Mannering Park PS NSW Syllabus for the Australian Curriculum – Measurement & Geometry

Length 1

Stage 3 Outcome

A student:	Language
› describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › gives a valid reason for supporting one possible solution over another MA3-3WM › selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length MA3-9MG	**Language**: Students should be able to communicate using the following language: length, distance, **kilometre**, metre, centimetre, millimetre, measure, **measuring device**, ruler, tape measure, trundle wheel, estimate, perimeter, **dimensions**, width. When recording measurements, a space should be left between the number and the abbreviated unit, eg 3 cm, not 3cm.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
<u>**Ignition Activity**</u> **Coming to School** The teacher poses the question: 'What distance do you travel to school?' Students suggest ways to determine the distance, such as checking the odometer on the car or bus, borrowing a trundle wheel and measuring the walk to school, estimating the distance using a street directory. Students record their answers using a combination of kilometres and metres, and express the distance in kilometres to three decimal places eg 1.375 km.		Literacy Critical and creative thinking
<u>**Explicit Mathematical Teaching**</u> Teachers will need to refresh the correct terminology and the processes for findling the length of onjects. A KWL chart would be a useful way to start this topic. Teachers must take into account prior knowledge and ensure students have at least a basic understanding of how to measure. Students should recognise the need for a formal unit longer than the metre for measuring distance. There are 1000 metres in one kilometre, ie 1000 metres = 1 kilometre Students calculate the perimeters of rectangles using familiar metric units, use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles		

When students are able to measure efficiently and effectively using formal units, they should be encouraged to apply their knowledge and skills in a variety of contexts. Following this, they should be encouraged to generalise their method for calculating the perimeters of squares, rectangles and triangles.

<u>Ignition Activity</u>

Coming to School

The teacher poses the question: 'What distance do you travel to school?' Students suggest ways to determine the distance, such as checking the odometer on the car or bus, borrowing a trundle wheel and measuring the walk to school, estimating the distance using a street directory. Students record their answers using a combination of kilometres and metres, and express the distance in kilometres to three decimal places eg 1.375 km.

Literacy
Critical and creative thinking

<u>Whole Class Teaching Activities</u>- some suggestions

Less Than, More Than, About the Same

Students estimate whether places known to them are less than, more than, or about one kilometre, from the front gate of the school. These can be checked by measuring. Students record the results in a table.

Place	Less than 1 km	About 1 km	More than 1 km
Library			
Post Office			

Critical and creative thinking

Trundle wheels

Small groups of students investigate the length measured by one rotation of the trundle wheel. Students can either: (1) draw a chalk line along the ground as the wheel rotates once, (2) draw a line one metre long, or place the 1 metre ruler on the ground and rotate the wheel along the line, (3) cut a piece of string 1 metre long and place it around the wheel or (4) place a tape measure around the wheel.

Students record the procedure used to measure the length and report on the accuracy of their group's trundle wheel. Students measure and record the perimeter of playground markings or pathways. Groups compare their measurements and report on any differences.

Literacy
Critical and creative thinking

Shapes to order

Students draw and label rectangles and squares which have specified perimeters, e.g. 20 cm, 36 cm, 1 m 20 cm, 3.6 m.

Students work in groups to record as many different rectangles as possible in a set time.

Note: 1 cm grid paper may assist students who have difficulty in drawing lines.

Literacy

String Shapes Students use a piece of string 1 metre long to experiment with making triangles, rectangles and square. Students measure the lengths of the sides of the shapes in centimetres and millimetres. Students record and label the shapes as square, rectangle and the triangles as right-angled, isosceles, equilateral or scalene. Students check the measurements on the drawn shapes to ensure that each shape has a perimeter of 1 metre.		
How far is a kilometre? Students discuss how kilometres are used as a unit to measure distance, and the relationship between metres and kilometres. Students discuss how to measure 1 kilometre in the school grounds, possibly by measuring 100 metres and multiplying by 10. Students estimate, then measure to see how long it takes them to walk 1 kilometre, e.g. by walking 100 metres 10 times.		Literacy
Metre, Centimetre and Millimetre Race Students are told they are going to race across the playground in small groups. Students are given three different coloured dice, one for metres, one for centimetres and one for millimetres. They are asked to choose the equipment they would need to measure the playground eg a metre ruler and a centimetre/millimetre ruler. The groups start at one side of the playground. Each student takes a turn at rolling the three dice. They measure the distance shown on the three dice (eg 3 m, 5 cm and 4 mm), add to the group's line on the ground, and record the total distance each time eg 3.54 m or 354 cm. The winner is the first group to reach the other side of the playground. Students compare and discuss the results. Results could be checked on the calculator. Possible questions include: ▮ what strategies did you use to record your distances? ▮ were there any differences in distances between the groups? Why? ▮ would you do it differently next time? *Variation:* Students measure a smaller/larger distance and vary the equipment used.		Literacy Critical and creative thinking
Appropriate Measure The teacher poses the problem: 'Alex needs to measure the length of the school hall. What measuring device and unit of measurement do you suggest would be best for him to use?' Explain why.		Literacy Critical and creative thinking
Perimeter Discuss what perimeter is - construct a definition - and what it's used for. Find the perimeter of a large area e.g. school playground and calculate and compare perimeters of squares, rectangles and triangles.		Literacy

Introduction To Perimeter Pairs of students find the perimeter of a rectangle or square by measuring, recording and then adding each side. Examples may include rectangular cards or drawings with sides which measure a whole number of centimetres. Students discuss the possible methods of finding the perimeter of a rectangle, and report on whether it is necessary to measure all four sides of a rectangle or square. Measure and record the perimeter of a desk or two desks joined together, by measuring one edge at a time. Record the perimeter in metres and centimetres. Check by using a long tape measure or piece of string. Students need multiple opportunities to; • use the term 'dimensions' to describe the 'lengths' and 'widths' of rectangles • calculate perimeters of common two-dimensional shapes, including squares, rectangles, triangles and regular polygons with more than four sides (ie regular polygons other than equilateral triangles and squares) • recognise that rectangles with the same perimeter may have different dimensions • explain that the perimeters of two-dimensional shapes can be found by finding the sum of the side lengths • explain the relationship between the lengths of the sides and the perimeters for regular polygons (including equilateral triangles and squares) record calculations used to find the perimeters of two-dimensional shapes		Literacy Critical and creative thinking
Shapes To Order Students draw and label rectangles and squares which have specified perimeters, e.g. 20 cm, 36 cm, 1 m 20 cm, 3.6 m. Students work in groups to record as many different rectangles as possible in a set time. *Note:* 1 cm grid paper may assist students who have difficulty in drawing lines.		Literacy

Guided/Independent Activities-some suggestions **Fun Run** In pairs, students plan the course of a fun run of 1 km within the school grounds. Students check the measurements in the school grounds using tapes, trundle wheels etc. Students are provided with a map of the school and discuss the scale they will use to draw a diagram of their course. They then draw and label their diagram. Possible questions include: - how many metres long is your fun run course? How do you know? - how did you measure the distance? - how could the distance be halved for younger runners? - how could you measure this distance? - how could the distance be doubled without retracing steps? Students place markers at intervals along the course to mark the distances and direction. They calculate and record the distances between the markers in metres (eg 80 m) and convert them to kilometres. They add the distances using a calculator to determine the length of the course.		Literacy Critical and creative thinking
Measuring Perimeter Students select the appropriate measuring device and unit of measurement to measure the perimeter of their desktops, the perimeter of the classroom floor and the perimeter of the school. Students compare their measurements and discuss. Students find the perimeter of a face of a small object eg an eraser. Students write their own list of objects for which perimeters could be measured. Possible questions include: - How could we categorise the list? In small groups, students categorise items into groups under the headings suggested.		Literacy Critical and creative thinking
Calculating Perimeter Students are given a sheet of paper on which a square, a rectangle, an equilateral triangle and an isosceles triangle have been drawn. Students calculate the perimeter of each shape. Students record and compare their findings. Possible questions include: - how will you calculate the perimeter of each shape? - did you discover an easy way to calculate the perimeter of squares , rectangles and triangles		Literacy Critical and creative thinking

Fixed Perimeter Students construct a rectangle, a square and a triangle, with a given perimeter eg 30 cm. Students label the shapes and explain why they have the same perimeter. Students discuss whether the areas of shapes with the same perimeter have the same area.		Literacy
Room For Elbows Students design a dinner table which will seat four students along each side, with enough space to eat comfortably. Students draw a diagram of the table with listed reasons for the dimensions.		Critical and creative thinking
Cut In Half Students choose a large, rectangular picture from a magazine. Students measure and record the perimeter. The picture is cut in half and the perimeter measured and recorded again. Students cut the picture in half again and measure the perimeter. Students record results with labelled diagrams and comment on how the measurements are changing. Students present to the class the results in a table and graph.		Literacy
Mystery Flight Students use the scale on a map of NSW (Google Maps). Students plan a mystery flight of 1000 kilometres (for example), which commences from the nearest airport and includes up to four take-offs and landings. Students present this to the class.		Literacy Critical and creative thinking Information and communication technology capability
Design A Cross Country Track Students work in pairs or small groups to design a 3 kilometre cross country course for their school. Students draw the course to scale and label their plan with the scale used and the length of each part of the course.		Literacy Critical and creative thinking

Plan a Trip Students use a website to complete an itinerary for a trip. On the site www.Travelmate.com.au students can click on *Smart Trip* and enter trip details, e.g. from Sydney to Bathurst for a detailed itinerary. From the driving directions, students will need to convert units to calculate time and distance. Students could complete a timeline of their trip using 24 hour time. Students can use www.qantas.com.au to plan a holiday with a flight.		Literacy Critical and creative thinking Information and communication technology
How Long? Students work in small groups to answer: How long is the wool in a ball of wool? Students may need to discuss a range of strategies before commencing to measure. Students express the measurement in kilometres, and in metres.		Literacy Critical and creative thinking
Maths for Sustainability Website http://maths4sustainability.wordpress.com/2011/08/02/holding-hands-around-the-world/ Use sustainability website to interpret and explore the use of length in real life situations.		Sustainability Critical and creative thinking Information and communication technology capability

Length 2

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 › selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length MA3-9MG	**Language**: Students should be able to communicate using the following language: length, distance, kilometre, metre, centimetre, millimetre, perimeter, dimensions, width.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date LAC Icons
<u>Ignition Activity</u> **Three Decimal Places** Students choose a distance of less than one kilometre and write their distances in metres on a card. On the back of the card students record the distance in kilometres e.g. 276 m = 0.276 km. The teacher asks: ▮ 'Who has the shortest distance?' This student stands at the front of the room. ▮ 'Who has the longest distance?' This student stands at the back of the room. The remainder of the class sort themselves between these two students in order. Students compare the two ways of recording the distances.		Literacy
<u>Explicit Mathematical Teaching</u> When the students are able to measure efficiently and effectively using formal units, they should be encouraged to apply their knowledge and skills in a variety of contexts. Following this they should be encouraged to generalise their method for calculating the perimeter of squares, rectangles and triangles. Review the units of measurement - mm, cm, m, km and converting between them. Discuss the devices you would use to measure the above units. Explain the relationship between the size of a unit and the number of units needed e.g. more metres than kilometres will be needed to measure the same distance. Discuss the need for universal units of measurement.		

Students will need to recognise the equivalence of whole-number and decimal representations of measurements of length, eg 165 cm is the same as 1.65 m and interpret decimal notation for lengths and distances, eg 13.5 cm is 13 centimetres and 5 millimetres.Students should be able to record lengths and distances using decimal notation to three decimal places, eg 2.753 km. Recognise the need for a unit longer than a metre for measuring distance (class discussion). Recognise that 1000 m = 1km and that 1m is 1/1000 of a km. Discuss places known to students that are standard lengths e.g. 25m pool, 50m pool, 100m sprint, 400m track, distance from school to Toronto. Measure 1 km around the back flat using trundle wheels or 100m lengths of string. **LENGHTS CONVERSIONS (PART 1)** **The base unit for length is the metre (m).** **1 km = 1000 m** ***kilo* = 1000** **1 m = 100 cm** **1 cm = 10 mm** $milli = \frac{1}{1000}$ ***BIG ⇒ SMALL, we multiply*** ***SMALL ⇒ BIG, we divide***		

Examples **Complete the conversions:** (a) 4 km = $\times 1000$ 4 000 m (b) 7.5 m = $\times 100$ 750 cm (c) 19.6 cm = $\times 10$ 196 mm (d) 0.25 m = $\times 100$ → 25 cm → $\times 10$ → 250 mm mathsonline.com Teachers will need to model and demonstrate how to convert between common metric units of length eg metres and kilometres, millimetres, centimetres and metres. Students require multiple opportunities to solve problems involving the comparison of lengths using appropriate units.		

Converting Between Millimetres, Centimetres and Metres
Students find, measure and record the lengths of three things:
- smaller than 1 cm
- bigger than 1 cm and smaller than 10 cm
- bigger than 10 cm and smaller than 1 m.

Students record measurements in metres, centimetres and millimetres using decimal notation.

Measurement	In metres	In centimetres	In millimetres
Watch band width	0.018 m	1.8 cm	18 mm

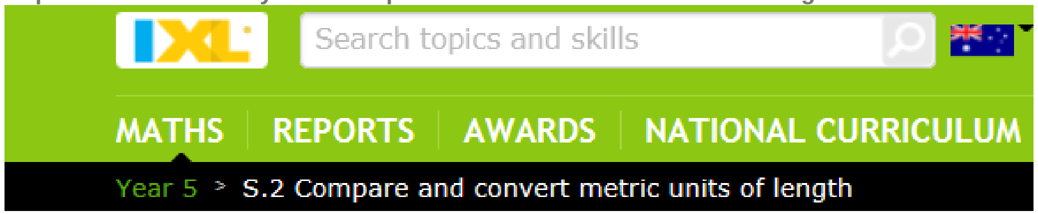
Possible questions include:
- can you estimate and measure the perimeter of six different objects in the classroom?
- what measuring device did you use? Why? What unit did you use to record your measurement initially?
- how did you convert your measurements to millimetres? Centimetres? Metres?

