KS3 Mathematics
Geometry
Trigonome*tree*!

NAME: _____

108033

ON-SITE ACTIVITY

Trigonome*tree*!
Estimating the height of a tree

▶ WORK IN PAIRS

▶ Choose a tree near to the Goodleaf climbing tree

▶ Today you are going to use three different methods to estimate the height of a tree!

First of all, you must choose your tree!

is most level. Every few paces you should stop, and look backwards through your legs towards your tree.

Carry on until you are at a point where you can just see the top of the tree and have your partner measure the distance you walked. This is approximately the same as the tree's height!

Now your partner can try. Take the average and record your findings.

45°
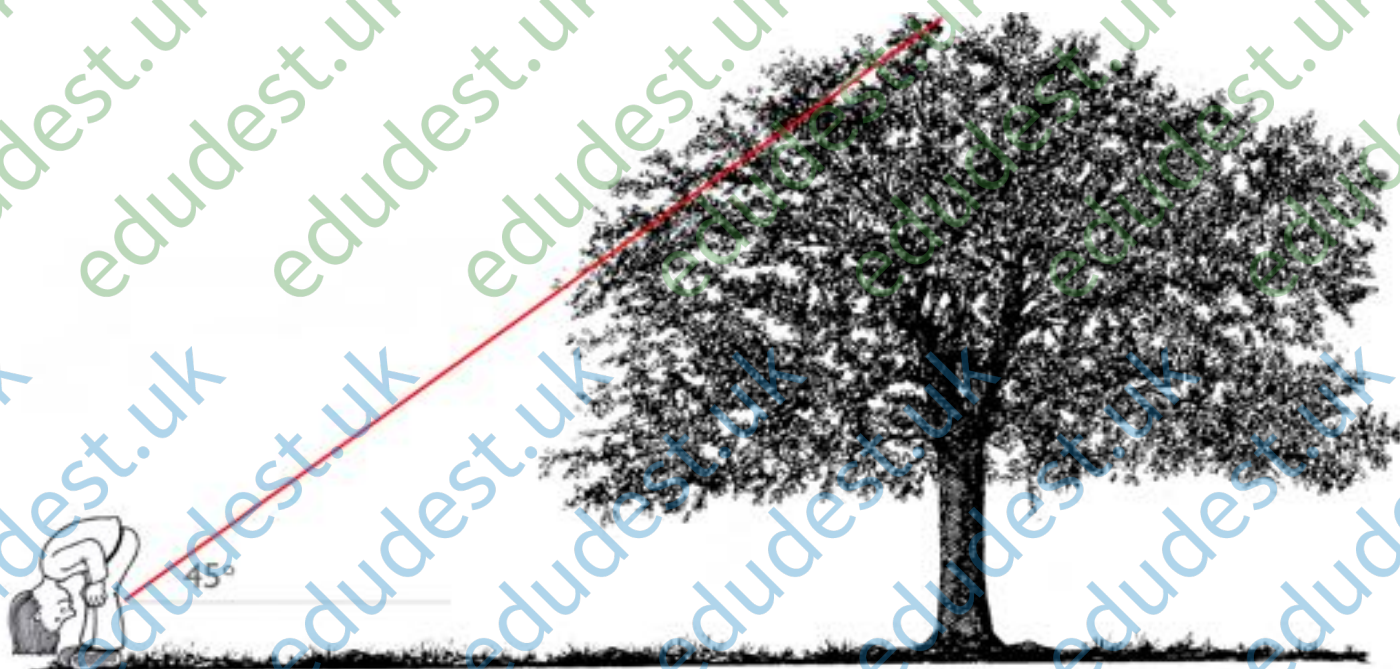
Can you explain why this works?

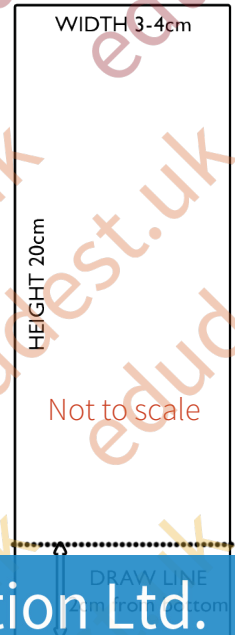What are the drawbacks with this method?

METHOD 2

The "Stick Trick"

The "Stick Trick" is used routinely by lumberjacks to estimate the landing position of trees they are about to fell.

