DESIGN AND MAKE A CLINOMETER AND MEASURE THE HEIGHT OF A TREE

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Strands/Strand Units

Living Things: Plants and Animals

Environmental Awareness and Care: Environmental Awareness, Science and the Environment
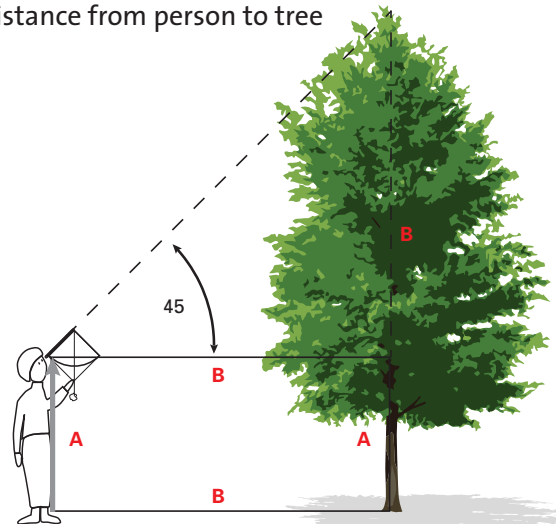
Learning Objective

Observing and recording in the natural environment

(SESE: Science, Teacher Guidelines, Exemplar 12, p. 64): "Children should be encouraged to observe and record features of the environment that they are investigating. .. The children should measure the size of the habitat, using standard or non-standard units".

APPROXIMATE HEIGHT OF TREE = A + B

A = distance from ground to eye
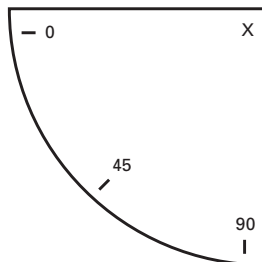
B = distance from person to tree

Equipment

Template, card, straw, string, sellotape, plasticine).
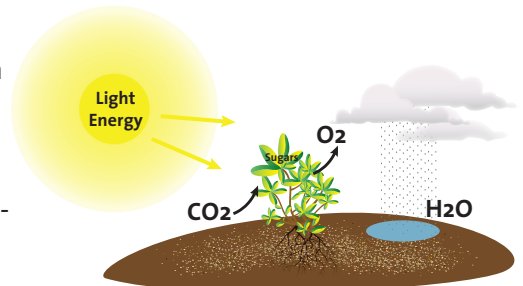
Suggested Class Level

5th/6th

Preparation

Photocopy the clinometer template at the end of the activity sheet.

A previous lesson on the importance of trees - habitats for animals and birds, and photosynthesis - would be helpful.

Background information

A Clinometer is a useful piece of equipment for measuring angles and calculating approximate heights. It is used frequently in forestry, engineering and astronomy.

It is also called an Astrolabe on account of being used in astronomy. It was invented over 1,000 years ago and was an important piece of equipment for early navigators.

You can use it here to estimate the height of a tree (assuming the tree is vertical!).

(Activity adapted from 'The TTS Make and Take Book 2')

Trees are one of the longest-living of all plants. They are very important because they absorb carbon dioxide from the air and produce oxygen for us to breathe (photosynthesis). They also become the habitat and source of food for many animals when they are grown, and are a safe habitat for many birds.

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Trigger questions

Why are trees important? (Oxygen-producers, habitats, etc.)

Pick the tree whose height you want to measure. Make sure you can measure the distance from you to its base.

What is the name of the tree? Does it lose its leaves in winter? etc.

Can you guess the height of the tree?

Do you know your own height?

How many times taller than you do you think the tree is?

Now can you estimate the height of the tree? (Multiply this number by your own height).

Skills

Designing and Making, Estimating and Measuring.
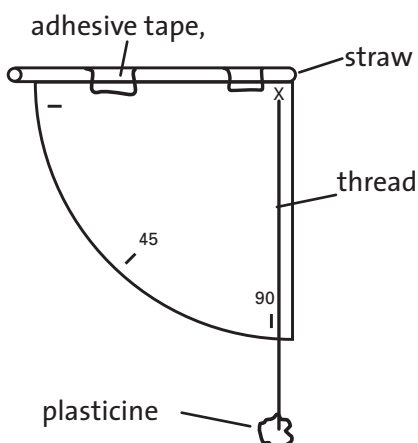
Cross-curricular links

MATHS: Number, Operations (estimate, add, multiply)
Shape and Space: 2-D Shapes (triangles – isosceles)
Lines and Angles (acute, protractor)
Measures: Length (choosing instrument)

HISTORY: Use of clinometers by early navigators to measure the elevation of the sun and stars, thus helping them to determine their location at sea.
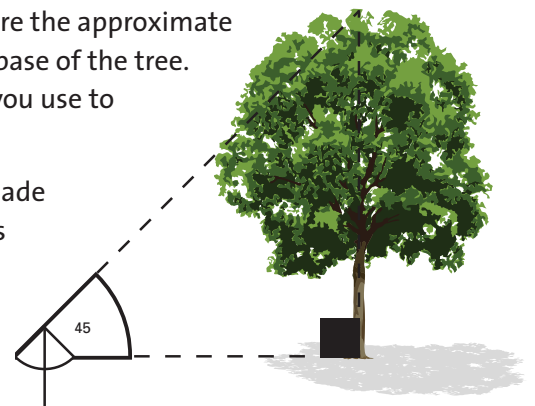
Activity, with Maths

1. **Making the clinometer**
   Stick the clinometer pattern onto card and cut it out. Tape a straw (cut to the same length) along the top edge. Attach some plasticine to a piece of string and hang it onto point X so that it hangs freely.
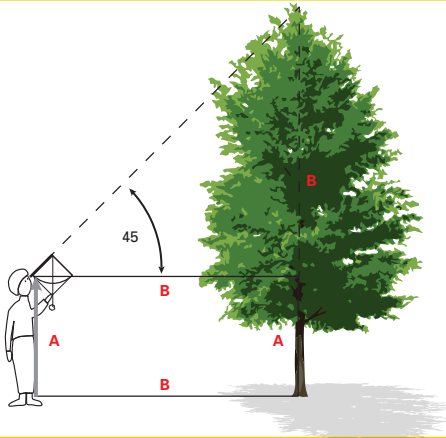

   adhesive tape, straw

   thread

   45

   90

   plasticine

2. **Using the clinometer**

   • Face the tree whose height you want to measure.

   • Looking through the straw at the end away from the string, adjust the angle of the card until the string hangs at 45°.

   • Now walk towards or away from the tree until you see the top of the tree through the straw. (This is easier to do with two people - one looking through the straw while the other keeps an eye on the string.)

   • Estimate and then measure the approximate distance from you to the base of the tree. What instrument would you use to measure the distance?

   • What sort of triangle is made in this diagram? (Isosceles triangle)

   45

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- Can you now estimate the height of the tree?
  (It will be approximately the same as the distance from you to the base of the tree, because you have an isosceles triangle).

- If you want to get a more accurate height for the tree, what do you think you have to add in? (Your own height).

  HEIGHT OF TREE = A + B

Safety

Do not look directly at the sun through the clinometer, it would damage your eyes.

Follow-up activity

Children can use this method to measure the height of a building or any other tall vertical object.

Did You Know?

Captain Jack Sparrow used a clinometer in the movie 'Pirates of the Caribbean'.

You can download a Clinometer app which can tell sailors the exact angle at which their boat is tilting.

CLINOMETER TEMPLATE

Attach a straw along this edge

— 0

X

45

90