Literacy
Critical and creative thinking

<u>Conversion Table</u>

Complete a conversion table using mm, cm, m, km. (standard abbreviations)

mm	cm
10	1
100	10

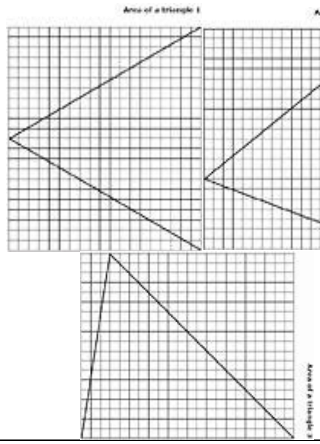
Tyres Students use a piece of string (or similar) to measure the circumference of a bike or car wheel. They then measure the string to determine the distance travelled in one revolution of the tyre and record the measurement in millimetres and centimetres. They calculate the distance travelled in 5 revolutions, 10 revolutions, 100 revolutions and 1000 revolutions, recording the distances using combinations of millimetres, centimetres, metres and kilometres, and using decimal notation to three decimal places.		Literacy Critical and creative thinking
Adding Lengths Students measure dimensions of three items, each involving a different unit of length e.g. thickness of an eraser, length of a pencil and length of a desk. They add these three measurements e.g. 5 mm, 20 cm and 1.2 m together to find the total length. Students choose three other items and measure and add their lengths.		Critical and creative thinking
Problem Solving http://au.ixl.com/math/year-5/compare-and-convert-metric-units-of-length 		Literacy Information and communication technology capability
Problem Solving **Teachers will need to develop a wide range of problem solving situations for their class. Students should be encouraged to write problems for their peers.**		Literacy Critical and creative thinking

Area 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 uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles MA3-10MG	**Language**: Students should be able to communicate using the following language: area, measure, square centimetre, square metre, **square kilometre**, **hectare**, **dimensions**, **length**, **width**. m^2 is read as 'square metre(s)' and not 'metre(s) squared' or 'metre(s) square'. cm^2 is read as 'square centimetre(s)' and not 'centimetre(s) squared' or 'centimetre(s) square'.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date LAC Icons
Ignition Activity **Yes/No** Class game. One student chooses and measures a surface in the classroom, and calculates the area in square centimetres or square metres. The class is told the area measurement and has to guess which object or surface was chosen. Students selected to be "in" may have to measure their area during a break when the class is not in the room.		
Explicit Mathematical Teaching Students should have a clear understanding of the distinction between perimeter and area. Area, or the amount of surface, is a two-dimensional quantity and has to be identified as a property of a three-dimensional object. The three-dimensional nature of the object being measured may obscure the two-dimensional nature of area. For example, the surface of a student's desk or the floor can be measured by overlaying it with square units. However, students may think that they are measuring the size of the desk itself because the concept of a surface with length and breadth but no width is difficult to imagine. Students may also gain the impression that areas are horizontal or vertical flat surfaces because such surfaces are most commonly measured. Students are likely to measure the area of the top of their desk, but not the areas of its sides, underneath surface, or legs. The areas of		

these surfaces are usually not measured, nor are other hard to measure areas, such as curved or irregular surfaces. It is important in Stage 3 that students establish a real reference for the square kilometre and the hectare, eg locating an area of one square kilometre or an area of one hectare on a local map. When the students are able to measure efficiently and effectively using formal units, they should be encouraged to apply their knowledge and skills in a variety of contexts. Students could be encouraged to find more efficient ways of counting such as finding how many squares in one row and multiplying this by the number of rows. Students could be encouraged to find more efficient ways of counting when determining area, such as finding how many squares in one row and multiplying this by the number of rows. When generalising their methods to calculate areas, students in Stage 3 should use words. Algebraic formulas for areas are not introduced until Stage 4.Extend mathematical tasks by asking questions eg 'If I change the dimensions of a rectangle but keep the perimeter the same, will the area change?'		
<u>**Whole Class Teaching**</u> **Bits and Pieces** Students work with a partner to use two or three cardboard templates of different rectangles and squares to make a composite shape. Students trace around the outline of the composite shape and mark and label the lengths of all sides on 1cm grid paper. Students swap their drawing with another pair of students, who must find the area of the composite shape from the given dimensions. Students check their answer by comparing with the areas of the cardboard templates. Record, using words, the method for finding the area of any rectangle, eg 'Area of rectangle = length × width'. Students calculate areas of rectangles (including squares) in square centimetres and square metres. They recognise that rectangles with the same area may have different dimensions Ensure students connect factors of a number with the whole-number dimensions of different rectangles with the same area and record calculations used to find the areas of rectangles		Literacy
Area sequences Set students the task of drawing the series of rectangles: 1cm x 8cm, 2cm x 8cm, 3cm x 8cm, 4cm x 8cm, 5cm x 8cm. Ask students to record the areas of the rectangles as a sequence, describe the sequence and look for patterns. Ask students to draw another series of rectangles involving fractions or decimals such as the following: 1cm x 3.5cm, 2cm x 3.5cm, 3cm x 3.5cm. Discuss: *How would you describe this sequence of multiples?*		Literacy

Cut and compare (refer to lesson for more detail) Pairs or individual students commence by taking a rectangle such as an A4 sheet of paper or smaller. Students draw and cut along one diagonal and investigate whether the two triangles which have been made are the same size. Students continue with different-sized rectangles to see if they can find a rectangle where the two triangles are not the same. Students select one of their rectangles and use the area of the rectangle to calculate the area of each triangle. As a whole class discuss how to find the area of a right-angled triangle.		Literacy Critical and creative thinking
Investigation Provide student worksheets to students in sequence. Students work with a partner to investigate the relationship of the triangle to the rectangle. Students write in words how they can find the area of any triangle. 		Literacy Critical and creative thinking
How Big is One Hectare? Show students a scale drawing of one hectare. Ask them how many square metres are represented. Have a brainstorming session to share the knowledge students have about hectares and to raise questions or problems they would like to investigate. Students might ask: ➢ "Could we make a hectare with newspaper?" ➢ "Are all hectares the same shape?" ➢ "What is this measurement used for?" Students recognise that there are 10 000 square metres in one hectare, ie 10 000 square metres = 1 hectare		Literacy Critical and creative thinking

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- equate one hectare to the area of a square with side lengths of 100 m
- relate the hectare to common large pieces of land, including courts and fields for sports, eg a tennis court is about one-quarter of a hectare (Reasoning)
- determine the dimensions of different rectangles with an area of one hectare
- record areas using the abbreviations for square kilometres (km^2) and hectares (ha)

- Take students to a large flat area, e.g. large playground, paddock. Students measure out 100m x 100m using trundle wheels. Students could place a marker every ten metres to show the boundaries. Ask students to name areas they think are about one hectare.
- Ask students to represent one hectare by drawing a 10 x 10 square on grid paper. Students cut up the diagram and rearrange the pieces to form other shapes. The shapes can have the side lengths marked and all diagrams can be labelled as “One Hectare” or “1 ha”.

Discuss the area of a hectare being equal to 10 000 square metres.

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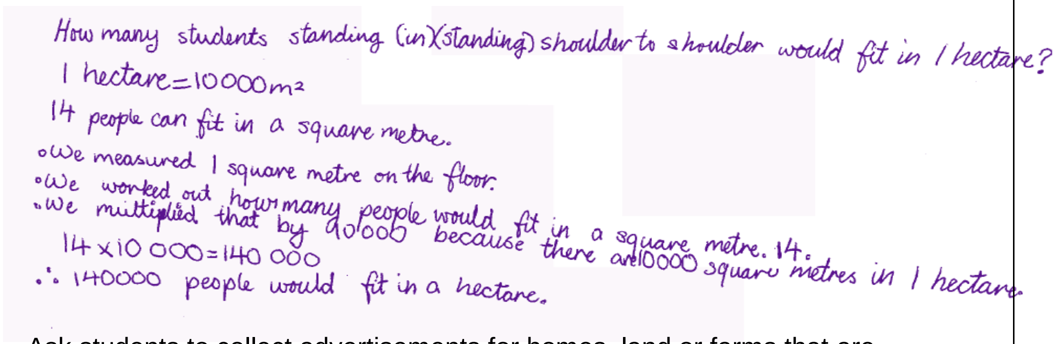
Believe It or Not!

How many Year 5 or Year 6 students could stand, shoulder to shoulder, in a square hectare?

How many Year 5 or Year 6 students could stand, shoulder to shoulder, in a square kilometre?

Extension: *If the world’s population was standing shoulder to shoulder, what area would be covered?*



- Ask students to collect advertisements for homes, land or farms that are expressed in hectares. Students can discuss the contents of the advertisements and questions such as:
  - “What is the most common area given in the advertisements?”
  - “Can you draw the shape of the land from the information given in the advertisements?”
  - “What additional information would you like to see in the advertisements?”

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<td>Literacy
Critical and creative thinking</td>
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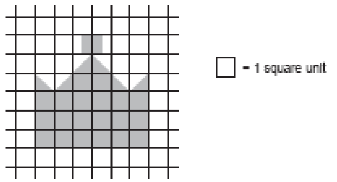
Largest Area, or Longest Borders?(Integrate in HSIE) Students investigate: ➢ Which Australian state has the largest area? ➢ Can you compare this with the state that has the smallest area? ➢ Which state has the longest borders? Students explain how they calculated their answers.		Literacy Critical and creative thinking
<u>**Guided Group/Independent Activities**</u> **Calculating areas** Have students find the areas of a number of rectangles drawn on 1cm grid paper. Students record the dimensions of the rectangles and the number of square units they counted for each rectangle in a table. Ask students to look for patterns in these numbers and use the pattern found to predict the area of other rectangles whose length and width are shown in a table.		Critical and creative thinking
Rectangles Use tiles that are 1cm ^{2} to make three different rectangles that have areas of 24cm^2. Draw them on grid paper, labelling lengths and widths. Students can make another table to show the dimensions of their rectangles and the areas. Discuss the number patterns with the students and have them repeat the activity using a different number of tiles. Establish the relationship between the lengths, widths and areas of rectangles (including squares) Explain that the area of a rectangle can be found by multiplying the length by the width		Literacy
Area of squares and rectangles Ask students to find the area of some common flat surfaces of squares and rectangles found in the classroom using Base 10 material. Count the number of squared centimetres. Then introduce the formula length x breadth. Have students calculate the surface area of other squares and rectangles using the formula.		
Area of rectangular prisms Measure the surface area of rectangular prisms by using a square centimetre grid overlay or by counting unit squares.		

Integrated Task: **Digging around the vegetable garden** http://efs.tki.org.nz/Curriculum-resources-and-tools/Digging-around-for-a-good-idea Education for SUSTAINABILITY		Sustainability Critical and creative thinking
<u>Previous NAPLAN Question</u> **NAPLAN 2008** 7  Shade one bubble. The shaded area on this grid, in square units, is closest to 18 ○ 24 ○ 28 ○ 36 ○		Literacy

Area 2

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

› selects and uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles MA3-10MG

Language: Students should be able to communicate using the following language: area, square centimetre, square metre, dimensions, length, width, **base (of triangle)**, **perpendicular height**.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
Explicit Teaching		

Explicit Teaching

AREA OF A TRIANGLE

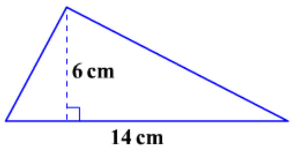
Area of a Triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

$$A = \frac{1}{2}bh$$

Examples

Find the area:

(a)

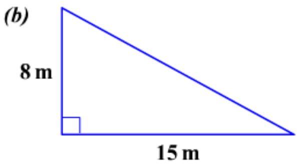


$A = \frac{1}{2}bh$

$= \frac{1}{2} \times 14 \times 6$

$= 42\ \text{cm}^2$

(b)

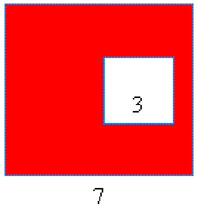


$A = \frac{1}{2}bh$

$= \frac{1}{2} \times 15 \times 8$

$= 60\ \text{m}^2$

mathsonline.com

Relationship – Rectangle to Triangle Teacher models that a triangle is simply half a rectangle. Students investigate the area of a triangle by comparing the area of a given triangle to the area of the rectangle of the same length and perpendicular height, eg use a copy of the given triangle with the given triangle to form a rectangle Students complete reflecting explaining the relationship between the area of a triangle and the area of the rectangle of the same length and perpendicular height.		Literacy Critical and creative thinking
Rectangles with the same Perimeter Students investigate and compare the areas of rectangles that have the same perimeter, eg compare the areas of all possible rectangles with whole-number dimensions and a perimeter of 20 centimetres. Students determine the number of different rectangles that can be formed using whole-number dimensions for a given perimeter		Critical and creative thinking
Word problem #1: The area of a square is 4 centimetres. What is the length of a side? **Important concept**: Square. It means 4 equal sides. Area = s × s= 4 × 4 = 16 $centimetres^2$ **Word problem #2:** A small square is located inside a bigger square. The length of one side of the small square is 3 centimetres and the length of one side of the big square is 7 centimetres What is the area of the region located outside the small square, but inside the big square? **Important concept**: Draw a picture and see the problem with your eyes. This is done below: 		Literacy Critical and creative thinking

The area that you are looking for is everything is red. So you need to remove the area of the small square from the area of the big square Area of big square = s × s = 7 × 7 = 49 $centimetres^2$ Area of small square = s × s = 3 × 3 = 9 $centimetres^2$ Area of the region in red = 49 - 9 = 40 $centimetres^2$ **Word problem #3:** A classroom has a length of 20 metres and a width of 30 metres. The headmaster decided that tiles will look good in that class. If each tile has a length of 24 centimetres and a width of 36 centimetres, how many tiles are needed to fill the classroom? **Word problem #4:** Sometimes area word problems may require skills in algebra, such as factoring and solving quadratic equations A room whose area is 24 m^2 has a length that is 2 metres longer than the width. What are the dimensions of the room? **http://www.basic-mathematics.com/area-word-problems.html**		Literacy Critical and creative thinking

Volume and Capacity 1

Stage 3 Outcome	
A student: › describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › gives a valid reason for supporting one possible solution over another MA3-3WM › selects and uses the appropriate unit to estimate, measure and calculate volumes and capacities, and converts between units of capacity MA3-11MG	**Language**: Students should be able to communicate using the following language: capacity, container, volume, layers, cubic centimetre, **cubic metre**, measure, estimate.

