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| **How to work out scale** |
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| Scaling activity to change the size of items |
| **Subject(s):** Mathematics, art**Approx. time:** 40 - 60 minutes |  | **Key words / Topics:** * Grid
* Scale up
* Scale down
* Twice
* Half
* Proportion
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| **Suggested Learning Outcomes**  |  |  |
| * To know how multiplication and division can be used to work out scale.
* To be able to scale drawings back to their original size by either scaling up or scaling down.
* To be able to solve simple problems in scaling contexts i.e. 2 times larger and 2 times smaller.
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| **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 focusses on the use of multiplication and division in the context of scaling an item to either double or half its size.Scale refers the proportion of an object or drawing relative to the full-size object. It is widely used in engineering in drawings, where a small drawing can represent a much bigger object. For example, when building a house, the drawings are scaled down to a convenient smaller size. You would not want the design drawings to be the same size as the house! We can use maths knowledge to solve problems involving scale factors, using proportion as measured by a scaled-up or scaled-down drawing. |
| **Purpose of this activity**In this activity learners will change the scale of items, by doubling or halving the size and drawing them to a new scale. Learners will be shown that multiplication and division are useful methods to change the scale of an item.This activity could be used as a main lesson activity to teach learners how to work out scale or to reinforce understanding of multiplication and division. It could be used as one of several activities within a wider scheme of learning focussing on the use of maths to understand ratio and proportion. It could also support the development of drawing skills in art. |
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| **Activity** |  | **Teacher notes** |
| **Introduction (5 minutes)**Teacher to explain that learners are going to scale up and down drawings using a grid. The presentation can be used to show the language used to scale up and how multiplication can help this.**Scaling up Activity (15-25 minutes)**Teacher to demonstrate the steps needed to draw the fish into the larger grid. Learners then complete this activity.**Scaling down Activity (15-25 minutes)**Teacher to use the presentation to explain how a drawing can be scaled down, then demonstrate the steps needed to draw the mouse into the smaller grid. Learners then complete this activity.**Discussing the results of the activity (5 minutes)**What went well, even better if… Selected learners present their work, identifying one thing that went well or they found useful when changing the scale and one thing that they need to improve.  |  | This activity could be done as individuals or in pairs.When demonstrating the scaling up and down activities, it is recommended to where to start the drawings. There is opportunity to discuss ratio and proportion.Additional worksheets can be created by deleting the graphic in the worksheets that accompany this activity and replacing this with an alternative. Potential sources of suitable images include media sources such as clipart, google images, cartoon stocks etc. |
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| **Differentiation** |  |  |
| **Basic** |  | **Extension** |
| Allow learners to trace the resulting scaled up/down drawing. |  | Learners could choose a drawing from the internet to scale up/down.Learners could also choose a different scale factor i.e. 3 or 4 times larger/smaller. |
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| **Resources** |  | **Required files** icon-docicon-pdficon-ppt |
| * How to work out scale worksheet
* Pencils
* Erasers
 |  |  How to work out scale presentation icon-doc How to work out scale worksheet |
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| **Additional websites** |  |  |
| * **BBC Bitesize** – How scale can help me divide: <https://www.bbc.co.uk/bitesize/topics/zm982hv/articles/zjmkkmn>
* **BBC Bitesize** – How scale can help me multiply: <https://www.bbc.co.uk/bitesize/topics/zm982hv/articles/zkwggwx>
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| **Related activities (to build a full lesson)** |  |  |
| **Starters** (Options) * Discuss how maths techniques can be used to scale up/down a drawing using multiplication/division.
* Watch one of the BBC Bitesize videos listed in the additional websites.
 | **Extension** (Options)* Choose a drawing from the internet and design their own grid to either scale up/down the drawing.
* Choose a different scale factor i.e. 3 or 4 times larger/smaller.

**Plenary*** What went well, even better if… - Learners share with class their scaled drawings, identifying a good feature and something they could do to improve the drawing
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| **The Engineering Context** film |
| * Structural engineers work with architects to help design most houses, hospitals, office blocks, bridges, oil rigs, ships and aircraft. They make scaled down drawings for each structure.
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| **Curriculum links**  |
| **England: National Curriculum**MathematicsKS2 Year 3 NumberMultiplication and Division* solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.
 | **Northern Ireland Curriculum**KS2 - Developing numerical reasoning* understand and use scale in the context of simple maps and drawings.
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| **Scotland: Curriculum for Excellence**Numeracy and MathematicsAngle, symmetry and transformation* MTH 3-17c
 | **Wales: National Curriculum** MathematicsKS2 - Represent and communicate * visualise and describe shapes, movements and transformations
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| **Assessment opportunities** |
| * Oral teacher feedback whilst drawing the scaled up and down drawings
* Teacher marking and assessment of either one of the scaled up or down worksheets.
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