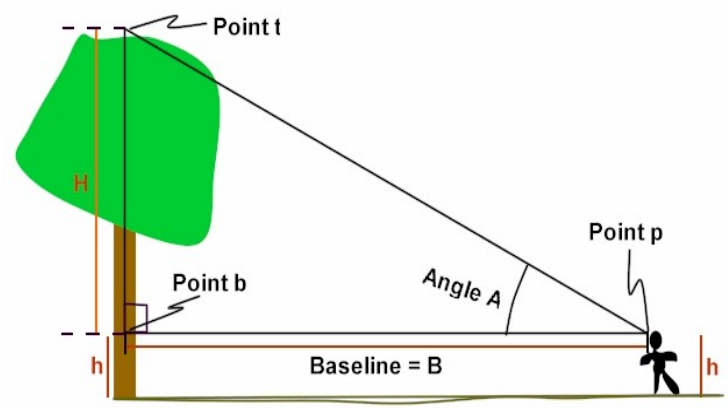






2B- Measure the height.

1. Walk away from the tree and then look through the straw at the top of the tree.
2. Check to see if the string hangs down in line with the straight edge of the triangle.
3. When you are far enough from the tree so that the string hangs down in line with the edge, mark the spot on the ground.
4. Measure the distance from your spot to the base of the tree in metres.
5. Measure your height in metres.
6. Distance to tree+ your height = height of tree!



In the diagram above, (courtesy of Offwell Woodland & Wildlife Trust at www.countrysideinfo.co.uk), if angle A = 45° then H=B.

So to find the tree height, (H+h) you must add B+h.

Tree height = B + h

B= distance to the tree

h= your height

H= the height of the tree less your height.

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Distance to tree in m. (B)	Your height in metres (h)	Height of tree (B + h)