Teaching and Learning Activities	**Notes/ Future Directions/Evaluation**	**Date/ LAC Icons**
Ignition Activity http://mathsstarters.net/numbersgame		
Explicit Mathematical Teaching The attribute of volume is the amount of space occupied by an object or substance and is usually measured in cubic units, eg cubic centimetres (cm^3) and cubic metres (m^3).Capacity refers to the amount a container can hold and is measured in units, such as millilitres (mL), litres (L) and kilolitres (kL). Capacity is only used in relation to containers and generally refers to liquid measurement. The capacity of a closed container will be slightly less than its volume – capacity is based on the inside dimensions, while volume is determined by the outside dimensions of the container. It is not necessary to refer to these definitions with students (capacity is not taught as a concept separate from volume until Stage 4). Once students are able to measure efficiently and effectively using formal units, they could use centimetre cubes to construct rectangular prisms, counting the number of cubes to determine volume, and then begin to generalise their method for calculating the volume.The cubic metre can be related to the metre as a unit to measure length and the square metre as a unit to measure area. It is important that students are given opportunities to reflect on their understanding of length and area so that they can use this to calculate volume.		Literacy

<u>Whole Class Teaching</u> **Five different ways to model 36cm^3** Task: Use 36 cubes to design a box that can hold 36 chocolates Discuss how a rectangular prism with a volume of 36 cubic centimetres could be built from cubic centimetre blocks (e.g. 3x4x3, 2x6x3, 4x9x1, 12x1x3). Pairs of students design and construct their 36 cm3 rectangular prism. Students display their diagrams, calculations and models and the class discusses the variations in rectangular prisms.		Literacy
Grid Prisms Pairs of students or individual students design and make rectangular prisms by folding, cutting and taping the nets of prisms drawn on 1 cm grid paper. Students find the volume of the prism in cubic centimetres, and record how the volume was calculated or counted. As a reflection students explain the advantages and disadvantages of using cubic-centimetre blocks as a unit to measure volume.		Literacy Critical and creative thinking
Make a Cubic Metre Students discuss what a cubic metre is, and what is measured in cubic metres. Students estimate the size of a cubic metre, half a cubic metre and two cubic metres. Small groups make a skeleton model of a cubic metre with wooden dowel or plastic sticks, rolled newspaper or a commercial kit. Students check all dimensions with a metre rule or tape measure. *C*ollect MAB blocks and flats from other classrooms, to make a model of a cubic metre. If possible, make one layer and at least one vertical column from blocks or ten flats placed together as a block. Students discuss how many cubic centimetres are in one layer, and how many cubic centimetres are in ten layers. The availability of materials may restrict this activity to a whole class demonstration and discussion, or a task completed by one small group at a time.		Literacy Critical and creative thinking
<u>Guided Group/Independent Activities</u> **Claustrophobia** Students use cubic metre models from a previous lesson to estimate then measure how many students can fit into a cubic metre. Small groups investigate how many students could fit into the classroom, if students were packed to the ceiling. How many rooms would be required for all of the students and teachers in the school? Record volumes using the abbreviation for cubic metres (m^3)		Critical and creative thinking
Loaves to the cubic metre Students investigate how many loaves of bread can be packed into 1 cubic metre. Suggestion: students make a scale drawing of one layer of loaves of bread, to find how the loaves can be arranged to fit 1 square metre, then calculate the number of layers.		Critical and creative thinking

<table>
<tr>
<td>What Went In?
Students in pairs mark the water level on a container and then add a model built from centimetre blocks. The new level is marked and the model removed. Students calculate the volume of the model in cubic centimetres and the volume of water displaced in millilitres. The container is given to a second pair of students who estimate the volume of blocks that were added, and check by building and adding a model. The students compare their results with the original measurements.</td>
<td></td>
<td>Critical and creative thinking</td>
</tr>
<tr>
<td>How Deep?
Students calculate the depth of water in containers when 1 litre of water has been poured into: a container with a base of 10 cm x 5 cm and height 30 cm a container with a base of 20 cm x 10 cm and height of 10 cm a container with a base of 30 cm x 7 cm and height of 10 cm.

Students work in pairs to set problems for each other, increasing the volume of water and the dimensions of the containers.</td>
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<td>Literacy
Critical and creative thinking</td>
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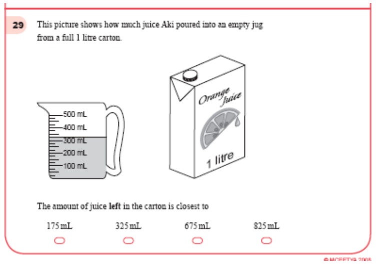
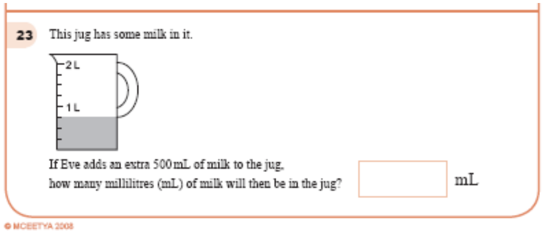
<td><u>Previous NAPLAN Questions</u>
NAPLAN 2008-Year5

NAPLAN 2008-Year 7
</td>
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<td>Literacy</td>
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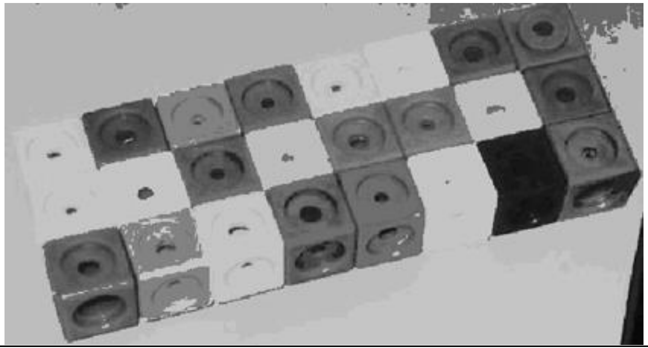
</table>

Volume and Capacity 2

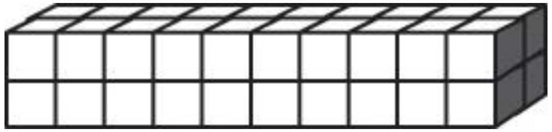
Stage 3 Outcome	
A student: › describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations MA3-2WM › gives a valid reason for supporting one possible solution over another MA3-3WM › selects and uses the appropriate unit to estimate, measure and calculate volumes and capacities, and converts between units of capacity MA3-11MG	**Language**: Students should be able to communicate using the following language: capacity, container, litre, millilitre, volume, **dimensions**, **length**, **width**, **height**, layers, cubic centimetre, cubic metre.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
<u>Ignition Activity</u> Get a 2L ice cream container filled with water and frozen. Allow it to melt completely and pour into a measuring jug. Students discuss the findings. Pose Question: How much ice cream are we really getting?		Literacy
<u>Explicit Teaching</u> Teachers need to explain and use the relationship between the size of a unit and the number of units needed to assist in determining whether multiplication or division is required when converting between units, eg 'Fewer litres than millilitres will be needed to measure the same capacity, and so to convert from millilitres to litres, I need to divide' Students will need to use repeated addition to find the volumes of rectangular prisms, eg 'My rectangle has 3 layers of 6 cubes, so the total number of cubes is 6 plus 6 plus 6, or 18' Ensure that students establish the relationship between the number of cubes in one layer, the number of layers, and the volume of a rectangular prism and are able to explain that the volume of a rectangular prism can be found by finding the number of cubes in one layer and multiplying by the number of layers.		Literacy

Whole Class Teaching and Learning Activities Complete the following activities to ensure that students connect volume and capacity and their units of measurement: • demonstrate that a cube of side 10 cm will displace 1 litre of water http://www.curriculumsupport.education.nsw.gov.au/primary/mathematics/assets/pdf/stage3/whatwentin.pdf • demonstrate, by using a medicine cup, that a cube of side 1 cm will displace 1 mL of water • equate 1 cubic centimetre to 1 millilitre and 1000 cubic centimetres to 1 litre Students use the above strategies to find the volumes of irregular solids in cubic centimetres using the displacement strategy.		
Volume of Prisms Students are given a collection of interlocking cubes (centicubes). Ask: • *How long is the side of each cube?* • *What is the volume of each cube? How did you know?* • Students make a rectangular prism using 24 cubes and record the dimensions (length, breadth, height). Determine the volume is 24 cubic units. Look at the relationship between the volume, length, breadth and height. • *What is the volume of each prism?* 24 cubic units/cubic centimetres • *How can we calculate the volume using the length, breadth and height of the prism?* • *Can you make other rectangular prisms with a volume of 24 cubic units?* 		Literacy Critical and creative thinking

Students attempt to make other prisms, record the results and describe what they notice.
Discuss:

- *How is your second prism different from your first prism?*
- *How is your second prism similar to your first prism?*
- *What is the length, breadth and height of each prism?*
- *What generalisations can you make?*
- *How do know that you have made all the possible prisms?*
-



Students draw some of the models they have made.

Students use centicubes to construct a rectangular prism which is 3 cm long, 2 cm wide and 1 cm high. Students add more cubes to the prism by following the steps below. After each step they must add the details to the table.

- What is the volume of the prism? Complete row a) of the table.
- Add another layer to this prism so the height is now 2 cm. Complete row b) of the table.
- Add another layer to this prism so the height is now 3 cm. Complete row c) of the table.
- Repeat with a height of 4 cm. Complete row d) of the table.
- Repeat with a height of 5 cm. Complete row e) of the table.
- Students choose their own measurement for the height and complete row f).

	Length	**Breadth**	**Height**	**Volume (cm^3)**
a	3 cm	2 cm	1 cm	
b	3 cm	2 cm	2 cm	
c	3 cm	2 cm	3 cm	
d	3 cm	2 cm	4 cm	
e	3 cm	2 cm	5 cm	
f	3 cm	2 cm		

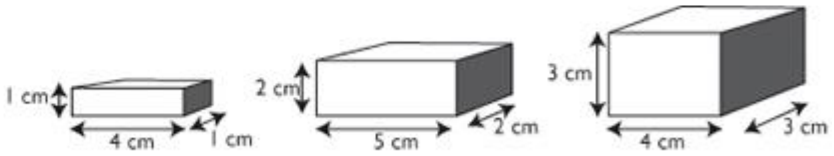
Literacy
Critical and creative thinking

Students complete similar tables where they are given two dimensions and the volume of a prism. Students have to calculate the missing dimension, e.g.

Length	Breadth	Height	Volume (cm^3)
-	5 cm	2 cm	80 cm^3

Rectangular Prisms

Provide students with drawings of a variety of rectangular prisms which have the dimensions labelled. Students have to determine the volume of each prism and give reasons for their answer.



Diagrams not to scale

Critical and creative thinking

Problem Solving

Pose this problem. Imagine a box which is 1 metre long, 1 metre wide and 1 metre high. Ask:

- *What is the volume of the box in cubic metres?*
- *What is the volume of the box in cubic centimetres?*
- *How did you work out this answer?*
- *How many centicubes would be needed to fill the box?*

http://www.schools.nsw.edu.au/learning/7-12assessments/naplan/teachstrategies/yr2010/index.php?id=numeracy/nn_meas/nn_meas_s3e_10

Literacy
Critical and creative thinking

Challenge

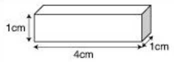
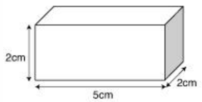
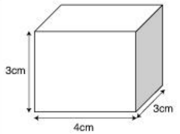
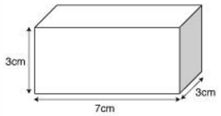
Students collect a handful of centicubes and a stopwatch. Within a time limit of 20 seconds the students have to construct the biggest prism that they can. They report back to the class by answering these questions:

- *How many centicubes did you use?*
- *How high is your prism?*
- *How wide is your prism?*
- *How long is your prism?*
- *What was the volume of your prism in cubic centimetres?*

Tell students to use the same number of centicubes to build a different prism. It will have the same volume because the students used the same number of cubes.

Students draw this prism and write the length, width and height in centimetres and note that it has the same volume.

Construct these solid rectangular prisms using centicubes. Record how many centicubes were needed to build each prism.

	Number of centicubes	Volume
		
		
		
		

[view and print]

Literacy
Critical and creative thinking

Calculating volume
Provide students with a copy of the table
a) Students use centicubes to construct a rectangular prism which is 3 cm long, 2 cm wide and 1 cm high.
Discuss:

- *How many centicubes did you use?*
- *What is the volume?*
- Complete the details in row (i) of the table. See below.

b) Add another layer to this prism so the height is now 2 cm. Complete row (ii) in the table.
c) Add another layer to this prism so the height is now 3 cm. Complete row (iii) in the table.
d) Repeat with a height of 4 cm.
e) Repeat with a height of 5 cm.
f) Choose your own measurement for the height and complete (vi).

Calculating volume

	Length	Breadth	Height	Number of Centicubes	Volume in cm^3
i)	3 cm	2 cm	1 cm		
ii)	3 cm	2 cm	2 cm		
iii)	3 cm	2 cm	3 cm		
iv)	3 cm	2 cm	4 cm		
v)	3 cm	2 cm	5 cm		
vi)	3 cm	2 cm			

view and print

Students look at the information in their table. Ask:

- *Can you see a relationship between the length, breadth, height and volume of your prisms?*
- *What happened to the volume when you increased the height of the prism?*

Students write what they have discovered about the volume of prisms. Include information about length, breadth, height and cubic centimetres.

