

# Booragul Public School NSW Syllabus for the Australian Curriculum – Measurement and Geometry

## Sub Strand – Two Dimensional Space 1

Outcome	Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date
<b>Stage 2</b> A student: <ul style="list-style-type: none"> <li>› uses appropriate terminology to describe, and symbols to represent, mathematical ideas MA2-1WM</li> <li>› checks the accuracy of a statement and explains the reasoning used MA2-3WM</li> <li>› manipulates, identifies and sketches two-dimensional shapes, including special quadrilaterals, and describes their features MA2-15MG</li> </ul>		<b>Language</b> Students should be able to communicate using the following language: shape, two-dimensional shape (2D shape), circle, triangle, quadrilateral, <b>parallelogram</b> , rectangle, <b>rhombus</b> , square, <b>trapezium</b> , <b>kite</b> , pentagon, hexagon, octagon, <b>regular shape</b> , <b>irregular shape</b> , orientation, features, <b>properties</b> , side, parallel, <b>pair of parallel sides</b> , <b>opposite</b> , <b>length</b> , vertex (vertices), <b>angle</b> , <b>right angle</b> , symmetry, <b>line (axis) of symmetry</b> , <b>rigid</b> . The term 'polygon' (derived from the Greek words meaning 'many angles') refers to closed shapes with three or more angles and sides. While the angles are the focus for the general naming system used for shapes, polygons are more usually understood in terms of their sides. Students are not expected to use the term 'polygon'. However, some students may explore other polygons and so benefit from being introduced to the collective term. Students could explore the language origins of the names of polygons. The term 'diamond' is often used in everyday contexts when describing quadrilaterals with four equal sides. However, 'diamond' is not the correct geometrical term to name such quadrilaterals; the correct term is 'rhombus'.	

## 2D Shapes

<p><b><u>Ignition Activities</u></b></p> <p><b>Shape Guessing</b>                      Hold a 2D shape hidden behind a screen. Gradually lift a small part into view. Write down all the shapes children think it could be.                      Slowly pull the shape up and ask the children to eliminate shapes from their list. Discuss the properties of the shape. Hold the shape at tilted angles to increase difficulty.  <b>Note:</b> SmartBoard have a shape program very similar to this and it reveals one square at a time. Can be downloaded for free.                      Sample Units of Work, Stage 2, 2D                      RIC, NSW, Math Assessment Stage 2</p>		 <p style="writing-mode: vertical-rl; transform: rotate(180deg);">                         Intercultural understanding                          Literacy                          Critical and creative thinking                          Asia and Australia's engagement with Asia                     </p>
<p><b>Shape Hunt</b>                      In manageable groups (3 or 4), children go on a shape hunt in the school grounds. They draw and label each shape they find and give a verbal description of its features. Students are to then divide shapes into parallelograms and rhombuses which have been presented in different orientations. Students are to draw representations of regular and irregular 2D</p>		

shapes in different orientations.

**Celebrity Quadrilateral.** (Played like Celebrity heads but with shapes instead) Use hints about parallel sides, right angles and equal sides to identify the quadrilateral. Students should identify shapes as regular or irregular. Students are to draw representations of regular and irregular 2D shapes in different orientations.

## Explicit Mathematical Teaching

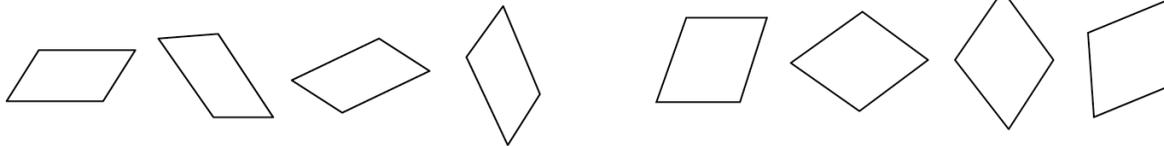
Compare and describe features of two-dimensional shapes, including the special quadrilaterals

- manipulate, compare and describe features of two-dimensional shapes, including the special quadrilaterals: parallelograms, rectangles, rhombuses, squares, trapeziums and kites

- ▮ determine the number of pairs of parallel sides, if any, of each of the special quadrilaterals (Reasoning)

- use measurement to establish and describe side properties of the special quadrilaterals, eg the opposite sides of a parallelogram are the same length

