MATHS learning springboards

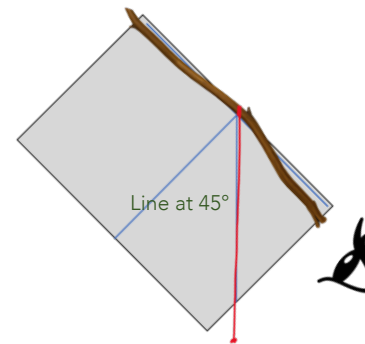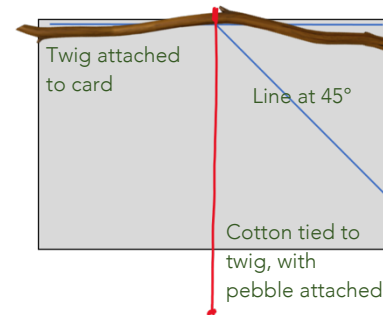## Twig clinometer

Measure the height of trees

Aim: Make clinometers and use a 45° right angled triangle to measure the height of trees in the school grounds.

A clinometer is used to measure the angle of elevation, or angle from the ground in a right-angle triangle. In this activity pupils work in pairs to make a clinometer and use it to measure the heights of trees.
Use this in association with other Learning Springboards such as *Maths: How old are your trees?* and *Maths: Does the tallest tree have the largest leaves?*
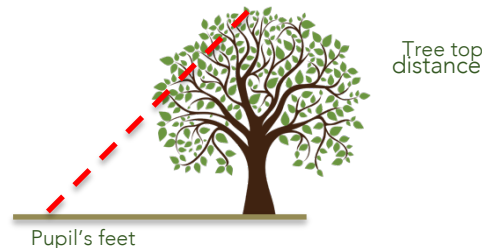
To make the clinometer:
- Find a straight twig and trim it to 20cm long. Mark the centre of it.
- Tie the cotton to the centre of the twig, leaving 20cm dangling.
- Glue or tape the twig to the long side of the A5 card, so the cotton hangs down in front of the card – this is now the 'plumbline'.
- Tie a weight (small pebble) to the end of the cotton or use a lump of Blutak.
- Use the protractor to mark 90° and 45° - as shown in the diagram.

To use the clinometer:
- Find a tall tree in a space where you can move as far away from the tree you are measuring as the height you estimate it might be.
- Pupil 1 looks ALONG the twig to find the top of the tree. It is very important to look along the stick – why?
- Pupil 2 looks at the angle made by the plumbline and asks Pupil 1 to move forwards or backwards until the plumbline indicates 45 degrees. Pupil 2 stands at this spot.
- Both pupils estimate the distance from this spot to the base of the tree.
- Pupil one measures the distance to the tree in metres, choosing an appropriate piece of equipment - trundle wheel, 30m tape, metre sticks etc.
- Why is this distance approximately equal the height of the tree?
- How can this calculation be made more accurate? Hint – allowance for the between Pupil 1's eyes and ground; incline of the ground.

Twig attached to card

Line at 45°

Cotton tied to twig, with pebble attached

Line at 45°

Tree top distance

Pupil's feet

Resources:
- Each pair needs:
- A straight twig, approx. 20cm long
- A5 sheet of cardboard
- 25 cm length of cotton
- Strong glue or tape
- Sticky-tak or a small pebble
- Protractor
- Trundle wheel, 30m tape or metre sticks.

Key vocabulary:
Clinometer, angles, isosceles, right angle

Success criteria:
- ✓ Students understand and apply the 45° right angle triangle principle.

More springboards:
- Learning Springboards - Maths: How old are your trees?
- Learning Springboards - Maths: Does the tallest tree have the largest leaves?