YuMi Deadly Maths

Year 5 Teacher Resource:

MG – Supersize it

Prepared by the YuMi Deadly Centre
Faculty of Education, QUT

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QUT

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ACKNOWLEDGEMENT

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refined and presented in professional development sessions.

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Prepared by the YuMi Deadly Centre
Queensland University of Technology
Kelvin Grove, Queensland, 4059

ydc.qut.edu.au

Year 5 Measurement and Geometry

Supersize it

Learning goal	Students will transform and enlarge shapes using a grid.
Content description	Measurement and Geometry – Location and transformation • Describe translations, reflections and rotations of two-dimensional shapes. Identify line and rotational symmetries (ACMMG114) • Apply the enlargement transformation to familiar two-dimensional shapes and explore the properties of the resulting image compared with the original (ACMMG115)
Big idea	Geometry – interpretation vs construction
Resources	Skipping ropes that are the same size, Maths Mat, elastics, grid paper, pencils, geoboards, rubber bands, pattern blocks, scissors, glue, grid paper worksheets

Reality

Local knowledge	Discuss places and objects where students see the same place or object but in an enlarged size. For example, school photos in different sizes, maps, street directories, computer images; eyes dilate coming from sunlight into a dark room in the house; same style shoes or clothes but different sizes in a shop.
Prior experience	Revise notion of similar and congruent shapes, transformations – e.g. begin by displaying a basketball and a rubber ball. Ask: *How are these two figures alike?* [They have the same shape.] *How are they different?* [They are different sizes.] Explain that the basketball and rubber ball are similar. *So similar figures have the same shape but are in different sizes*. Show two tennis balls. Ask: *How are these objects the same?* [They are the same shape and size.] *Are there any differences?* [no]. *Objects that are the same or equal in every respect are congruent. Congruent figures have the same size and same shape*.
Kinaesthetic	Students search in the natural environment for objects that are similar, e.g. a young leaf and mature leaf from the same tree. Discuss how the leaves are similar. Collect 12 of each to take back to the classroom. Divide students into two groups, shorter in one group and taller in the other. In each group, four students lie on the ground to form a square with side of one student. Around them, other students make a square that has two students per side thus making an enlarged square. *How many times has the original square been enlarged? What is the scale factor that has been used to make the similar square?* Take photos. Reverse: Make a rectangle that is six students long and four students wide. Other students now inscribe a rectangle within the original that is half as large. *What is the scale factor of the reduced rectangle?* Skipping ropes: Students make an equilateral triangle by laying three skipping ropes out on the ground. Make a similar triangle that is enlarged three times more than the one just made. Reverse and make similar shapes that are half the size of the given shape.

Abstraction

Body	Ask three students to make a triangle on the 10 × 6 Maths Mat with an elastic that has a base of 4 squares, extends 3 squares at right angles to the base and re-connects back to the base. *What shape has been made?* [right-angle triangle]. With a different-coloured elastic, have students make a similar triangle that enlarges the first triangle to double its size. Enlarge a variety of simple 2D shapes, e.g. regular and irregular polygons. Reverse: Reduce simple 2D shapes by a scale factor of ½. This would halve the original size of the shape.

Hand	1. Students use grid paper to draw examples of shapes which are congruent to each other. Next, they draw figures which are similar to each other, varying the scale factor to enlarge and also to reduce the shape. 2. Arrange and glue leaves collected from the same tree onto paper in ascending order of size.
Mind	*Close your eyes and think of a photo of something small. Now imagine that it has been enlarged to a scale factor of 4. Think of something else and reduce this by a scale factor of one half.*
Creativity	*Create your own shapes and build series of similar images that both increase and decrease in size.*

Mathematics

Language/ symbols	two-dimensional shape, side, similar, congruent, translate, transformation, grid, enlarge, scale factor, increase, reduce, rotate, reflect
Practice	1. Students make a shape on the geoboard. The students then switch with a partner who tries to duplicate the figure (congruency) and then make a similar shape with a scale factor of 3. Reverse and make a scale factor of ½. 2. Pattern blocks: Students sort pattern blocks into those which are congruent to each other and those which are similar to each other. Trace a shape on grid paper. Replicate a congruent shape using translation, reflection or rotation. To make sure the shapes are congruent, have the students cut out one of the shapes, place it over the other shape to see if they are congruent, and glue it to the previous shape. Then make a series of similar shapes using the pattern blocks. Transcribe these onto grid paper.
Connections	Relate to ratio, proportion and percent.

Reflection

Validation	Students check where objects are enlarged or reduced in the real world, e.g. advertisements: enlarged on billboards, reduced in newspaper clips.
Application/ problems	Provide applications and problems for students to apply to different real-world contexts independently; e.g. *Develop a PowerPoint presentation. Show pictures of well-known fairy tales where the characters are in different sizes (e.g. "Three Billy Goats Gruff"). Construct a fairyland city where the buildings are all the same shape but differ in size.*
Extension	**Flexibility**. Show different ways of representing congruent and similar figures by using transformations. **Reversing**. Students are able to move between using the language of congruence and similarity ↔ modelling it ↔ diagrams ↔ constructing replicas that are either congruent or similar (enlarged or reduced by a given scale factor), starting from and moving between any given point. **Generalising**. *Similar shapes are made when one shape is an enlargement or reduction of the other. Similar figures have the same shape but are in different sizes. This means that angles stay the same and lengths are in the same ratio. Congruent figures have the same size and same shape, being equal in every respect even when their position may be moved through any of the transformations*. **Changing parameters**. Explore similarity in 3D shapes. Experiment with scale drawing.

Teacher's notes

- Ensure that students have a sound understanding of the notions of congruence and similarity before proceeding to transforming shapes into similar figures, either enlarging or reducing.
- Students need to be taught the skill of visualising: closing their eyes and seeing pictures in their minds, making mental images; e.g. show a picture of a shape, students look at it, remove the picture, students then close their eyes and see the shape in their mind; then make a mental picture of a different shape.
- Suggestions in Local Knowledge are only a guide. It is very important that examples in Reality are taken from the local environment that have significance to the local culture and come from the students' experience of their local environment.
- Useful websites for resources: www.rrr.edu.au; https://www.qcaa.qld.edu.au/3035.html
- Explicit teaching that **aligns with students' understanding** is part of every section of the RAMR cycle and has particular emphasis in the Mathematics section. The RAMR cycle is not always linear but may necessitate revisiting the previous stage/s at any given point.
- Reflection on the concept may happen at any stage of the RAMR cycle to reinforce the concept being taught. Validation, Application, and the last two parts of Extension should not be undertaken until students have mastered the mathematical concept as students need the foundation in order to be able to validate, apply, generalise and change parameters.