Students complete this statement:

To find the volume of a rectangular prism, multiply the l__________, by the b__________, by the h__________.

Students use the fact, volume = length x breadth x height, to calculate the missing measurements and complete the table.

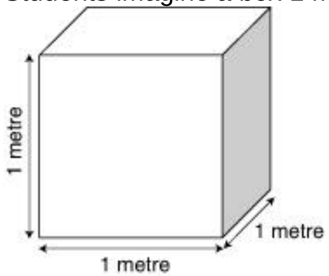
	Length	Breadth	Height	Volume
i)	4 cm	3 cm		24 cm^3
ii)		5 cm	2 cm	80 cm^3
iii)	3 cm		3 cm	27 cm^3
iv)	6 cm	2 cm	4 cm	

view and print

Students find a box and study the dimensions, its length, breadth and height. Students estimate its volume in cm^3. They explain to the class the procedure they used to estimate the volume. Students check how accurate their estimations were by measuring the box and working out the volume. They may use a calculator

1x1x1

Students imagine a box 1 metre long, 1 metre wide and 1 metre high.



Use a calculator to work out the volume of the box.

Discuss:

- *How many centicubes would it take to fill this box?*
- *Would you be able to lift the box when it was full?*

Literacy

Critical and creative thinking

Mass 1

<table>
<tr><td colspan="3">Stage 3 Outcome</td></tr>
<tr><td colspan="2">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
› selects and uses the appropriate unit and device to measure the masses of objects, and converts between units of mass MA3-12MG</td><td>Language: Students should be able to communicate using the following language: mass, gross mass, net mass, measure, device, scales, tonne, kilogram, gram.</td></tr>
<tr><td>Teaching and Learning Activities</td><td>Notes/ Future Directions/Evaluation</td><td>Date/ LAC Icons</td></tr>
<tr><td><u>Explicit Mathematical Teaching</u>
Mass is defined as the amount of matter in an object but, like time and temperature, it cannot be seen. Students may confuse mass and volume because objects with a larger volume will often have more mass than with a smaller volume. However, if two contrasting materials are compared, for example, foam packaging and iron, students will quickly realize that the larger volume does not necessarily have the larger mass. Mass may also be confused with weight. Students may have some awareness of the difference between these two concepts now that space travel has been widely reported and astronauts have been shown to weigh less on the moon because the moon's gravitational field is not as strong as that of earth. Weight is a force that is affected by gravity and so as gravity changes, the weight of an object will change. So scientifically, it is incorrect to say an object weighs one kilogram because weight is measured in units of force (Newton's, named after Sir Isaac Newton who formulated the law of gravity). The correct expression is that an object has a mass of one kilogram. Use of precise language by teachers will assist students to distinguish between these two concepts when they encounter them in secondary school.
The measurement framework for mass is slightly different from length, area and volume as units of mass are not spatially organized. Students learn to use an equal-arm balance to measure mass in Level 1.3 and then progress to the use of informal units in Level 2. The only concept at Level 3 is that of the relationship between the size of the unit and the number of units. For example, if four-block units are used to balance an</td><td></td><td>Literacy</td></tr>
</table>

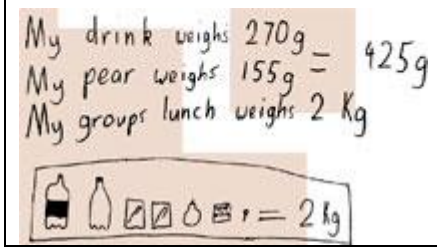
object, then four times as many will be needed if one block units are substituted. In levels 4, 5 and 6, students are progressively introduced to using and recording the formal units of measure, grams, kilograms and tonnes. As with length, area, and volume and capacity, it is important that students be given ample opportunities to select the units of measure and the measuring instruments which are appropriate to the task. ***NB** Gross mass is the mass of the contents and the container. Nett mass is the mass of the contents only.*		Literacy
Aussies Abroad Students work in small groups to investigate the gross and net weights of small plastic jars and large glass containers of vegemite. If several different examples are used, each container can be examined by a small group and then rotated to the next group. Students determine which containers would hold the greater volume of Vegemite and find how many of each container would fit into a 10 kilogram carton (students may choose to use a calculator). *C*ompare the vegemite containers by finding the best value-for-money.		Critical and creative thinking
Lunchtime Students weigh and record each item in their lunch box. Express each item in grams. Total the number of grams of their lunch. Compare with other students. *Note:* ensure the students have access to scales that can accurately measure small masses in grams; lunches which have been ordered at the school canteen will need to be collected early to be available for the activity. *A*sk students to use kitchen scales at home to find the mass of their breakfast and dinner, then calculate the total mass of food eaten in a day.		Critical and creative thinking
Accurate Students work in pairs or small groups to check the accuracy of kitchen and bathroom scales by using mass pieces. Students draw a table to record the measure of each mass, and comment on the accuracy of each instrument. Note: ensure the kitchen scales used are able to measure a mass of more than two kilograms. If the scales are inaccurate, predict and measure what happens when the mass is increased.		Critical and creative thinking

Which unit would you use? Students think of ten different animals, from very large, to small, and record this list. Beside each animal name, students write the unit of mass which may be used to measure each one. Students research the mass of several of the listed animals and record the results. Students find the difference between the lightest animal and the heaviest animal; students find the number of small animals required to balance the mass of the largest animal. *Note:* students may need to be reminded that resource material can refer to both imperial and metric measurements such as ton or tonne. (pp. 134-135 *Teaching Measurement Stage 2 and Stage 3*)  1 Elephant = tonnes African Elephant = 4 tonnes 2. Giraffe = tonnes Giraffe = 2 tonnes 3. Rhino = tonnes African Rhino = $1\frac{1}{2}$ tonnes 4. Hippo = tonnes 5. Lion = Kilograms 6. Tiger = Kilograms 7. Dog = Kilograms 8. Cat = Kilograms 9. Mouse = Grams 10. Tadpole = Grams		Critical and creative thinking
<u>Guided Group/Independent Activities</u> **School bags full** Students in groups of four or five find the average mass of their full school bags. This measurement is used to calculate the mass of all bags in the class. Students predict the mass of all bags in the school. *H*ow many teachers' bags or baskets make a tonne?		Critical and creative thinking
Cool Using ice cube trays, find how many ice cubes would be needed to make a tonne of ice.		Critical and creative thinking

Tonnes of Tables Students work in pairs or small groups to find the mass of all the desks in the school. Variation: Students nominate objects or materials to measure		Critical and creative thinking
Gross Mass and Nett Mass Students bring in a 'pantry item'. Students work in pairs to interpret information about mass on commercial packaging.Teacher supply problems involving gross mass and net mass, eg find the mass of a container given the gross mass and the net mass.Students select and use the appropriate unit and device to measure mass, eg electronic scales, kitchen scales. They determine the net mass of the contents of a container after measuring the gross mass and the mass of the container. Students find the approximate mass of a small object by establishing the mass of a number of that object, eg 'The stated weight of a box of chocolates is 250 g. If there are 20 identical chocolates in the box, what does each chocolate weigh?'		Literacy Critical and creative thinking

Mass 2

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 › selects and uses the appropriate unit and device to measure the masses of objects, and converts between units of mass MA3-12MG		**Language**: Students should be able to communicate using the following language: mass, measure, scales, tonne, kilogram, gram.
Teaching and Learning Activities	**Notes/ Future Directions/Evaluation**	**Date/ LAC Icons**

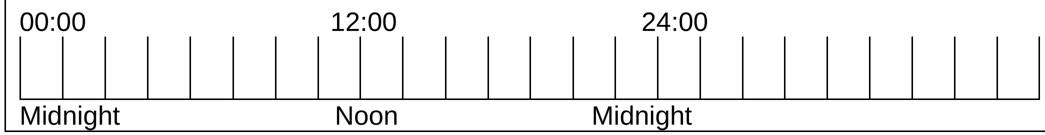
Explicit Teaching Teacher must explain and demonstrate how to connect decimal representations to the metric system. Students will: • recognise quivalence of whole-number and decimal representations of measurements of mass, eg 3 kg 250 g is the same as 3.25 kg • interpret decimal notation for masses, eg 2.08 kg is the same as 2 kilograms and 80 grams • measure mass using scales and record using decimal notation of up to three decimal places, eg 0.875 kg Student must understand how to convert between kilograms and grams and between kilograms and tonnes. Students will explain and use the relationship between the size of a unit and the number of units needed to assist in determining whether multiplication or division is required when converting between units, eg 'More grams than kilograms will be needed to measure the same mass, and so to convert from kilograms to grams, I need to multiply One litre of water has a mass of one kilogram and a volume of1000 cubic centimetres. While the relationship between volume and capacity is constant for all substances, the same volumes of substances other than water may have different masses, eg 1 litre of oil is lighter than 1 litre of water, which in turn is lighter than 1 litre of honey. This can be demonstrated using digital scales.		Literacy
<u>Whole Class Teaching Activities</u> **The Average Lunch** Students find the average mass of lunch, including fruit and drinks, eaten by the students in their small group. Students use the measurement of each group's lunch mass to calculate the total mass of all lunches for the class for one day. Express the total in kilograms and grams. Students then find how many 5 kg crates would be needed for carrying the lunches from the whole class. 		Literacy Critical and creative thinking

Follow That Jelly Bean(refer to lesson plan pp138-139 for more details) Students investigate the length of a line of jellybeans, if 0.5 t of jellybeans were placed end-to-end. *How long would the line be?* 		Critical and creative thinking
Towering tins Students calculate the height of a tower of items where the tower has a total mass of 1 tonne. Examples of items may include: drink cans (full or empty), books, bricks, an “average” Year 5 or Year 6 student.		Critical and creative thinking
A Wet Week Students calculate the mass of rainwater that would fall on a football field in a wet week. Either measure rainfall, or select reports of rainfall from the newspaper or television weather reports. Calculate by finding the volume of water on the football field and then converting to units of mass. Students will relate the mass of one litre of water to one kilogram Students compare the mass of water on a football field and a netball court.		Critical and creative thinking

Problem Solving Students complete problems similar to: **Mass** Estimate and place in order the following: a standard family car a million cubic centimetres of water a team of international male rugby players (15 players) enough potatoes to make chips to feed everyone in the school for a week. Students solve problems involving different units of mass, eg find the total mass of three items weighing 50 g, 750 g and 2.5 kg		Critical and creative thinking

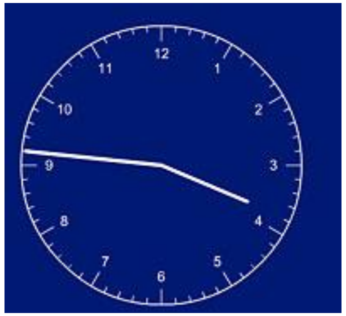
Time 1

Stage 3 Outcome	
A student: › describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › uses 24-hour time and am and pm notation in real-life situations, and constructs timelines MA3-13MG	**Language**: Students should be able to communicate using the following language: **12-hour time**, **24-hour time**, **time zone**, **daylight saving**, **local time**, hour, minute, second, am (notation), pm (notation).

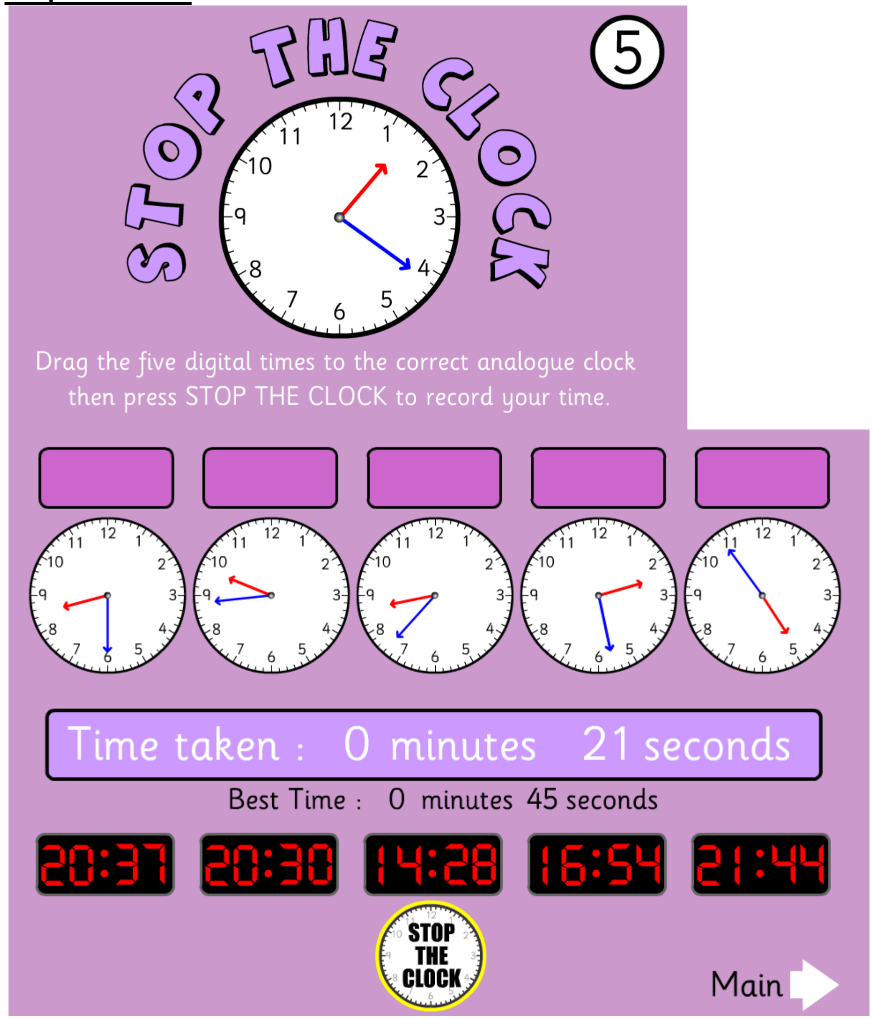
Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
Ignition Activity Have students make a clock face with the twelve hour markings shown in the inner circle and the twenty-four markings on an outer circle. Use this to convert between am/pm notation and 24-hour time. Introduce 24 hour time. Discuss with students where it is used, why this form of time might be useful and who uses it. Ask students to show 24 hour time on a time line and record a.m. and p.m. 		Critical and creative thinking

