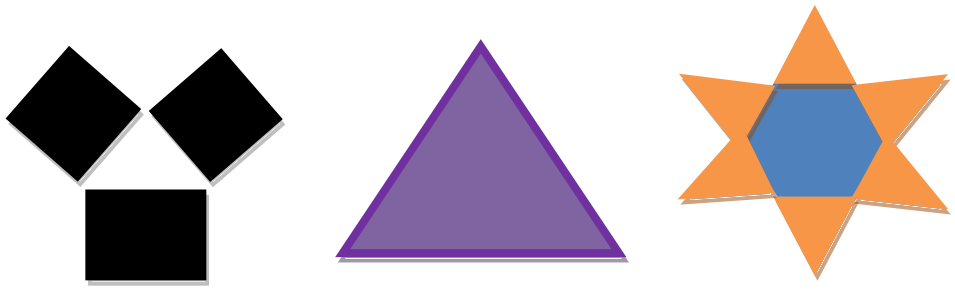
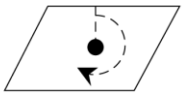
Two-Dimensional Space 1

Stage 3 Outcome

A student:
› describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM
› selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations MA3-2WM
› gives a valid reason for supporting one possible solution over another MA3-3WM › manipulates, classifies and draws two-dimensional shapes, including equilateral, isosceles and scalene triangles, and describes their properties MA3-15MG

Language: Students should be able to communicate using the following language: shape, two-dimensional shape (2D shape), triangle, **equilateral triangle**, **isosceles triangle**, **scalene triangle**, **rightangled triangle**, quadrilateral, parallelogram, rectangle, rhombus, square, trapezium, kite, pentagon, hexagon, octagon, regular shape, irregular shape, features, properties, side, parallel, pair of parallel sides, opposite, length, vertex (vertices), angle, right angle, line (axis) of symmetry, **rotational symmetry**, **order of rotational symmetry**, translate, reflect, rotate, **enlarge**.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
Ignition Activities		
Pattern Blocks Students make shapes that they predict will match one, two, three, four, five or six times when rotated. Students start with a central shape and build around this. The shapes can be traced and the objects rotated to match the tracing. 		
Barrier Game In pairs, students are positioned back to back. One student is the 'sketcher', the other student is the 'describer'. The 'describer' describes a given two-dimensional shape focusing on side and angle properties. The 'sketcher' listens to the description and sketches the two-dimensional shape described. The 'sketcher' names the two-dimensional shape sketched and then compares their sketch with the describer's shape. The students swap roles and repeat the activity.		Literacy Critical and creative thinking

What am I? Students select a shape and write a description of its side and angle properties. Students share their descriptions with the class who attempt to identify the shape eg 'My shape has four sides and four equal angles. The opposite sides are the same length. What am I?' *Variation:* Students create flipbooks recording clues and share with a friend. Students reproduce shapes and clues using a computer software package eg Logo		Literacy Critical and creative thinking
Explicit Mathematical Teaching		
A shape has rotational symmetry if a tracing of the shape, rotated part of a full turn around its centre, matches the original shape exactly. The order of rotational symmetry refers to the number of times a figure coincides with its original position in turning through one full rotation, eg  A regular octagon has rotational symmetry of order 8.  A parallelogram has rotational symmetry of order 2.  A trapezium does not have rotational symmetry.		Literacy
Scalene means 'uneven' (Greek word 'skalenos': uneven): our English word 'scale' comes from the same word. Isosceles comes from the two Greek words 'isos': equals and 'skelos': leg; equilateral comes from the two Latin words 'aequus': equal and 'latus': side; equiangular comes from 'aequus' and another Latin word 'angulus': corner.		Literacy
Whole Class Teaching Activities		
Barrier Game Teacher models and explain the difference between regular and irregular shapes. In pairs students take turn to describe supplied shapes. Second student to draw shape based on description of sides and angle properties. Use tools such as templates, rulers, set squares and protractors to draw regular and irregular two-dimensional shapes. Use computer drawing tools to construct a shape from a description of its side and angle properties.		Literacy Critical and creative thinking Information and communication technology capability

Enlarging and Reducing

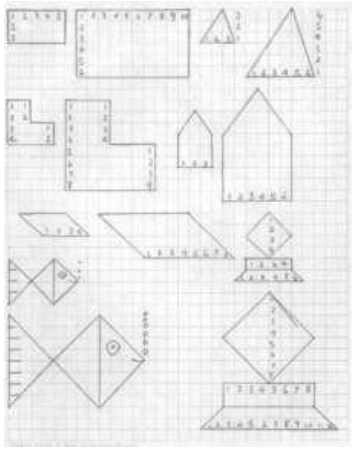
This lesson should take several sessions

Students are given drawings of a variety of two-dimensional shapes on grid paper.
Show how to classify two-dimensional shapes and describe their features.manipulate, identify and name right-angled, equilateral, isosceles and scalene triangles.
Ensure that students recognise that a triangle can be both right-angled and isosceles or right-angled and scalene.
Compare and describe features of the sides of equilateral, isosceles and scalene triangles and explore by measurement side and angle properties of equilateral, isosceles and scalene triangles.
Students should explore by measurement angle properties of squares, rectangles, parallelograms and rhombuses and select and classify a two-dimensional shape from a description of its features.
Discuss that two-dimensional shapes can be classified in more than one way, eg a rhombus can be more simply classified as a parallelogram.