Today we're going to use a slightly modified version of the "Stick Trick" which should be more accurate for first-timers.

First you will need to prepare a card to help with your measurements. You may already have done this in school, but if not, you will need 4 things: a piece of A4 card, a ruler, scissors, and a pen or pencil.

WIDTH 3-4cm

HEIGHT 20cm

Not to scale

DRAW LINE 2cm from bottom

✓ Cut a strip of card exactly **20cm tall** and a few cm wide. Measure **2cm from the bottom** and draw a horizontal line across the width of the card. You're now ready to estimate the tree height using your new "Ratio Stick"!

✓ Ask your partner to stand by the tree.

✓ Walk away from the tree holding the ratio stick at arm's length, covering the top of the tree **AND** the bottom is in line with the ground at the foot of the tree.

✓ Your partner should now slowly move their hand up or down the tree trunk until it is level with. They must keep very still whilst you return to the tree!

✓ Measure the distance from your partner's hand to the ground.

✓ Multiply this measurement by 10 to estimate the height of the tree!

✓ Swap places and do the experiment again to see if you both get the same answer! Record your average.
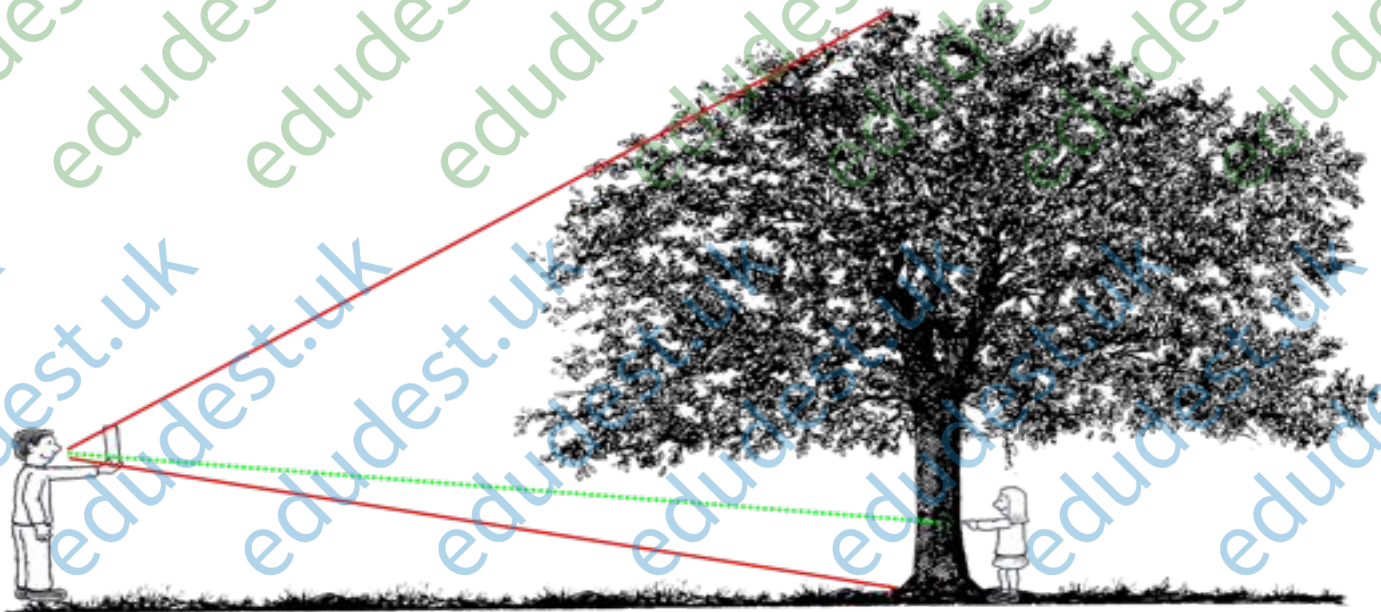
Can you explain why this calculation works?

Do you think this method is more accurate than the first, and if so, why?

