Outdoor Learning Maths Investigations KS2 Guidance

These notes provided guidance for the seven outdoor maths investigations. The purpose of these investigations is to allow children to develop their own methods of planning, implementing and evaluating maths investigations. They should therefore be encouraged to work as a group when investigating by agreeing on their choice of equipment and methods of recording, ensuring that they can prove whether the statement is true or false. It is suggested that those children who need more help could be prompted by the ideas in this guidance pack.

Investigation 1: Tree Measuring
Investigation 2: Tallest Trees, Largest Leaves
Investigation 3: Blades of Grass
Investigation 4: Sticky Problem
Investigation 5: Minibeast Bar Graph
Investigation 6: Angles, Angles Everywhere
Investigation 7: Tree Trunk Trouble

Investigation 1

"I can measure the height of a tree by standing at the base of the tree and then walking away from it until I can see the tree when I look up through my legs!"

Explain to the children how to do the 'Through the Legs' tree measuring method.

1. Stand at the base of a tree and walk away from the tree in a straight line.

2. Stop and look through your legs back up at the tree. Can you see the top of the tree? If not, keep walking away and try again.

3. When you can see the top of the tree as you look through your legs, stop.

4. Measure the distance you have walked. This is the height of the tree.

Prove it!

What will you use to measure the distance you are from the tree?

- Children should learn that metre sticks and measuring tapes are sensible for measuring this distance.

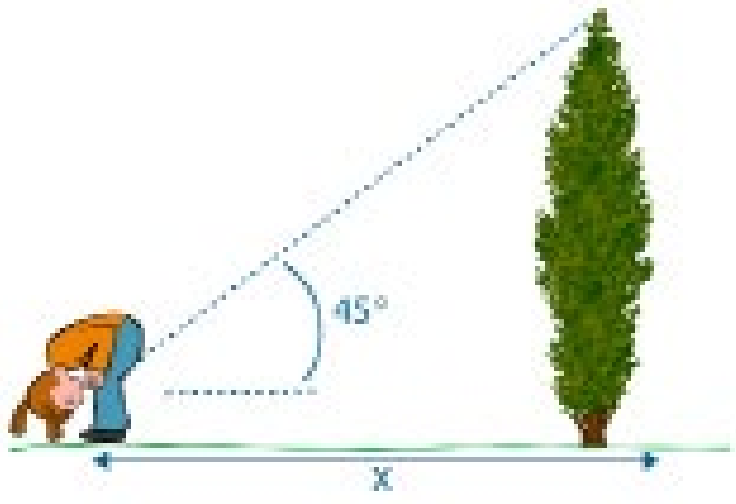
How will you know you are accurate?

- Children should learn that they could check this method using estimation (e.g. approximately how many metre sticks would it take to reach the top?), or they could research other methods of measuring tree height, for example, the 'Thumb Method', to further test this statement.

How will you know if this works for all trees?

- Children should learn that after estimating and using the 'Through the Legs Method' with their first tree, they should test this out on at least two other trees to ensure their findings are accurate.

Throughout this, children will choose to record in their own way. A table with the tree name and its measurements in corresponding columns, illustrations of the tree etc. should be encouraged as it shows a child's learning process, however there is no 'right way' to record.



Investigation 2

“The tallest trees have the largest leaves.”

Prove it!

How will you measure the height of the tree?

- Children can use the ‘Through the Leg Method’ in Investigation 1, or the ‘Thumb Method’ if they have researched it as part of Investigation 1.

- Children should learn that metre sticks or measuring tape are sensible for measuring the height of trees. They can use rulers to measure leaves.

How will you decide the size of the leaf?

- Children may decide that the height of the leaf dictates its size or that the width does. This is their choice, so long as they keep this consistent.

- Children should learn that after measuring their tree and leaf, they must compare this to other trees and their leaves. They must begin then to compare them. They may choose to put the trees in height order in their recordings to do this.

- If they find that a tree 3m tall has a leaf of 5cm wide, a tree 6m tall has a leaf of 10cm wide and a tree 9m tall has a leaf 15cm wide, then they may conclude that the statement is true.

How will you record your investigation?

- Throughout this, children will choose to record in their own way. A table with the tree name and its measurements in corresponding columns, illustrations of the tree etc. should be encouraged as it shows a child’s learning process, however there is no ‘right way’ to record.

Investigation 3

“The longest blades of grass are always around the edge of the grass patch.”

Prove it!

What will you use to measure the grass?

