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| **Mathematical measuring – lengths of leaves** | | | |
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| Measuring leaves and finding the mean values for a tree | | | |
| **Subject(s):** Mathematics, Science  **Approx time:** 60 - 90 minutes |  | | **Key words / Topics:**   * Average * Data set * Leaf * Length * Mean * Measurement * Width |
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| **Suggested Learning Outcomes** |  | |  |
| * To measure the length and width of leaves from a tree. * To place the measured values in an appropriate table format. * To calculate the mean average length and width of the leaves. * To identify the parts of a leaf. | | | |
| **Introduction** |  | |  |
| This is one of a set of resources developed to support the teaching of the primary national curriculum. They are designed to support the delivery of key topics within maths and science. This resource focuses on measuring the lengths and widths of leaves from a tree, placing the data in a table and calculating the mean average of each.  Trees and their leaves are an important part of our natural environment. We can use our maths and science knowledge to better understand them and hence the environment around us! | | | |
| **Purpose of this activity**  In this activity learners will measure the lengths and widths of six leaves from a single tree. They will place this data in a table and then calculate the mean average length and width of the leaves from the tree. They will also develop and reinforce their knowledge of the different parts of a leaf by labelling it.  This activity could be used as a main lesson activity to teach learners how to collect data and calculate the mean value of a data set. It could also be used as one of several activities within a wider scheme of learning focusing on the use of maths and science to understand the natural environment. | | | |
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| **Activity** |  | | **Teacher notes** |
| **Introduction and preparation to go outside (5-10 minutes)**  Teacher to explain that learners are going to go outside and collect six leaves each from a tree. Learners to put on coats etc so that they are ready to go outside.  **Collecting the leaves (15-20 minutes)**  Learners to go outside and each identify a tree that they are going to collect their leaves from. Learners to take six leaves from the tree that they have identified.  Learners should return to the classroom once the whole class has collected their leaves.  **Measuring the leaves (15-20 minutes)**  Teacher to demonstrate how to measure the length and width of a leaf using a ruler. The teacher presentation can be used as a visual aid.  Learners to then measure the length and width of each leaf that they have collected. Learners to write their results in the table given in the leaf measurements handout.  **Calculating the mean values (15-20 minutes)**  Using the presentation, teacher to explain how the mean length and width of the leaves from each tree is to be calculated.  Learners to calculate the mean length and width of the leaves that they have collected from their tree. The results should be recorded either in their exercise books or using the leaf measurements handout.  Class to discuss the meaning of these values. What do they tell us about the size of the leaves on each tree sampled?  **Labelling the parts of the leaf (10-15 minutes)**  Learners to complete the missing letters on the parts of the leaf handout to label each part of the leaf shown.  Teacher to review answers given using the presentation - learners could also self and/or peer assess their responses. |  | | This activity could be done as individuals or in small groups.  **Collecting and measuring leaves**  Leaves can be collected from trees in and around the school grounds as available. Appropriate safeguarding checks and risk assessments will need to be put in place by the teacher depending on where the collection of the leaves takes place.  Explain and demonstrate to the learners that the width is to be measured at the leaf’s widest point, and the length is from the tip of the leaf to the start of the stalk (petiole) as shown in the teacher presentation.  If learners are unable to go outside to collect their own leaves, then these could be collected and prepared in advance by the teacher.  **Calculating the mean values**  The teacher may wish to show an example calculation if learners have not covered this before.  The measurements worksheet could be printed out for learners to write down their measurements and show their calculations for the mean values. Calculators can be used, but all working should be written down.  **Labelling the parts of a leaf**  This could be used as an additional related activity to link into areas of the Science curriculum. The slide could be printed and used as a worksheet or learners could write their responses in their exercise books, using the slide shown on the board.  **Parts of the leaf answers:** |