Students enlarge or reduce the shapes onto another piece of grid paper. Possible questions include:

- what features change when a two-dimensional shape is enlarged or reduced?
- what features remain the same?
- do properties change or remain the same? Why?

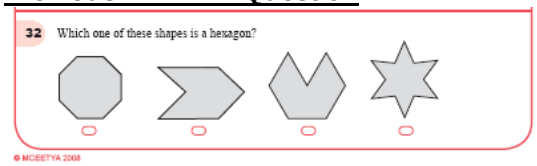
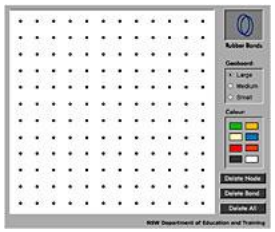
Students explain the process they used to enlarge and reduce two-dimensional shapes.

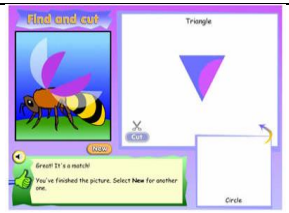


Literacy
Critical and creative thinking

Rotational Symmetry Teacher models and describes translations, reflections and rotations of two-dimensional shapes. Use the terms 'translate', 'reflect' and 'rotate' to describe the movement of two-dimensional shapes. Describe the effect when a two-dimensional shape is translated, reflected or rotated, eg when a vertical arrow is rotated 90°, the resulting arrow is horizontal. Students should recognise that the properties of shapes do not change when shapes are translated, reflected or rotated. Students make a two-dimensional shape out of cardboard and trace it onto paper. They pin the tracing to the cardboard shape through its centre. While the cardboard shape remains still, students rotate the tracing around the pin. As it is being rotated, students count the number of times in a complete turn the tracing and the cardboard shape match, and check the total against the number of axes of symmetry of the shape. Rotate a graphic or object through a specified angle about a particular point, including by using the rotate function in a computer drawing program.		Literacy Critical and creative thinking Information and communication technology capability
<u>Guided and Independent Activities</u> **Rotational Symmetry** Teacher demonstrates how **to** identify and quantify the total number of lines (axes) of symmetry (if any exist) of two-dimensional shapes, including the special quadrilaterals and triangles. Students identify shapes that have rotational symmetry and determine the 'order' of rotational symmetry. Students are given a variety of cardboard shapes to investigate their rotational symmetry by pinning each shape through the centre to grid paper and tracing the shapes onto the paper. While the cardboard shape remains still, students rotate the tracing around the pin. Students draw other shapes onto grid paper and predict whether they have rotational symmetry. They then check their predictions. Students construct a variety of designs with rotational symmetry using digital technologies.		Literacy Critical and creative thinking Information and communication technology capability

Guided Group/Independent Activities **Triangles** The teacher provides students with a variety of scalene, isosceles, equilateral and right-angled triangles. In small groups, students discuss the side and angle properties of each triangle and sort triangles with similar properties into groups. Students devise a description for each type of triangle eg equilateral triangles have three equal sides and three equal angles. Students share sorting procedures and descriptions. *Variation:* Students construct triangles using a variety of equipment eg set squares, protractors, rulers, templates. They then sort the triangles and describe their properties.		Literacy
Enlargement Transformation Teacher demonstrates how to overlay an image with a grid composed of small squares (eg 5 mm by 5 mm) and create an enlargement by drawing the contents of each square onto a grid composed of larger squares (eg 2 cm by 2 cm). http://www.bbc.co.uk/bitesize/ks3/maths/shape_space/transformations2/revision/4/ Teacher supplies grid paper and image to enlarge. Students enlarge image.		Critical and creative thinking
Digital Enlargements Investigate and use functions of digital technologies that allow shapes and images to be enlarged without losing the relative proportions of the image		Critical and creative thinking Information and communication technology capability
Scale Models In small groups, students sketch the classroom from an aerial perspective. Students use their sketch, and grid paper, to produce an appropriately scaled drawing of the major features of the classroom. Students then make an enlargement and reduction of their scale drawing. Students use drawing software to enlarge or reduce their sketches. Students sketch a scale drawing of their bedroom.		Critical and creative thinking Information and communication technology capability

Geoboards Students are asked to create as many different triangles as they can, with no pegs inside them, on the geoboard. Students are provided with dot paper to record the triangles that have been created. Students are encouraged to discuss whether the triangles are the same or different. Possible questions include: ▮ are the angles the same? ▮ are the sides the same? ▮ are there any differences between the triangles? ▮ do triangles retain their properties when their size is doubled or tripled?		Literacy
Previous NAPLAN Question  **Computer Learning Objects** DIGITAL GEOBOARD -STAGES 1-3 A digital version of a geoboard which enables a band to stretch around the pegs on the geoboard to form a coloured shape.  **SHAPE OVERLAYS** - STAGES 1-3 The Shape overlays series of learning objects requires the student to manipulate 2D shapes, by sliding and overlapping, to create other 2D shapes. Shape overlays: picture studio Shape overlays: find and cut Shape overlays: find, cut and turn Shape overlays: picture puzzle		Literacy

 Find and cut Triangle Cut New Great! It's a match! You've finished the picture. Select New for another one. Circle		