<u>Explicit Mathematical Teaching</u> Australia is divided into three time zones. Time in Queensland, New South Wales, Victoria, and Tasmania is Eastern Standard Time (EST); time in South Australia, and the Northern Territory is half an hour behind EST; and time in Western Australia is two hours behind EST. The terms 'am' and 'pm' are used only for the digital form of time recording and not with the 'o'clock' terminology. The abbreviation *am* stands for the Latin words 'ante meridiem' which means 'before midday'. The abbreviation *pm* stands for 'post meridiem' which means 'after midday'. Midday and midnight need not be expressed in am or pm form.'12 noon' or '12 midday' and '12 midnight' should be used, even though 12:00 pm and 12:00 am are sometimes seen. It is important to note that there are many different ways of recording dates, including abbreviated forms. Different notations for dates are used in different countries, i.e. 8th		Literacy
December 2002 is recorded as 8.12.02 in Australia but as 12.8.02 in America. Telling the time accurately using 24-hour time eg '2330 is the same as 11:30 pm' Explain where 24-hour time is used e.g. transport, armed forces, digital clock display, etc.		Literacy
Stopwatches Students read digital stopwatch displays showing time from left to right in minutes, seconds and hundredths of a second. Students use stopwatches to time various events and order them according to the time taken. Students discuss cases where accurate timing is important eg athletics, swimming, television advertisements. Students research the world records of different sports. They then record and order them. 2 : 34 : 26		Literacy
Timing Experiments Students estimate and order the amount of time selected events will take and then check by timing the events with a stopwatch eg ▮ the time for a ball dropped from the top floor of a building to reach the ground ▮ the time for a car seen in the distance to reach a chosen point. Students record the times in a table and order the events.		

Matching Times In pairs, students are given two blank cards. They record the time in am or pm notation on one card and 24-hour time on the other. The teacher collects the cards, shuffles them and redistributes the cards to the class. Each student has to find their partner by asking other students questions to identify the matching time. Students can only answer 'yes' or 'no'. Possible questions include: ▮ do you have an o'clock time? ▮ is your time ten minutes after 7:15 am? ▮ is your time 2130 in 24-hour time? Students then group themselves into am and pm times. Each group then orders its cards.		Critical and creative thinking Literacy
Spending Time Students collect data and record on a graph the amount of time they spend on average watching television, travelling to school, sleeping, eating, working at school and engaged in other activities, using start time and finish time to calculate elapsed time. They compare and discuss their graphs. Students use start and finish times to calculate the elapsed time of events. Students use appropriate units. Students calculate how much time is spent on different subjects each day/week, when looking at the class timetable.		Critical and creative thinking
Time Zones Students research different time zones in Australia where their relatives or friends live. Students use atlases to sort states, towns or cities into time zones. The teacher poses the question: 'What time would it be in Perth at the moment?' The activity should be extended to include daylight-saving times. Possible questions include: ▮ why does Australia have different time zones? ▮ where could you find out about different time zones? Students use the Internet to research different time zones.		Critical and creative thinking Literacy

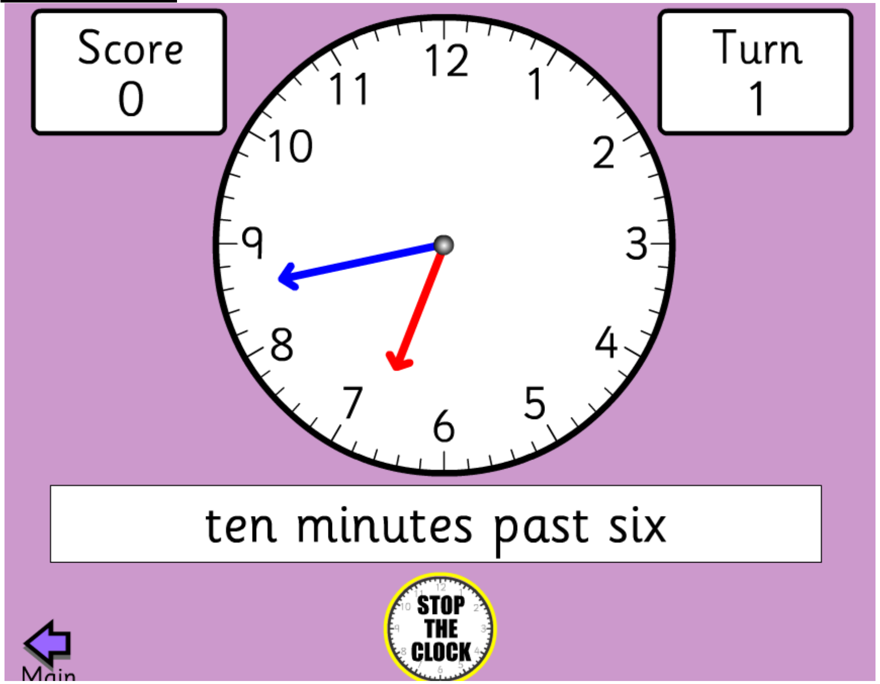
TELL THE TIME –ES1 – STAGE 3 Tell the time is an interactive teaching program (ITP) on the **Standards Site** in the UK. It displays on-screen analogue and digital clocks separately or together. The clocks can be moved around the screen and their sizes altered. Times can be adjusted in different intervals of time. The 'set' option on the digital clock is used to set the time shown on the clocks. Once you have selected your options click on 'set' again to restart the clocks. The clocks can run in real time or from a set time and over any interval. The clock can be stopped and started. 		Information and communication technology capability

Stop the Clock

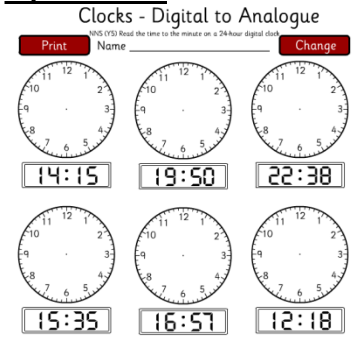


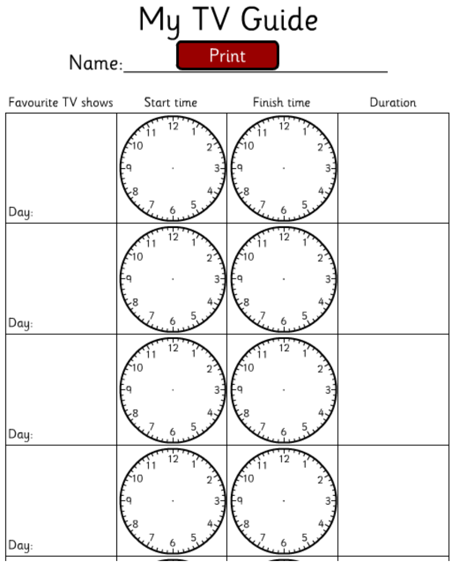
http://www.eastiron.org/schools/interactive-resources/ir_contents/contents/ts/time/sthec5.html

Information and communication technology capability

Bang on Time  **http://www.eastiron.org/schools/interactive-resources/ir_contents/contents/ts/time/clockwordsres.html**		
Digital to Analog **http://www.eastiron.org/schools/interactive-resources/ir_contents/contents/ts/time/y5dtoa.html**		

My TV Guide





http://www.eastiron.org/schools/interactive-resources/ir_contents/contents/ts/time/tvguide.html

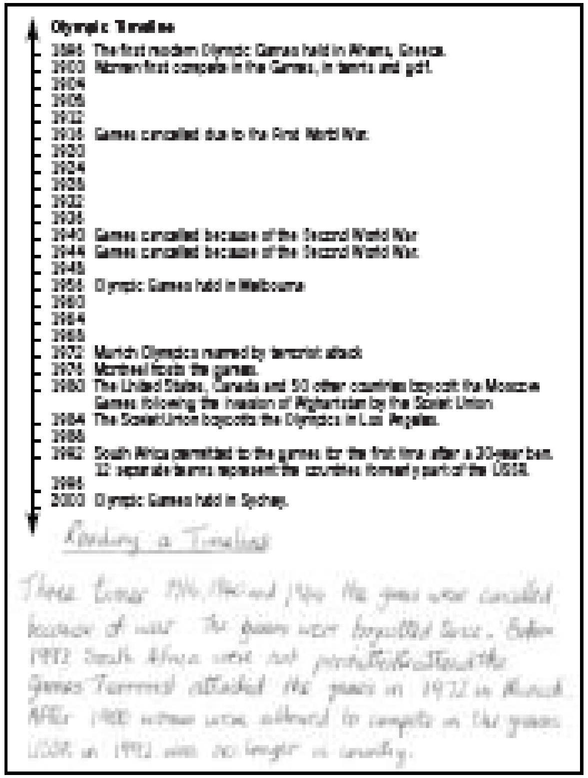
Information and communication technology capability

Time 2

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 › uses 24-hour time and am and pm notation in real-life situations, and constructs timelines MA3-13MG	**Language**: Students should be able to communicate using the following language: timetable, timeline, **scale**, 12-hour time, 24-hour time, hour, minute, second, am (notation), pm (notation).

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/LAC Icons
Timetables Students access timetables on the Internet or the teacher provides students with a variety of timetables eg bus, plane, train, ferry, theme parks, movies. Students describe any visible patterns eg 'Buses leave every 15 minutes on weekday mornings.' Students calculate the duration of different journeys or events using start and finish times. They develop an itinerary for a given time-frame eg 4 hours. Students plan their 'ultimate' 24-hour itinerary. Students record their itinerary in 12-hour time using am and pm notation, and 24-hour time. Students discuss which timetables use 24-hour time and why it is important. Students to investigate online timetables to prepare simple travel itineraries. Students use timetable to create their own problems. Swap with a partner and complete.		Literacy Critical and creative thinking Information and communication technology capability
Interpreting and Drawing a Timeline The teacher displays a timeline related to real life or a literary text. Students write what they can interpret from the timeline. Teacher displays a timeline and discusses scale.(Many to one) Student develop own set of scales for timeline. Draw. eg 1cm equal 10 years		Literacy Critical and creative thinking



Olympic Timeline

1896 The first modern Olympic Games held in Athens, Greece.
1900 Women first compete in the Games, in tennis and golf.
1904
1908
1912
1916 Games cancelled due to the First World War.
1920
1924
1928
1932
1936
1940 Games cancelled because of the Second World War
1944 Games cancelled because of the Second World War.
1948
1956 Olympic Games held in Melbourne
1960
1964
1968
1972 Munich Olympics marred by terrorist attack
1976 Montreal hosts the games.
1980 The United States, Canada and 50 other countries boycott the Moscow Games following the invasion of Afghanistan by the Soviet Union
1984 The Soviet Union boycotts the Olympics in Los Angeles.
1988
1992 South Africa permitted to the games for the first time after a 30-year ban. 12 separate teams represent the countries formerly part of the USSR.
1996
2000 Olympic Games held in Sydney.

Reading a Timeline

Three times 1916, 1940 and 1944 the games were cancelled because of war. The games were boycotted twice. Before 1992 South Africa were not permitted to attend the Games. Terrorist attacked the games in 1972 in Munich. After 1900 women were allowed to compete in the games. USSR in 1992 was no longer a country.

Guided Group/Independent Activities

A Day In My Life

Students list at least eight things they do on a particular day of the school week along with the time they do each activity. They then record these times on a sheet of clock faces. Students convert the times to 24-hour time.

They use the 24-hour times and activities to draw a timeline using an appropriate scale.

Possible questions include:

- how could you order the events according to the time taken?

Literacy

Drawing and Interpreting Timelines Students research key dates in Australian history. Students construct a timeline using an appropriate scale. In small groups, students compare scales used and any observations. Possible questions include: ▮ what scale did you use? Why? ▮ how does the scale help to interpret the timeline? ▮ did your chosen scale cause any problems? Why? ▮ what is the importance of the scale?		Literacy Critical and creative thinking
Calculating Elapsed Time The teacher provides students with a copy of a television guide. Students are told that they can record 180 minutes total. Students use the television guide to calculate the duration of programs they would like to tape. Students then record their information in a 'program table' using 24-hour time. Possible questions include: ▮ how did you work out elapsed time? ▮ did you manage to use the whole 180 minutes?		Literacy Critical and creative thinking

Three-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 › gives a valid reason for supporting one possible solution over another MA3-3WM › identifies three-dimensional objects, including prisms and pyramids, on the basis of their properties, and visualises, sketches and constructs them given drawings of different views MA3-14MG	**Language**: Students should be able to communicate using the following language: object, shape, three-dimensional object (3D object), prism, cube, pyramid, **base**, **uniform cross-section**, face, edge, vertex (vertices), **apex**, top view, front view, side view, depth, net.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
<u>**Ignition Activities**</u> **Different Views** Students sketch different everyday objects eg buildings, power pole. They are asked to sketch a front, side and top view on separate cards. Students swap their sketches with a partner who names the object. *Variation:* The teacher collects the cards and photocopies them so that there are enough sets for the class to play a concentration game with the cards. In small groups, students place all the cards face down in the centre of the group. Each player takes a turn at turning over three cards. If the three cards turned over match the front, side and top view of one object then that player keeps the cards, but if they do not match then they are turned back over and the next student has a turn. The winner is the player who has the most cards when all the cards have been collected.		
Explicit Teaching		
In Stage 3, the formal names for particular prisms and pyramids are introduced while students are engaged in their construction and representation. (Only 'family' names, such as prism, were introduced in Stage 2.) This syllabus names pyramids in the following format: square pyramid, pentagonal pyramid, etc. However, it is also acceptable to name pyramids using the word 'based', eg square-based pyramid, pentagonal-based pyramid. *Prisms* have two bases that are the same shape and size. The bases of a prism may be squares, rectangles, triangles or other polygons. The other faces are rectangular if the faces are perpendicular to the bases. The base of a prism is the shape of the uniform cross-section,		

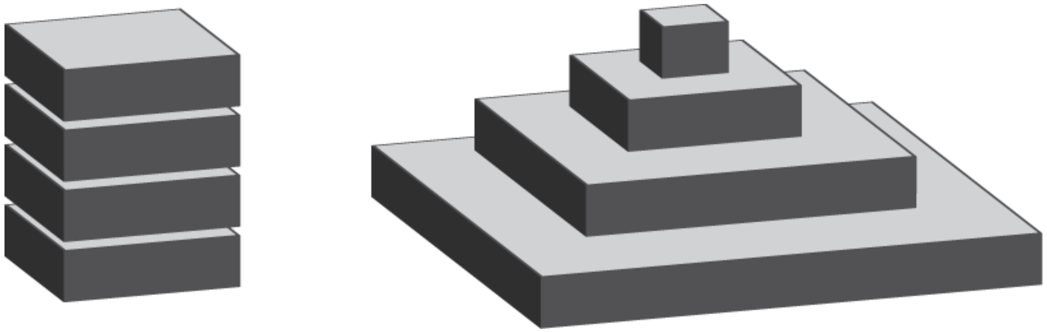
not necessarily the face on which it is resting.