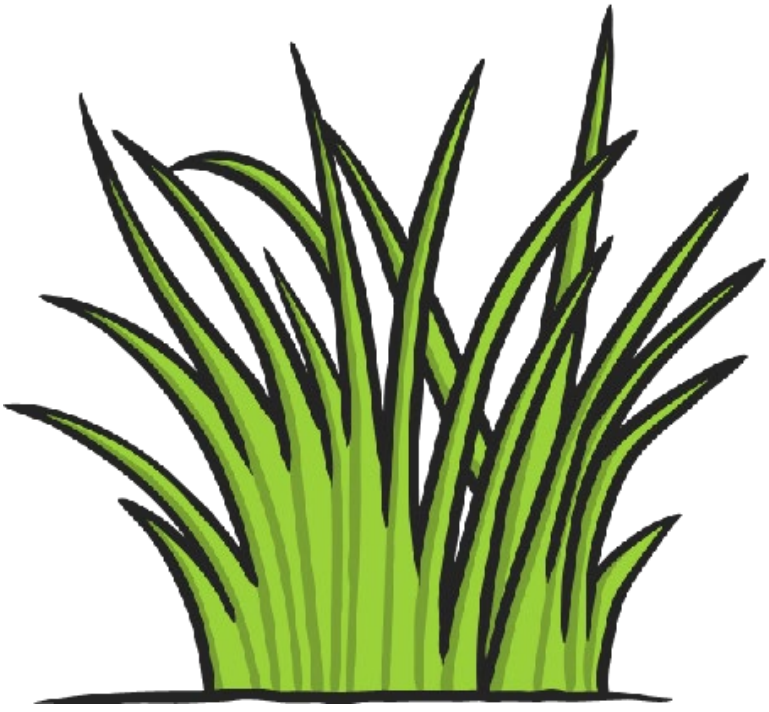
- Children should learn that a ruler with either cm (including decimals) or mm are sensible units of measuring the length. Therefore a ruler would be appropriate.

How will you record your investigation?

- Children must learn that they must investigate the area in the statement but also compare this with another area in the grass. They may be able to see straight away that the statement is true or false, but they must **prove it** using mathematical recordings and evidence.

- They may see an area that has longer grass and create their own statement for other children to investigate and prove right or wrong- “The longest blades of grass are always under the slide.”

- Throughout this, children will choose to record in their own way. A table with the grass name and its measurements in corresponding columns, illustrations of the grass etc. should be encouraged as it shows a child’s learning process, however there is no ‘right way’ to record.



Investigation 4

“It is impossible to find a stick which is half the length of another stick.”

Prove it!

Do not break sticks to change their size (this will provide more opportunity for practising measuring).

How will you begin your investigation?

- Children should learn that it is a good idea to work methodically by choosing either their ‘longer’ stick or their ‘shorter’ stick first, and then keep a hold of this to find its ‘partner’ (rather than trying to find both sticks at once).

- They should learn which sticks are a sensible size to choose, i.e. it will be more difficult to find a stick which is double the length of an extremely large stick (as there are few sticks like this).

How will you know which sticks you have already tried?

- They should learn that throwing their sticks back on the ground may become confusing if they forget which ones they have looked at/measured/checked already. They may create a pile of ‘checked sticks’.

How will you measure your sticks?

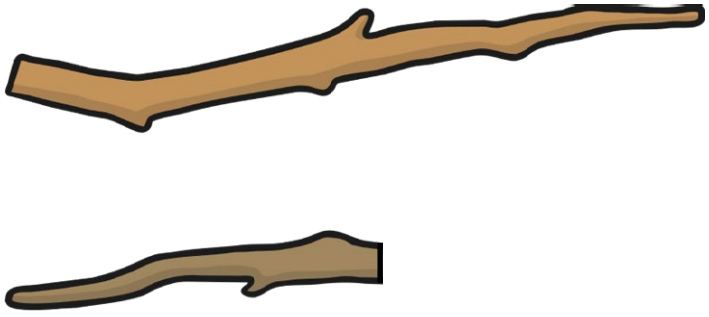
- They should begin by estimating the length of the sticks by eye, using their knowledge of cm being about the width of a fingernail.

- They may line up sticks beside each other.

- When they feel they are close to having a stick which is double the size of another, they should begin measuring the sticks using appropriate equipment such as a ruler. They should realise that recording in cm and mm would make most sense.

If they are not accurate enough, they may keep one or the other of the sticks and begin their methodical searching again. Alternatively, they may want to start all over again.

If they are very close (you may decide how close is acceptable), they could try and find a stick which is double the length of the longer stick!



Investigation 5

Go on a short minibeast hunt in a specific area, e.g under a tree.

Create a graph to show the types of minibeasts you found in that area

(Be sure to remind children not to touch the minbeasts, only to observe and count them.) Children will learn that it is useful to record the minibeasts they see as they go to avoid forgetting them.

Which type of graph will you use?