- identify and name the special quadrilaterals presented in different orientations, eg



parallelograms

rhombuses

- ▮ explain why a particular quadrilateral has a given name, eg 'It is a parallelogram because it has four sides and the opposite sides are parallel' (Communicating, Reasoning)

- ▮ name a shape, given a written or verbal description of its features (Reasoning)

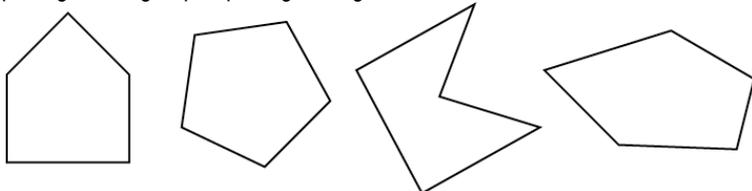
- recognise the vertices of two-dimensional shapes as the vertices of angles that have the sides of the shape as their arms

- identify right angles in squares and rectangles

- group parallelograms, rectangles, rhombuses, squares, trapeziums and kites using one or more attributes, eg quadrilaterals with parallel sides and right angles

- identify and describe two-dimensional shapes as either 'regular' or 'irregular', eg 'This shape is a regular pentagon because it has five equal sides and five equal angles'

- ▮ identify regular shapes in a group that includes irregular shapes, such as a regular pentagon in a group of pentagons, eg



(Reasoning)

<ul style="list-style-type: none"> <li>▮ explain the difference between regular and irregular two-dimensional shapes (Communicating, Reasoning)</li> <li>▮ recognise that the name of a shape does not change if its size or orientation in space is changed (Reasoning)</li> <li>• draw representations of regular and irregular two-dimensional shapes in different orientations</li> <li>• construct regular and irregular two-dimensional shapes from a variety of materials, eg cardboard, straws, pattern blocks</li> <li>▮ determine that a triangle cannot be constructed from three straws if the sum of the lengths of the two shorter straws is less than the length of the longest straw (Reasoning)</li> <li>• compare the rigidity of two-dimensional frames of three sides with the rigidity of those of four or more sides</li> <li>▮ construct and manipulate a four-sided frame and explain how adding a brace can make a four-sided frame rigid (Communicating, Reasoning)</li> </ul>		
<h2 style="margin: 0;"><u>Whole Class and Group Teaching</u></h2> <p style="margin: 0;"><b>Exploring Quadrilaterals Unit of Work –need to be taught in sequence</b></p> <p style="margin: 0;"><b>Lesson One</b> <b>What are Quadrilaterals?</b> <i>Discovering the features of quadrilaterals</i></p> <p style="margin: 0;"><b>Lesson Two</b> <b>Four Sided frames</b> <i>Manipulating four-sided frames to create different quadrilaterals</i></p> <p style="margin: 0;"><b>Lesson Three</b> <b>Rigid and Non Rigid Shapes</b> <i>Manipulating shapes to explore their rigidity</i></p> <p style="margin: 0;"><b>Lesson Four</b> <b>Computer Quadrilaterals</b> <i>Using computer drawing tools to create a variety of quadrilaterals</i> (Refer to lesson sheets in folder)</p> <p style="margin: 0;"><b>Teaching Space and Geometry CD ROM-Stage Two- Exploring Quadrilaterals Unit of Work</b></p>		
<p style="margin: 0;">Is a square always a rectangle? Why or why not? Is a rectangle always a square? Why or why not? Discuss with students the refinements of a quadrilateral to form the special quadrilaterals.</p>		
<p style="margin: 0;"><b>Geoboard Shapes</b> The students are asked to try and make a shape by stretching a rubber band around a geoboard. As each shape is made, the students can explain and record their observations. Students are to compare their shapes with others. Ask questions such as: How many sides does the shape have? Can you find shapes that look like other shapes? Can you make up names for them? Do your shapes have sharp corners? Blunt corners? What is the smallest number of sides you need to make a shape? Why can't we have a shape with two sides? Students are to draw representations of regular and irregular 2D shapes in different orientations. Students will then make</p>		

these shapes out of a variety of resources including straws, toothpicks, paddle pop sticks, pattern blocks and cardboard.

Irregular/Regular- Make a regular octagon, now make an irregular octagon. Remember that an irregular shape does not have equal sides.