Pyramids differ from prisms as they have only one base and all the other faces are triangular. The triangular faces meet at a common vertex (the apex). Pyramids do not have a uniform cross-section.

Spheres, cones and cylinders do not fit into the classification of prisms or pyramids as they have curved surfaces, not faces, eg a cylinder has two flat surfaces and one curved surface.

A section is a representation of an object as it would appear if cut by a plane, eg if the corner were cut off a cube, the resulting cut face would be a triangle. An important understanding in Stage 3 is that the cross-sections parallel to the base of a prism are uniform and the cross-sections parallel to the base of a pyramid are not.

Students could explore these ideas by stacking uniform objects to model prisms, and by stacking sets of seriated shapes to model pyramids, eg



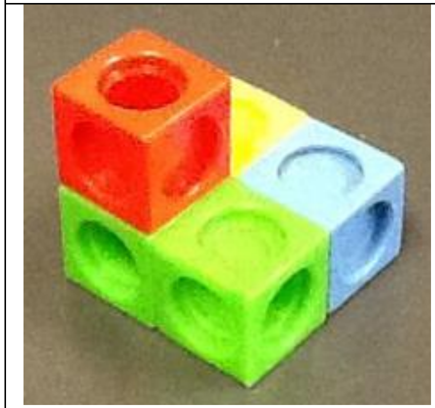
Note: such stacks are not strictly pyramids, but they do assist understanding.

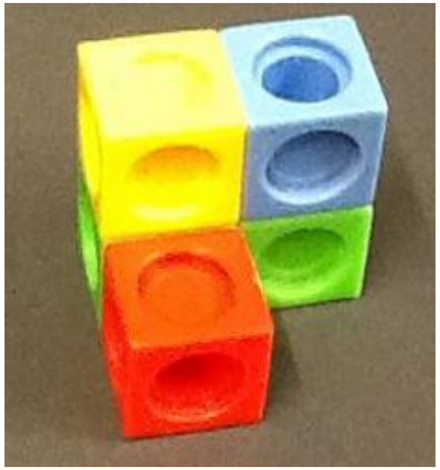
In geometry, a three-dimensional object is called a solid. The three-dimensional object may in fact be hollow, but it is still defined as a geometrical solid.

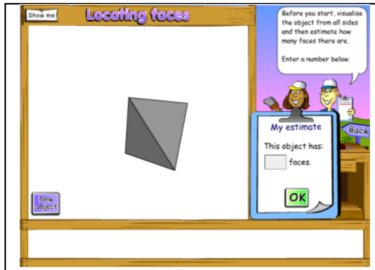
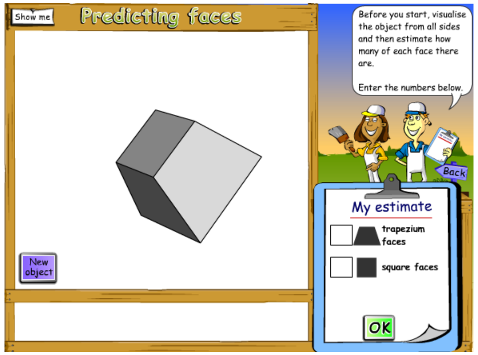
Teaching and Learning Activities

Teacher ensure students identify, describe and compare the properties of prisms and pyramids, including: • number of faces • shape of faces • number and type of identical faces • number of vertices • number of edges		Literacy Critical and creative thinking
Students are given a selection of prisms and pyramids to investigate the number of faces, edges, and vertices. They look for similarities and differences between the objects. Students construct a table to record findings		
Classifying Students collect pictures of three-dimensional objects that occur in everyday life from magazines, papers or the internet. In small groups, students classify the pictures into prisms or pyramids and list their similarities and differences. As a whole class identify and determine the number of pairs of parallel faces of three-dimensional objects, eg 'A rectangular prism has three pairs of parallel faces' https://hwb.wales.gov.uk/cms/hwbcontent/Shared%20Documents/vtc/castle_shapes/eng/Introduction/default.htm		Literacy

Bases/Apex Teacher models and students will**:** • identify the 'base' of prisms and pyramids • recognise that the base of a prism is not always the face where the prism touches the ground • recognise that the base of a prism is identical to the uniform cross-section of the prism • name prisms and pyramids according to the shape of their base, eg rectangular prism, square pyramid • recognise that prisms have a 'uniform cross-section' when the section is parallel to the base • determine that the faces of prisms are always rectangles except the base faces, which may not be rectangles • determine that the faces of pyramids are always triangles except the base face, which may not be a triangle • use the term 'apex' to describe the highest point above the base of a pyramid or cone		Literacy
Faces Using playdough students in pairs will build and experiment with creating 3D shapes. Using fishing line students will cut the 3D object. They will visualise and draw the resulting cut face (plane section) Students will share with whole class findings regarding similarities and differences and determine facts about faces.		
Three-Dimensional Viewpoints The teacher prepares cards that show the front, top and side view of various prisms. Students label each card, naming the view. They then use the cards to construct a three-dimensional model, naming it according to the shape of its base. Students display their labelled cards and models. The other students in the class match the model to the cards. Students reflect on their own drawing of a three-dimensional object and consider how it can be improved. Students then make their own cards and repeat the activity.		Literacy Critical and creative thinking

What Three-Dimensional Object Am I? Students select an object and write a description of its properties. Name and draw the net. Other students ask questions to identify the object eg ‘Does your object have 6 faces?’ ‘Are your object’s opposite faces equal?’ ‘Is your object’s base a rectangle?’ ‘Are your object’s faces rectangular?’ ‘Is your object a rectangular prism?’ Students select the correct diagram of a net for a given prism or pyramid from a group of similar diagrams where the others are not valid nets of the object. Students make ‘What Object am I?’ booklets.		Literacy Critical and creative thinking
Net Challenge **Students** examine a diagram to determine whether it is or is not the net of a closed three-dimensional object. Students will need to explain to their partner why a given net will not form a closed three-dimensional object. Students select an object from with the outside school environment or home to visualise and sketch. Students should prepare nets for the three-dimensional object. Students swap net with their partners and are challenged to recognise what the net represents.		
 Discuss the properties of the above picture. Draw it in two-point linear perspective. Which properties of the original structure are preserved in your drawings, which are not? You should think about: • the relationship between the lengths of the edges of the cubes • the angles between them • parallel and perpendicular lines What do you think the advantages of linear perspective drawing are? What disadvantages are there with this method of representing 3D objects in 2D?		Literacy Critical and creative thinking

Here is another view of the multilink structure  Now try drawing it again, this time with a different face as the front		Critical and creative thinking
Which properties of the original structure are preserved in your drawings, which are not? You should think about: • the relationship between the lengths of the edges of the cubes • the angles between them • parallel and perpendicular lines? How has the perspective changed?		
Construct a model Students are given 8 straws/pop sticks and blue tack. They construct a three-dimensional model using all 8 straws/sticks. Students display their models. Possible questions include: ▮ what is the name of your model? ▮ can you list its properties? Students draw the model showing simple perspective. *Variation:* The number of straws could be varied. Commercially produced construction equipment could be used to produce other models. ***Investigation** – How many different nets are possible for a square-based pyramid?*		Critical and creative thinking
<u>Computer Learning Objects</u> **Face painter : Locating Faces** **TaLe Reference Number : L1069**		

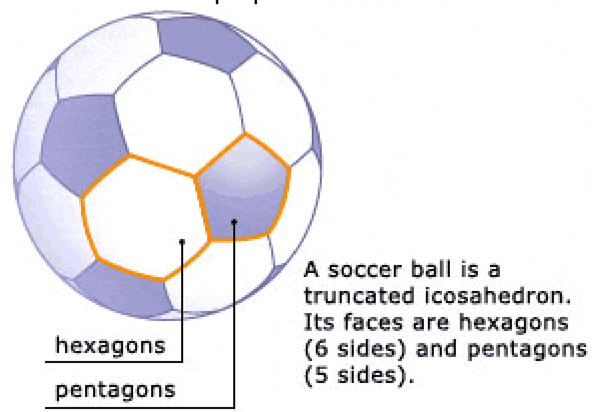
 **Click on link below** **http://tlf.dlr.det.nsw.edu.au/learningobjects/ Content/L1069/object/index.html** **Face Painter: Predicting Faces** **TaLe Reference Number : L1070**  http://tlf.dlr.det.nsw.edu.au/learningobjects/Content/ L1070/object/index.html		

Three-Dimensional Space 2

Stage 3 Outcome

A student:	**Language**: Students should be able to communicate using the following language: object, shape, three-dimensional object (3D object), prism, cube, pyramid, base, uniform cross-section, face, edge, vertex (vertices), top view, front view, side view, net.
› describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › identifies three-dimensional objects, including prisms and pyramids, on the basis of their properties, and visualises, sketches and constructs them given drawings of different views MA3-14MG	

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
<u>Ignition Activities</u> **Barrier Game.** Students work in pairs, with a barrier e.g. a folder or school bag between them. One student makes a three-dimensional model using construction materials. The student then instructs the partner to make a similar model. When complete, the models are compared and discussed.		Literacy
Students create prisms and pyramids using a variety of materials, eg plasticine, paper or cardboard nets, connecting cubes. Sketch front, top and side views. Students describe to a partner how they constructed and drew their 3D object.		Literacy
Nets – 3D Models **http://www.senteacher.org/worksheet/12/3D.html** Using a variety of nets, students create 3D models of prisms and pyramids. Cube, cuboid, pyramid, tetrahedron, pentagonal prism, pentagonal pyramid, cone, octahedron, rhombic prism, dodecahedron, cylinder, triangular prism, icosahedron, hexagonal pyramid, hexagonal prism.		

Illuminations – Fishing for the best prism http://illuminations.nctm.org/LessonDetail.aspx?ID=L793 In this lesson, students use polydrons to create nets of rectangular prisms. They discover that there are many configurations for rectangular prisms with the same volume, and determine that certain configurations minimize surface area. The lesson continues in a discovery activity related to building the most cost-efficient and appealing fish tank. 		Literacy
Geometry – 3D Shapes Interactive http://www.learner.org/interactives/geometry/3d_prisms.html We live in a three-dimensional world. Every object you can see or touch has three dimensions that can be measured: length, width, and height. The room you are sitting in can be described by these three dimensions. The monitor you're looking at has these three dimensions. Even you can be described by these three dimensions. In fact, the clothes you are wearing were made specifically for a person with your dimensions. In the world around us, there are many three-dimensional geometric shapes. In these lessons, you'll learn about some of them. You'll learn some of the terminology used to describe them, how to calculate their surface area and volume, as well as a lot about their mathematical properties.  		Literacy Critical and creative thinking
Geometry – Nets of Solids http://www.onlinemathlearning.com/geometry-nets.html		

How many ways? Rectangular Prisms Students are given 24 interlocking cubes. They are asked to make a rectangular prism with a volume of 24 cubic units. They describe their rectangular prism in terms of its length, breadth and height and record this information. The teacher poses the question. ‘Can you make other rectangular prisms with a volume of 24 cubic units?’ Students attempt to do this, record the results and describe what they notice. Students draw a simple perspective drawing of each prism showing depth. Variation: Students make prisms with a variety of volumes and discuss. *DIFFERENTIATION - Extension* • Ask students to suggest possible dimensions for a rectangular prism that has a volume of 42 cm^3 without using snap cubes.		Critical and creative thinking
Students are challenged to create all the possible nets for a cube. Students could use polydrons, grid paper or tiles to create the nets. Students are encouraged to decide if each solution is different or if it is the same net in a different orientation. Students record the nets on paper or by using a computer package. *Variation:* Students draw the nets of other prisms and pyramids. They find nets of other three-dimensional objects.		