METHOD 3
Inclinometer

For this method, you will need: a protractor template, a 30cm piece of thin cord, a weight, a drinking straw and some sticky tape. You may have already made this in class, but if not, follow the instructions below:
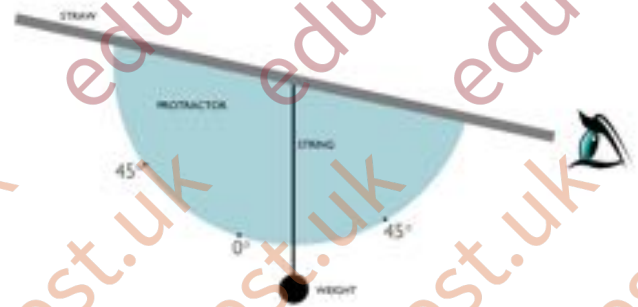
1. Cut out the protractor template and tie the cord through the hole marked
2. Tie the weight to the other end of the string
3. Stick a drinking straw along the straight edge of the protractor. You have now made an *inclinometer!*

To measure:

- Holding the inclinometer with the curved edge downwards, look through the straw to the top of the tree.
- Walk **slowly** backwards from the tree keeping the top in your sights - your partner can guide you safely! Watch the angle of the string against the protractor.
- When the angle of the string reaches 45 degrees, stop walking.
- Measure the distance back to the tree from where you are standing.
- **Add your own height** and you now have the height of the tree!
- Repeat the experiment, swapping places with your partner, and record your average measurement.
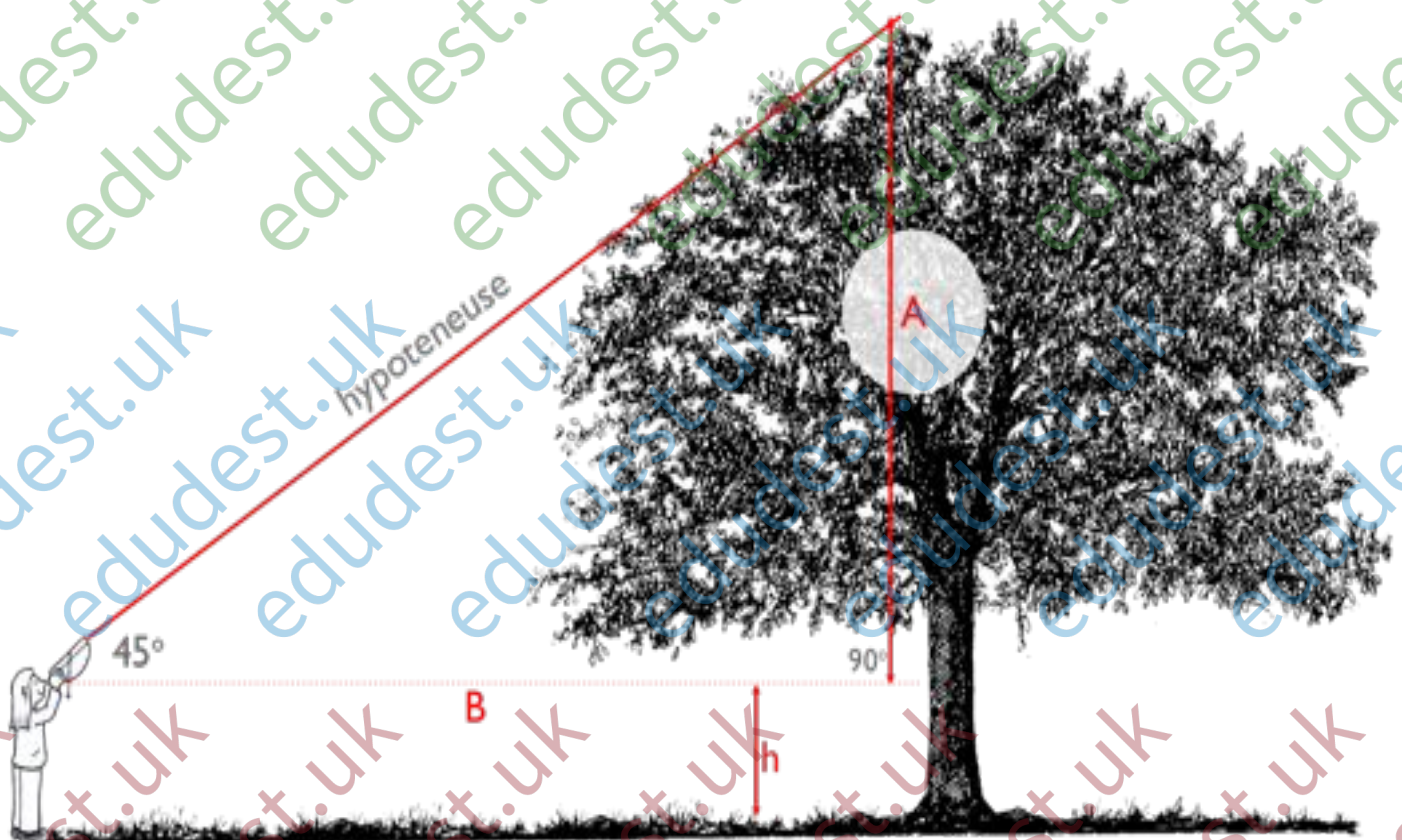
When the angle is 45 degrees, A = B. The height of the tree overall is A + h (your height).