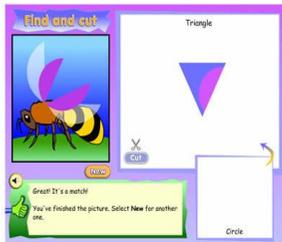
**Make 3 sides, make 4 sides**

construct and manipulate a four-sided frame and explain how adding a brace can make a four-sided frame rigid

## Computer Learning Objects

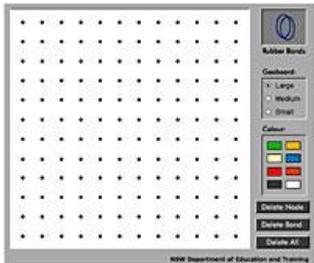
### SHAPE OVERLAYS -STAGES 1-3

The Shape overlays series of learning objects requires the student to manipulate 2D shapes, by sliding and overlapping, to create other 2D shapes.



### 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.



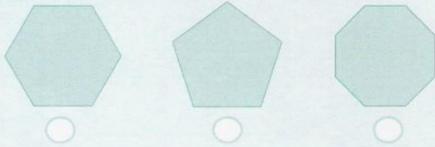
**BST/NAPLAN Questions to practise**

3. Colour the pentagon.



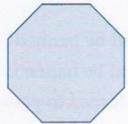
**2003 BST-YR 3**

5. Which one of these shapes is an octagon?

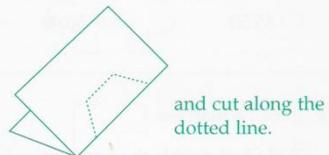


**2006 BST Yr 5**

G Mai drew this octagon.  
Draw a square next to the octagon.



**2006 BST-YR 3 and Yr 5 question**

<p>21 Carl folded a piece of paper like this</p>  <p>and cut along the dotted line.</p> <p>What shape did he see when the paper was unfolded?</p> <p> <input type="radio"/> trapezium      <input type="radio"/> hexagon  <input type="radio"/> pentagon      <input type="radio"/> octagon </p>		
<p><b><u>Planned assessment</u></b></p> <p><b>Pre Assessment –</b> Sort a group of shapes based on given criteria eg, number of lines of symmetry, regular/irregular shape, at least one pair of parallel sides (remember that in mathematics 'regular' shapes have all sides equal, and all internal angles equal).</p> <p><b>Pre Assessment</b> Match up- match the shape name and number of sides to the picture of the shape.</p> <p><b>Teaching Space and Geometry CD ROM-Stage Two –Exploring Quadrilaterals Unit - Lesson Five-(assessment activity)</b> <b>Parallelograms on the Geoboard</b> <i>Using computer drawing tools to create a variety of quadrilaterals</i> <b>QT focus-Deep Knowledge</b> (refer to attached lesson)</p>		
<p><b><u>Symmetry</u></b></p>		
<p><b><u>Ignition Activity</u></b></p> <p><b>SYMMETRICAL FACE</b> Have each child cut out a face from an old magazine. The face should be large (the larger the easier the activity) and looking straight at the viewer. Cut the face down the center. Children paste one half into workbook or onto fresh piece of paper. Children then attempt to draw the missing side to be symmetrical with the side they pasted. When completed they can compare the 'real' person with the one they have created. Point out that people's faces are never truly symmetrical. Option students could be provided with a photograph of their own face.</p>		
<p><b><u>Explicit Teaching</u></b> Identify symmetry in the environment (ACMMG066) • identify lines of symmetry in pictures, artefacts, designs and the environment, eg Aboriginal rock carvings or Asian lotus designs</p>		

- identify and draw lines of symmetry on given shapes, including the special quadrilaterals and other regular and irregular shapes
- ▮ determine and explain whether a given line through a shape is a line of symmetry (Communicating, Reasoning)
- ▮ recognise and explain why any line through the centre of (and across) a circle is a line of symmetry (Communicating, Reasoning)

## Whole Class Teaching Activities

### **SYMMETRY**

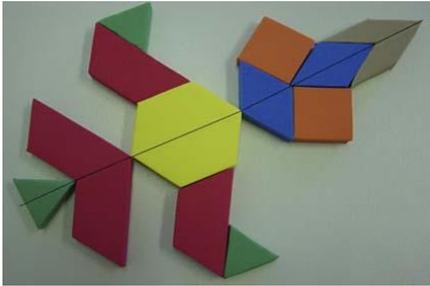
The following is a link to a video presentation and interactive activities for students on lines of symmetry from Links Learning (USA).