COMMON MISCONCEPTIONS: When filling a 3-D figure, students may think there can be gaps or overlaps with the cubes filling the object. Have students compare this to finding the capacity of a container. If you put an object in that container, you would displace space to be filled with liquid, and you would get an inaccurate measure of the capacity. Same goes for a solid figure-there can be no displacement (unfilled space) if you want an accurate measurement. **ESSENTIAL QUESTIONS** • What is the relationship between the size of the box and the number of cubes it will hold? • How does the volume change as the dimensions of the box change? **MATERIALS** • cube nets, scissors, tape, cm cubes, ruler, recording sheet **GROUPING** Individual/Partners **TASK DESCRIPTION, DEVELOPMENT, AND DISCUSSION** In this task, students will create boxes and discover how volume is related to the length, width, and height of cubes. Comments: To introduce this task, show the cube net and ask this question? What could be done to this net so that the top of the cube will be open? Students should discern that the top square could be cut off. Tell students that they will be building open cubes of different sizes and filling them with cubes. Explain that they will need to measure the dimensions of each cube to complete the chart. Once students have completed the task, lead a class discussion about the patterns they noticed. Allow students to explain their findings and any relationships they noticed. Also, allow students to share their conclusions about the relationships between volume and the dimensions of cubes. Finally, allow students to write about their findings in their math journals. **Task Directions**: Using the cube net, have students construct cubes of different dimensions and fill them with cm cubes. Have them measure the dimensions and record them in the appropriate boxes on the recording sheet. Then they will count the number of cubes it took to fill the cube and record the volume of each cube. Have students discuss their findings to generalise statements about the relationship between the dimensions of the cubes and their volume.		Critical and creative thinking

FORMATIVE ASSESSMENT QUESTIONS
• What do you notice about the size of the open cubes and the number of cm cubes they can hold? Explain your thinking.
• Could you predict how many cm cubes a container can hold, based on its measurements? Justify your answer.
• Students may create their own cubes using grid paper to create nets.
• Students may present a demonstration on drawing nets for cubes to the class.
Intervention:

Literacy
Critical and creative thinking

Exploring With Boxes

Materials: cube nets, scissors, tape, cm ruler, cm cubes, recording sheet

Directions:

1. Work with a partner. Cut out the nets for the open cubes, fold up the sides, and tape them together.
2. Measure each open cube and record your findings in the chart below.
3. Fill each box (open cube) with cm cubes and count them to find the volume.
4. Record your findings in the chart below.
5. Write in your math journal and describe how the size of the box is related to its volume.

Box (Open Cube)	Length of Base	Width of Base	Height of Cube	Volume
A				
B				
C				

Findings____

____

Literacy
Critical and creative thinking

Geometric Skeletons
Materials: tooth picks, gumdrops (or raisins, currants, miniature marshmallows), 3-D solid of a triangular prism
Activity: Part One
Show students the toothpicks and gumdrops, and tell them they will use these

Literacy

materials to make three-dimensional figures. Now, show them the 3-D solid of a triangular prism. Ask: • What 3-D solid am I holding? • What can you tell me about it? • What are its characteristics? Explain to students that they will be making skeletons of triangular prisms. Explain that for their skeletons, they will use toothpicks to show each edge where faces meet. They will also use gumdrops to show each vertex where edges meet. Ask: • How could we find out how many toothpicks we need to make a skeleton of a triangular prism? • How many gumdrops do you think it will take to make a triangular prism? • Why do you think so? Show students how to use the toothpicks and gumdrops to make a triangular prism. Then, have them use the same materials to make their own triangular prisms. Once they have completed them, discuss students' triangular prisms. Ask: • What do the gumdrops represent? (vertices) • What do the toothpicks represent? (edges) Explain to students that the model they just made is called a skeleton (as opposed to a 3-D solid) of a triangular prism, because it only shows the edges and vertices of the shape. It does not show the faces. Remove one of the toothpicks from the prism, and then ask: • Is this a skeleton of a triangular prism? • Why or why not? (no, because it is now incomplete) Divide the class into pairs of students, and distribute copies of Activity Sheet A as well as more toothpicks and gumdrops. Tell students to use the number of gumdrops and toothpicks shown on the chart to try to make skeletons of triangular and rectangular prisms. If they can make a prism with a given number of gumdrops and toothpicks, have them record "yes" in the fourth column of the chart. If they cannot make a prism, have them record "no" in the fourth column. When their answer is "yes" in the fourth column, ask students to record, in the fifth column, whether the prism they built is a triangular or a rectangular one. Finally, have them complete the last part of the activity sheet. **Activity Sheet A** Directions to students: Use the number of gumdrops and toothpicks shown on the chart to try to make skeletons of triangular and rectangular prisms. If you can make a prism with a given number of gumdrops and toothpicks, record "yes" in the fourth column of the chart. If you cannot make a prism, record "no" in the fourth column. When your answer is "yes" in the fourth column, record, in the fifth column, whether the prism you built is a triangular or a rectangular one. Complete the last part of the activity sheet. **Activity: Part Two** Once students have completed the previous activity and their charts, show them		

Activity Sheet A. Ask:

- Which of the skeletons that you built are prisms?
- What do you notice about the number of edges on the prisms?
- What do you notice about the number of vertices on the prisms?
- What is the relationship between the number of edges and the number of vertices?
- Which of the skeletons are not prisms? Why not?

Have students use their completed skeletons to help them explain their findings.

Problem Solving

Use gumdrops and toothpicks to build a prism.

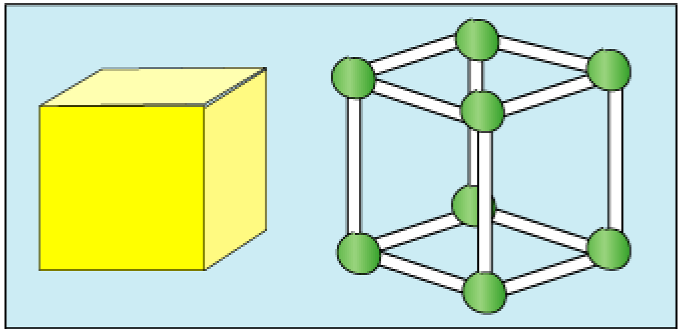
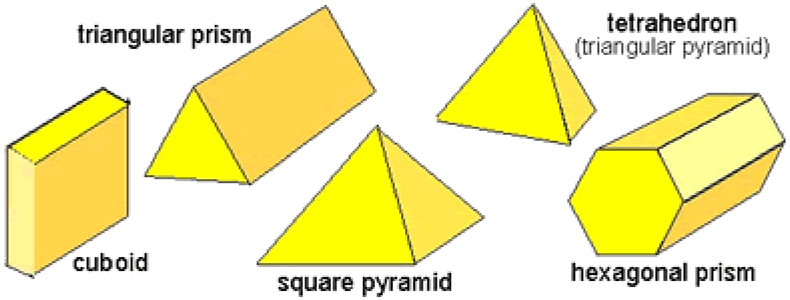
Can you build a prism that has exactly 27 edges? Why or why not? Use drawings to show how you know.

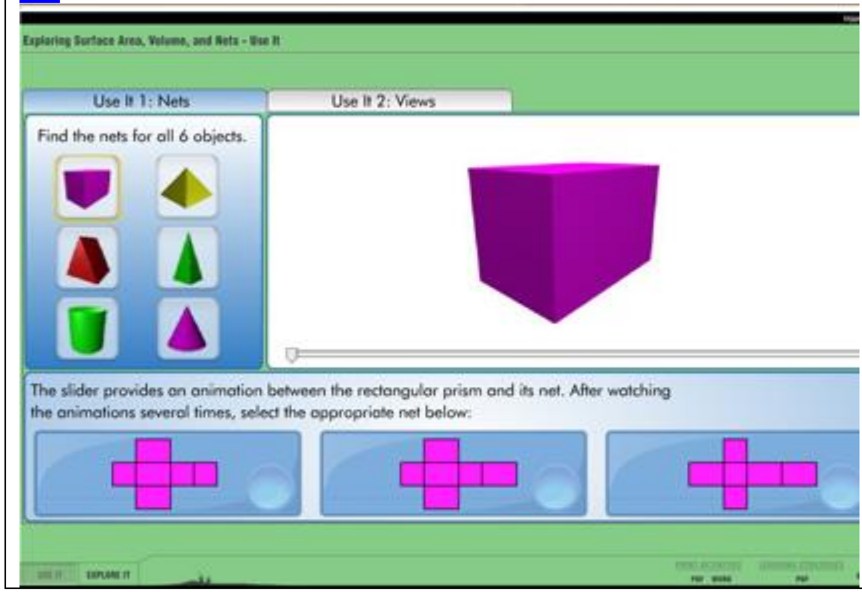
Activity Sheet A:

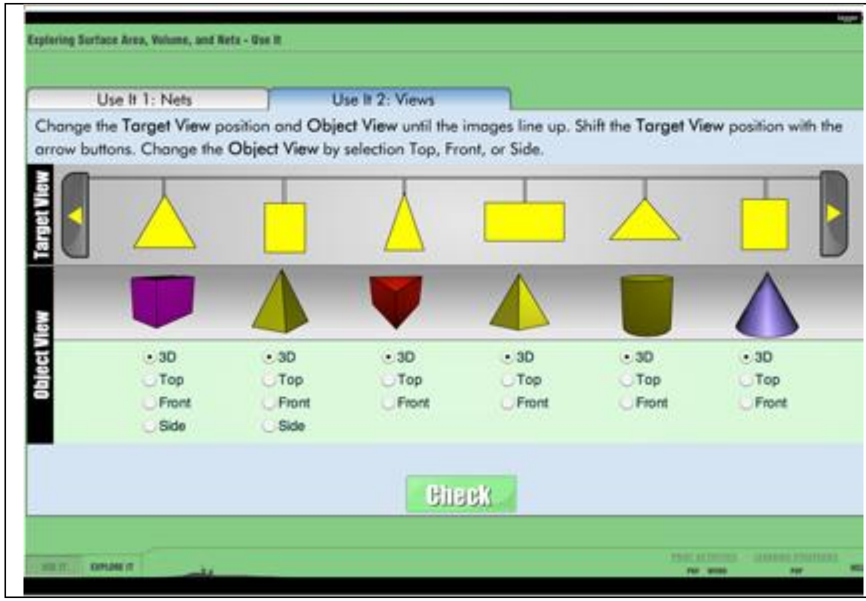
Making 3-D Skeletons

	Gumdrops	Toothpicks	Is it Possible to Make a Prism? (yes/no)	Triangular or Rectangular Prism?
A	5	8		
B	6	9		
C	10	3		
D	6	10		
E	8	12		
F	10	15		
G	8	5		
H	12	18		
I	7	12		
J	5	9		

Discuss results.

Skeleton Shapes Skeleton shapes are made with balls of modelling clay and straws. This shows a cube and a skeleton cube:  Students make their own Skeleton shapes . Pose questions such as; How many balls of modelling clay and how many straws does it take to make the cube? Look at the shapes below and decide which piles are needed to make a skeleton of each shape.  		Critical and creative thinking
Making 3D Models Provide students with top, side, and front views of a 3D shape. Ask them to construct a 3D model of that shape, given the different views. Discuss and pose questions.		

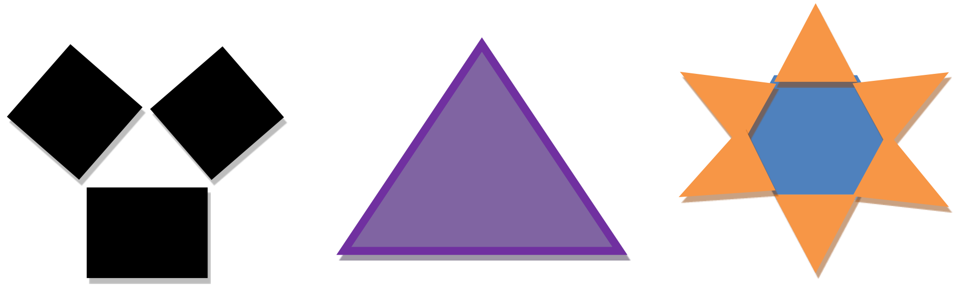
NAPLAN Teaching Strategies http://www.schools.nsw.edu.au/learning/7-12assessments/naplan/teachstrategies/yr2010/index.php?id=numeracy/nn_spac/nn_spac_s3a_10 Activity 2 Students use the *Surface Area, Volume and Nets* Learning Object to explore surface area, volume, 3D objects and nets. Objects include rectangular and triangular prisms; rectangular and triangular pyramids; cylinders and cones. Included are print activities, solutions and learning strategies. http://www.learnalberta.ca/content/mejhm/index.html?l=0&ID1=AB.MATH.JR.SHAP&ID2=AB.MATH.JR.SHAP.SURF&lesson=html/object_interactives/surfaceArea/use_it.html 		

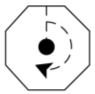
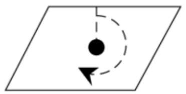
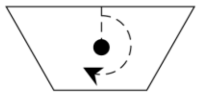
Exploring Surface Area, Volume, and Nets - Use It Use It 1: Nets Use It 2: Views Change the Target View position and Object View until the images line up. Shift the Target View position with the arrow buttons. Change the Object View by selection Top, Front, or Side. Target View Object View 3D Top Front Side Check		

Two-Dimensional Space 1

Stage 3 Outcome

A student:	Language
› 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

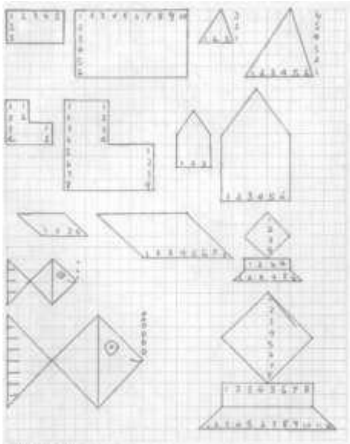
This lesson should take several sessions

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?

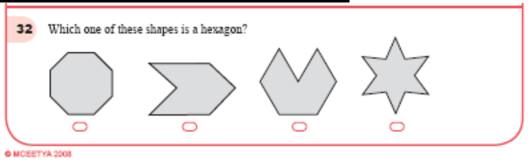
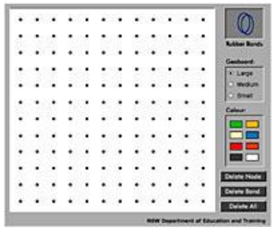
Students explain the process they used to enlarge and reduce two-dimensional shapes.