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| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| Reduce the number of leaves collected to produce a smaller data set and hence simplify the mean value calculations.  Provide learners with pre-measured leaves to practice calculating mean values. |  | | Explain the meaning of mode and median and then calculate these values for the length and width of the leaves. Calculate the range of each.  Identify the main parts of the leaf without the letters given. Explain the main purpose of each part of the leaf. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Access to an outside area with trees and leaves * Rulers and/or tape measures * Calculators |  | | Mathematical measuring presentation  icon-pdf Leaf measurements worksheet  icon-pdf Parts of the leaf worksheet |
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| **Additional websites** |  | |  |
| * **Bitesize – How to find the mean, median, mode and range:** Notes explaining and showing how to calculate the mean, median, mode and range of a data set. <https://www.bbc.co.uk/bitesize/topics/zm49q6f/articles/z99jpbk> * **Toppr – Leaf:** Explanation of a leaf and its parts. <https://www.toppr.com/guides/biology/anatomy-of-flowering-plants/leaf/> * **YouTube –** **Structure of a leaf:** Video explaining the purpose, function and structure of a leaf in more detail. <https://www.youtube.com/watch?v=co0JdqUlycg> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Discuss the importance of trees and leaves to the natural environment. * Discuss how maths techniques can be used to find out more about the natural environment. | | **Extension** (Options)   * Calculate the mode, median and range of each data set. * Identify and explain the function of the main parts of the leaf. * ACTIVITY – Put a ring on it   **Plenary**   * Discuss the meaning of the results found and the mean calculations for the length and width of the leaves. * Self and peer assess responses to leaf labelling activity. | |

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| **The Engineering Context** film |
| * Engineers are required to use mathematics knowledge and skills regularly as part of their everyday job. It is therefore essential that they have a good grasp of basic concepts, such as collecting data and calculating averages. * Environmental engineers are tasked with improving the quality of the natural environment around them. The more they understand about this, the better they can do their jobs. |

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| **Curriculum links** | |
| **England: National Curriculum**  Mathematics  KS2 Year 5 Statistics:   * complete, read and interpret information in tables   KS2 Year 6 Statistics:   * calculate and interpret the mean as an average.   Science  KS2 Year 3 Plants:   * identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. | **Northern Ireland Curriculum**  KS2 Numeracy across the curriculum – the world around us:   * by interpreting statistical data and using it to solve problems using measurement, shape, space and estimation in the world around them   KS2 - Mathematics and Numeracy  Processes in mathematics:   * identify and obtain the information required for a task, suggesting appropriate * sources to find the information * understand mathematical language and use it to discuss their work and explain their thinking * present information and results clearly   Handling data:   * collect, classify, record and present data drawn from a range of meaningful   situations, using graphs, tables, diagrams and ICT software   * explain their work orally and/or through writing and draw conclusions * interpret a wide range of tables, lists, graphs and diagrams * understand, calculate and use the mean and range of a set of discrete data.   KS2 The World Around us across the curriculum – mathematics and numeracy:   * by exploring different ways of solving problems by collecting, formulating and interpreting numerical data and by exploring shape and patterns occurring naturally in the environment. |
| **Scotland: Curriculum for Excellence**  Numeracy and Mathematics  Number and number processes:   * MNU2-20a * MNU2-20b * MTH2-21a * MTH4-20b   Sciences  Biodiversity and interdependence:   * SCN 2-02b * SCN 0-03a | **Wales: National Curriculum**  Mathematics  KS2 - Using data skills:   * represent data using lists, tally charts, tables, diagrams and frequency tables * extract and interpret information from an increasing range of diagrams, timetables and graphs * use mean, median, mode and range to describe a data set.   Science  KS2 – Skills:   * communicate clearly by speech, writing, drawings, diagrams, charts, tables, using relevant scientific vocabulary * use standard measures and S.I. units. |
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| **Assessment opportunities** | | |
| * Oral teacher feedback whilst leaf measurements are being taken. * Teacher marking and assessment of data collected and mean average calculations. * Self and peer assessment of responses to identifying the parts of the leaf. | | |
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