[http://www.linkslearning.org/Kids/1\\_Math/2\\_Illustrated\\_Lessons/4\\_Line\\_Symmetry/index.html](http://www.linkslearning.org/Kids/1_Math/2_Illustrated_Lessons/4_Line_Symmetry/index.html)

### **Exploring the Concepts of Symmetry –need to be taught in sequence**

**Lesson One -Lines of Symmetry** *Investigating the lines of symmetry of quadrilaterals*

**Lesson Two-Symmetry in Design** *Creating a design and identifying its lines of symmetry*



**Lesson Three-Pentomino symmetry** *Adding a square to a pentomino to create a symmetrical shape*

### **Aboriginal rock carving**

Students are provided with a range of aboriginal rock carving pictures. Students are to then identify lines of symmetry within the drawings.

## Guided and Independent Activities

### **Visual Symmetry**

What symmetrical objects can you see at the front of the room?...at the back of the room?...on the left side of the room? etc.

Name a symmetrical object - from your kitchen...your bedroom...the beach...etc.

Students are to identify and explain whether a given line through a shape is a line of symmetry.

### **Symmetrical Names**

Look at all the capital letters and discuss letters which are symmetrical. Have children write their names in large capitals

on a piece of paper. Children can then draw in all axes of symmetry they can find in their names.  
Who has the most?...none?...etc.

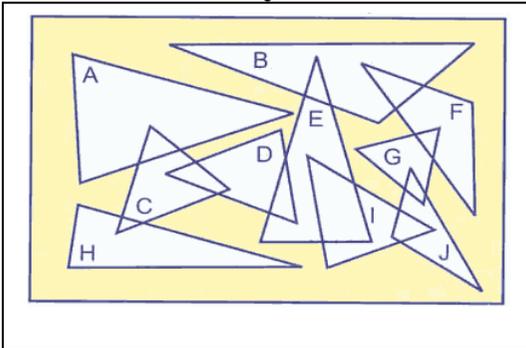
**Regular Shapes**

Provide students with regular geometric shapes, that is, shapes which have equal angles and sides of equal length. Have students fold the shapes to discover the lines of symmetry. Dotted lines can be drawn along fold lines. Construct a table showing...

SHAPE	NO. OF SIDES	NO OF LINES OF SYMMETRY
Triangle	□□3	3
Square	□□□□4	4

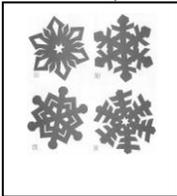
**Regular Shapes**

Students fold different triangles to determine their axes of symmetry.



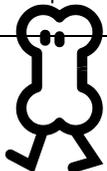
**SNOWFLAKES**

Create paper snowflakes. Use white or coloured squares of paper. Fold in half and half again. Using scissors children cut shapes out of the sides of the small square. When the paper is opened up they have a symmetrical paper pattern.



**BISCUIT SHAPES**

The students make biscuits of different shapes and bake them in an oven. The students describe what happened to the shapes when they were cooked. They group their shapes before eating them. (This could be repeated for other irregular shapes.)



**MICROSOFT PAINT**

Using Microsoft Paint students create a tessellating pattern using both regular and irregular shapes.

**Previous NAPLAN Questions**

**Year 5 2008**

22 Which flag has exactly two lines of symmetry?

Shade one bubble.

Refer to attached sheet at the end for examples of other BST questions

**Reflection**

Discuss with students the tessellating or symmetrical examples we have discovered around our environment. Hold up or show correct and incorrect examples for the students. Ask students to choose the correct examples by justifying their choice. Discuss why some examples are not correct.

**Ongoing**

Continue to discuss tessellating patterns and symmetrical shapes as they are noticed in the classroom and the school environment. Take photos and add to the examples displayed in the classroom.

**Planned Assessment**

- Draw a shape that has
- 1 line of symmetry,
- 2 lines of symmetry
- 3 lines of symmetry

4 or more lines of symmetry Include the lines of symmetry in the diagram.		
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