YOUR RESULTS

Method	Tree Height Estimate (metres)
Method One - Simple Trignometry	
Method Two - The "Stick Trick"	
Method Three - Inclinometer	

Is there much variation in the results? If so, explain why this might be.

If you still have time, why not practise your new-found skills on a different tree?
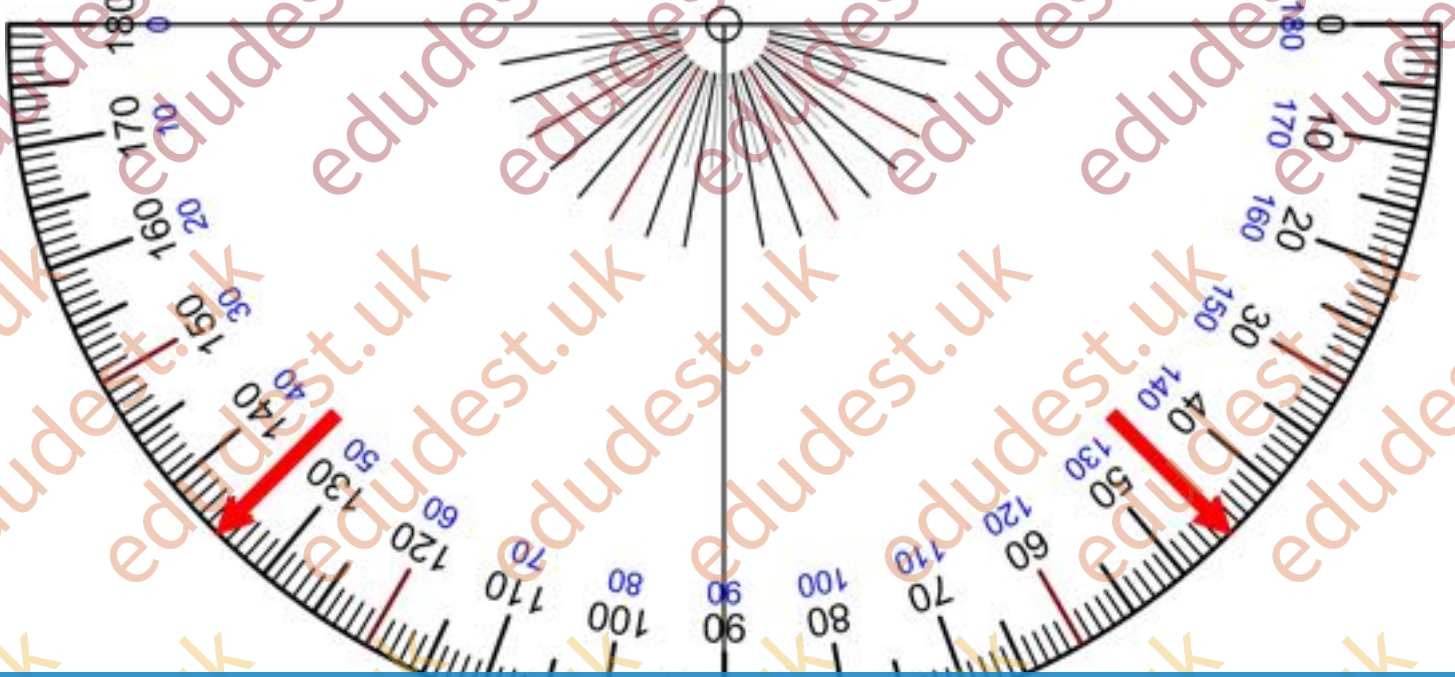
Cut it out or leave it square - it doesn't affect the test or result.

Half way along the straight edge, carefully punch a hole as marked for the cord.