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| **Make a pyramid** | | |
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| Learning about scale and volume using pyramids made from paper | | |
| **Subject(s):** Mathematics and Design and Technology  **Approx time:** 40 – 60 minutes |  | **Key words / Topics:**   * Pyramid * Net * Volume * Scale * 2D and 3D |
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| Stay safe  Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ | | |
| **Suggested Learning Outcomes** |  |  |
| * To understand how structures are made using nets * To understand that scale refers to the proportional change in the dimensions of an object * To be able to calculate the volume of a pyramid * To be able to make and assemble a graphic product | | |
| **Introduction** |  |  |
| This is one of a set of resources developed to support the teaching of the primary national curriculum. It was inspired by the achievements of the ancient Egyptians and uses pyramids to teach about scale and volume. This resource involves building a card structure to make pyramids of varied sizes. | | |
| **Purpose of this activity**  In this activity learners will learn about 3D structures within a graphical project. Learners will have an opportunity to use a net to make pyramids of different sizes.  This activity could be used as a main lesson activity, to teach learners about simple structures made from nets. | | |
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| **Activity** |  | | **Teacher notes** |
| **Introduction (10 minutes)**  Teacher to explain that learners are going to make pyramids using different sized nets.  Teacher to hand out equipment and worksheets needed for the task to the learners. Teacher to use the presentation to introduce the concept of scale.  **Making the pyramids (15-25 minutes)**  Teacher to demonstrate the steps shown in the teacher presentation and listed below:   * Step 1 – Safely cut out the six small and one large pyramid net, then score and fold the dotted lines. ⚠ * Step 2 – Glue the tabs and join the sides of each pyramid together. Assemble the six small and one large pyramid.   Learners to complete each step to conduct the activity for themselves. The teacher presentation could be left on the whiteboard as a supporting guide as they do this.  **The Maths (15-25 minutes)**  Learners to calculate the volume of the small and large pyramids.  Teacher to explain that the scale of the larger pyramid to the smaller ones is 2:1. Learners to determine practically how many of the small pyramids are needed to make the larger pyramid.  Learners to calculate how many small pyramids actually would fit into the larger pyramid. Class to discuss how the scale affects the volume. |  | | **Build a Pyramid**  Print the activity sheets and distribute to the learners.  The scale for the triangle is presented; learners could calculate the scale for the square. The scale should be presented using the lowest common denominator.  Step 3 – Learners may need to use a small amount of sticky tack to keep the small pyramids in place.  Step 4 – Teacher to explain how to calculate volume and then discuss how to work out how many small pyramids will fit into the larger pyramid.  Five small pyramids will assemble to form the shape of the larger pyramid but what about the gaps? Sticky tack could be used to assist the small pyramids staying in place.  A uniform doubling of the length, width and height results in an increase in volume of 2 x 2 x 2 = 8. Learners could calculate what the increase in volume would be if only one side or two sides were doubled in size (2 and 4 respectively). |
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| **Differentiation** |  | |  |
| **Basic** |  | | **Extension** |
| * Provide learners with pre-cut nets |  | | * Learners use A3 paper to draw and make another pyramid that is double the size of the 80 mm2 pyramid. |
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| **Resources** |  | | **Required files** icon-docicon-pdficon-ppt |
| * Glue sticks * Paper * Rulers * Scissors * Calculators * Sticky tack (optional) |  | | icon-ppt Make a pyramid presentation  icon-doc Make a pyramid handout |
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| **Additional websites** |  | |  |
| * **Now – How the Egyptian pyramids were built inspires engineering historians:** <https://now.northropgrumman.com/how-the-pyramids-were-built-inspires-engineering-historians/> * **World history encyclopaedia – Ancient Egyptian Science & Technology**: An explanation of the scientific and technological achievements of the ancient Egyptians. <https://www.worldhistory.org/article/967/ancient-egyptian-science--technology/> * YouTube: Ancient Egypt: Pyramids; History; BBC Teach: <https://www.youtube.com/watch?v=DklFWjDJMzA> | | | |
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| **Related activities (to build a full lesson)** |  | |  |
| **Starters** (Options)   * Watch the video: YouTube: Ancient Egypt: Pyramids; History; BBC Teach: https://www.youtube.com/watch?v=DklFWjDJMzA | | **Extension** (Options)   * Learners use A3 paper to draw and make another pyramid that is double the size of the 80 mm2 pyramid.   **Plenary**   * Learners to share their completed pyramids and their findings. | |
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| **The Engineering Context** film |
| * Engineers are use nets and card to allow them to make 3D models of buildings, structures and even products like hair dryers. |

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| **Curriculum links** | |
| **England: National Curriculum**  Mathematics  KS2 Geometry   * recognise, describe, and build simple 3-D shapes, including making nets   KS2 Measurement   * measure, compare, add and subtract: lengths(m/cm/mm); volume/capacity (l/ml) | **Northern Ireland Curriculum**  KS2 – Mathematics and Numeracy  Shape and Space   * build and make models with 3D shapes; create pictures and patterns with 2D shapes.   Measures   * calculate perimeter and the areas and volumes of simple shapes |
| **Scotland: Curriculum for Excellence**  **Scotland: Curriculum for Excellence**  Numeracy and Mathematics  Measurement  MNU2-11a   * Calculates the volume of cubes and cuboids   Shape, position and movement  MTH 2-16   * Through practical activities, I can show my understanding of the relationship between 3D objects and their nets. | **Wales: National Curriculum**  Mathematics  KS2 – Using geometry skills   * construct solids from given nets   KS2 – Using measuring skills   * Find volumes by counting and other practical methods. |
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| **Assessment opportunities** | | |
| * Formal teacher assessment of manufactured pyramids. * Informal teacher assessment of the calculations and resulting discussion. | | |
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