- Children should learn that because they are showing different groups (discrete data), a bar graph is the best graph to use. (A line graph is normally used for changes over time or other continuous data.)

What will you put in the x-axis?

- 'Type/Name of Minibeast'

What will you put in the y-axis?

- 'Number of Minibeasts'

Create questions about your graph to test another pupil.

- Any questions relating to gathered data could be used.

Example Questions:

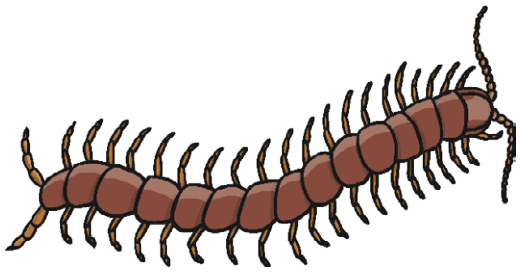
How many beetles were there altogether?

What is the difference between the number or flies and the number of spiders found?

- Learning could be extended by creating a graph in another area of the school grounds and comparing them.

Example Questions:

Why do you think there were more worms in the 'muddy path' area than in the 'under the tree' area?



Investigation 6

“There are right angles, obtuse angles and acute angles in nature.”

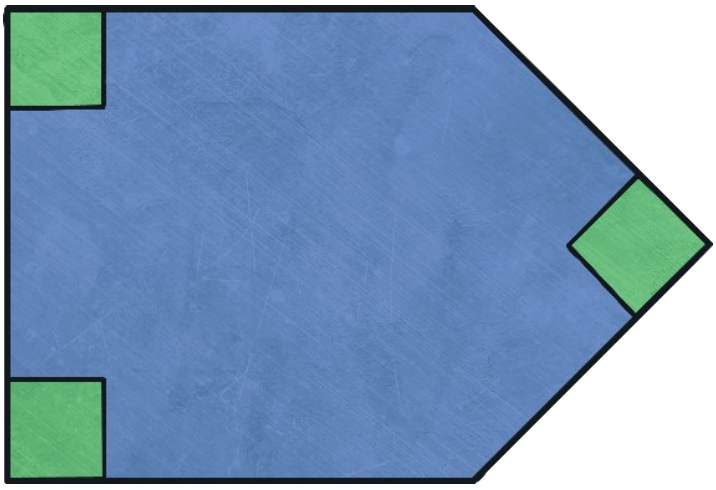
Prove it!

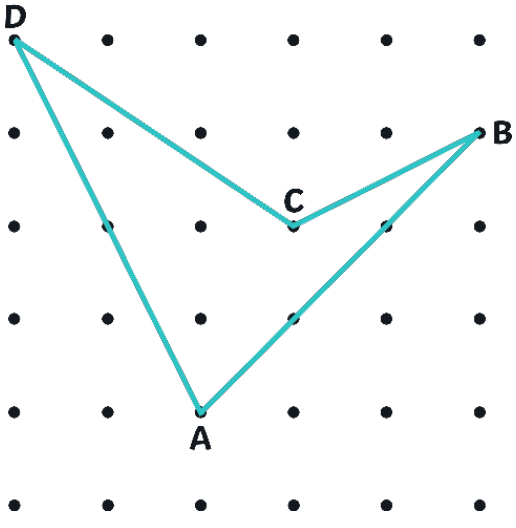
How will you record your investigation?

- Children may choose to record using a camera or illustrations or simply record the location of the angle outside.
- They must show all three angles in nature to prove the statement.

How will you measure the angles?

- They may choose to use a protractor, a ‘right angle finder’ or an object they know has a right angle (e.g. the corner of a sheet of paper).
- They should learn to use a right angle as a gauge to decide whether an angle in nature is smaller than 90° and is therefore acute or larger than 90° (but smaller than 180°) and is therefore obtuse.





Investigation 7

"The height of a tree is three times the distance around its trunk (tree girth)."

Ensure children understand what 'three times the distance means (i.e. that the girth × 3 = height).

Prove it!

How will you plan your investigation?

- Children should learn that after measuring their tree height (using the method from Investigations 1 and 2) and girth, they must compare this to other trees and their girths. They must begin then to compare them.

How will you measure the tree height?

- See investigations 1 and 2.

How will you measure the girth of the tree trunk?

- Children should learn that m and cm are sensible units here.
- However, they should realise that a metre stick will not curve around the tree. They may choose a measuring tape or string which they mark and measure against the metre stick in order to find an accurate reading.
- If they find that a tree 3m tall has a girth of 1m wide, 6m tall has a girth of 2m wide and a tree 9m tall has a girth of 3m wide, then they may conclude that the statement is true. (NB: This is unlikely!)