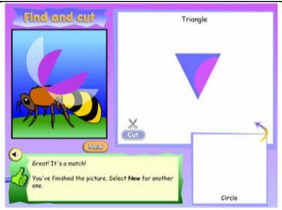


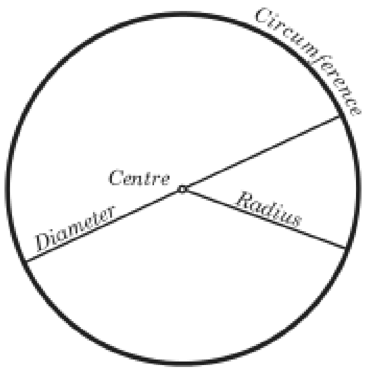
Literacy
Critical and creative thinking

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

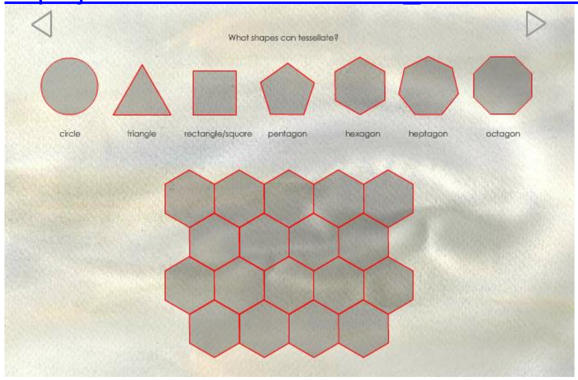
<u>Guided Group/Independent Activities</u> **Triangles** The teacher provides students with a variety of scalene, isosceles, equilateral and right-angled triangles. In small groups, students discuss the side and angle properties of each triangle and sort triangles with similar properties into groups. 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
<u>Previous NAPLAN Question</u>  **<u>Computer Learning Objects</u>** <u>DIGITAL GEOBOARD</u> -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. <u>Shape overlays: picture studio</u> <u>Shape overlays: find and cut</u> <u>Shape overlays: find, cut and turn</u> <u>Shape overlays: picture puzzle</u>		Literacy

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

Stae 3 - Two-Dimensional Space 2		
Outcome		Language
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 › manipulates, classifies and draws two-dimensional shapes, including equilateral, isosceles and scalene triangles, and describes their properties MA3-15MG		Students should be able to communicate using the following language: shape, two-dimensional shape (2D shape), circle, **centre**, **radius**, **diameter**, **circumference**, **sector**, **semicircle**, **quadrant**, triangle, equilateral triangle, isosceles triangle, scalene triangle, right-angled triangle, quadrilateral, parallelogram, rectangle, rhombus, square, trapezium, kite, pentagon, hexagon, octagon, regular shape, irregular shape, **diagonal**, vertex (vertices), line (axis) of symmetry, translate, reflect, rotate, clockwise, anti-clockwise.
Teaching and Learning Activities	**Notes/ Future Directions/Evaluation**	**LAC Icon/ Date**
Explicit Teaching		
Teacher must show students how to identify and name parts of a circle, including the centre, radius, diameter, circumference, sector, semicircle and quadrant. A circle is a closed curve in a plane. All of its points are an equal distance from its centre. That distance is called the radius of the circle. A **diameter** is a line segment that has both of its endpoints on the circle and passes through the centre. A **sector** is a portion of the circle that is enclosed by two radiuses and the connecting arc of a circle (a slice of pie). A **semi-circle** is half a circle. A **quadrant** is a quarter of a circle made by two radiuses at a right angle and the connecting arc. The **circumference** is the distance around the edge of the circle.  		Literacy

Circles In small groups, students draw a large circle in the playground using a range of materials from a fixed point e.g. ropes, stakes, chalk, tape measures. Students assess their circle and the strategy they used. They label parts of their circle: centre, radius, diameter, circumference, sector, semi-circle and quadrant. Students then investigate materials in the classroom they can use to draw circles eg a pair of compasses, a protractor, round containers, templates. They then draw and label circles. This activity could be extended to students drawing squares, equilateral triangles, regular hexagons, and regular octagons with in circles.		Literacy
Diagonals Students explore diagonals by joining two geostrips of equal length at their centres. They then join the ends of these to other geostrips to form a two-dimensional shape. Students join three or more geostrips of different lengths at their centres and use other geostrips to join the ends of these to make various convex two-dimensional shapes. Possible questions include: • what is the relationship between the number of sides and the number of diagonals? • which shapes are the strongest? • what happens when the diagonals are removed? • determine whether any of the diagonals of a particular shape are also lines (axes) of <u>symmetry</u> of the shape In groups, students draw their convex two-dimensional shapes complete with diagonals, and record their findings. The students’ posters could be displayed. Teacher models so that students identify and name 'diagonals' of convex two-dimensional shapes. Students recognise the endpoints of the diagonals of a shape as the vertices of the shape. Students use measurement to determine which of the special quadrilaterals have diagonals that are equal in length.		Literacy Critical and creative thinking Information and communication technology capability

Translations**,** reflections **and** rotations Teacher revises the langauage and how to manipulate shapes. Students investigate combinations of translations, reflections and rotations, with and without the use of digital technologies. Students identify whether a two-dimensional shape has been translated, reflected or rotated, or has undergone a number of transformations, eg 'The parallelogram has been rotated clockwise through 90° once and then reflected once'. Students construct patterns of two-dimensional shapes that involve translations, reflections and rotations using computer software.They predict the next translation, reflection or rotation in a pattern, eg 'The arrow is being rotated 90° anti-clockwise each time'.		Literacy Critical and creative thinking Information and communication technology capability
Drawing and Manipulating Students are given access to a variety of geometric equipment (including rulers, protractors, templates, pairs of compasses, set squares, drawing software) to draw regular and irregular two-dimensional shapes. Possible questions include: ▮ what did you use to construct angles? ▮ how did you ensure angle, side and diagonal properties were correct? ▮ what did you use to construct circles? ▮ what is the difference between a regular and an irregular shape? This activity could be extended to writing a list of properties for the various two-dimensional shapes.		Literacy Critical and creative thinking Information and communication technology capability
http://juliannakunstler.com/art1_tessellations.html#.Ui2ys9I0WuI  Students choose the correct pattern from a number of options when given information about a combination of transformations.		Critical and creative thinking

Computer Design Students explore rotational symmetry and patterns through computer applications. The students are challenged to design a logo that incorporates rotational symmetry. Possible questions include: • how many times can you get your shape to match its original outline in one full turn? • how many axes of symmetry does your logo have? Students discuss their logos.		Critical and creative thinking Information and communication technology capability

Angles 1

Stage 3 Outcome		
A student: › describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › measures and constructs angles, and applies angle relationships to find unknown angles MA3-16MG		**Language**: Students should be able to communicate using the following language: angle, arm, vertex, **protractor**, **degree**.
Teaching and Learning Activities	**Notes/ Future Directions/Evaluation**	**Date/ LAC Icons**
Ignition Activities		
Protractors Students are shown how to use protractors to measure angles in degrees. The teacher ensures that students are aware of: • The scale around the edge • The point on the protractor to be aligned with the vertex of the angle to be measured • The reason for two sets of numbers • The largest angle that can be measured • The need to line up an arm of the angle being measured with the zero degree line on the protractor, not its bottom edge. In pairs, one student estimates the size of an angle and the other student checks the estimate by measuring with the protractor. *Extension:* Students replicate angles in the room using geo-strips. They then copy the angles onto paper and estimate and measure the angles.		
Constructing Angles In pairs, students draw ten different angles for each other. Students then measure, label and order their partner's drawings.		
Explicit Teaching		
Students learn about: • Identifying the arms and vertex of an angle where both arms are invisible, such as rotations and rebounds • Recognising the need for a formal unit for the measurement of angles		Literacy

• Using the symbol for degrees (º) • Using a protractor to construct an angle of a given size and to measure angles • Estimating and measuring angles in degrees • Classifying angles as right, acute, obtuse, reflex, straight or a revolution		Critical and creative thinking
Whole Class Teaching and Learning Activities		
Ball Games Students roll a wet tennis ball along the ground at an angle to the wall. Students observe the ball rolling to and rebounding from the wall. The wet lines form the arms of the angle and the point where the ball hits the wall is the vertex of the angle. Possible questions include: • Where is the ball rolled from to create the smallest angle? • Where is the ball rolled from to create the largest angle? • What is the smallest angle that can be made? • What is the largest angle that can be made? *Extension:* Students record results by measuring the angles produced.		Literacy
Kicking a Goal A small goal is created on an asphalt area using witches' hats. Students place a ball in front of the goal. They draw the angle created in chalk on the asphalt, using the ball as the vertex and the goal posts as the ends of the arms. They then measure and record the angle created, using the teacher's protractor. Students try to score a goal from that position. Students repeat the activity from other positions in front of the goal, drawing, measuring and recording the angle created in each new position. Possible questions include: • Where were the angles smaller? Why? • How did the size of the angle affect the ease of scoring a goal? Why? • If you moved the ball closer or further away from the goal line, did it change the size of the angle? How? Why? • How would the presence of a goal-keeper affect the angles created? Results could be recorded in a table using a computer.		Literacy Information and communication technology capability
<u>**Guided and Independent Activities**</u> **Measuring Angles in Two-dimensional Shapes** Students are provided with a variety of two-dimensional shapes. Using a protractor, they measure the angles within the shapes.		

Possible questions include: • How did you measure the angles? • Using your knowledge of angle properties of two dimensional shapes, what do you expect your measurements to show? • How can you record your measurements? • How can you classify the angles you have found? • How can you classify the shapes according to their angles? • How can you compare the shapes by their angles?		Literacy Critical and creative thinking
Classifying Angles Students identify, record and classify angles in the environment using the terms ‘right’, ‘acute’, ‘obtuse’, ‘straight’, ‘reflex’ and ‘revolution’. In pairs, students describe the angles they have classified eg the angles are all obtuse because they are greater than 90º but smaller than 180º. Students draw each type of angle and label the vertex and arms. This activity could be extended so that students could estimate the size of each angle in the environment and then check by measuring. Possible questions include: • Were some of your estimations closer than others? • Why do you think this was?		Literacy Critical and creative thinking
Angling In pairs, students take turns to nominate the size of an angle eg 50º. Both students estimate and draw an angle of the nominated size. Students use a protractor to measure their partner’s angle. The student whose angle is closer to the nominated measurement is the winner. *Variation:* Students create two sets of cards, one with a range of angles drawn on them and the other with the measured size of the angles. They play a concentration game with the cards.		Critical and creative thinking
Angles in the Environment Students collect a variety of pictures that show various angles eg buildings, football fields, aerial views. They identify angles in the pictures, trace them onto overhead transparencies and then describe them. Possible questions include: • What strategies did you use to describe your angles? • Did you discover anything about the type of angles identified? *Variation:* Students measure the angles traced and record their findings.		Critical and creative thinking

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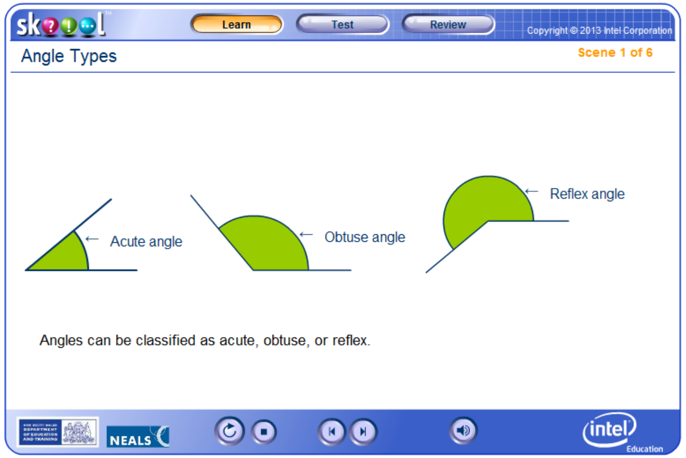
<u>Computer Learning Object</u>
Links To NEALS Computer Activities
http://lrr.dlr.det.nsw.edu.au/Web/skoool/math/step/angle_types/index.html



http://lrr.dlr.det.nsw.edu.au/Web/skoool/math/sim/Angle%20Measure%201%20Acute%20and%20Obtuse/index.htm

http://lrr.dlr.det.nsw.edu.au/Web/skoool/math/sim/Angle%20measure%202%20Reflex/index.htm

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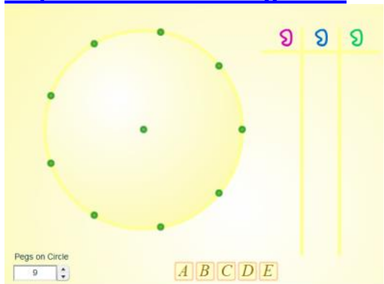
Right Angles
http://nrich.maths.org/2847



Can you make a right-angled triangle on this peg-board by joining up three points round the edge?
Can you work systematically to prove this?

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Critical and creative thinking
Information and communication technology capability</td>
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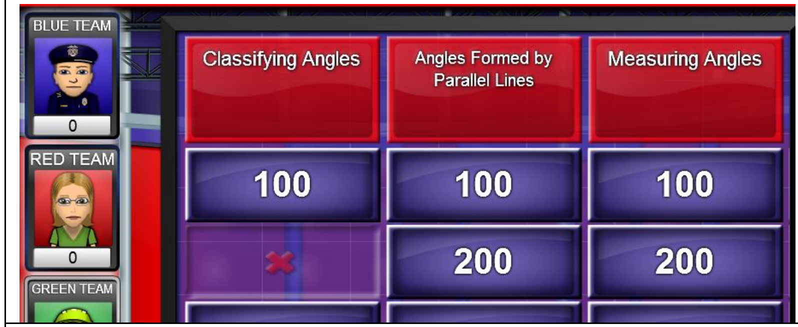
Angles 2

Stage 3 Outcome	
A student: › describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM › measures and constructs angles, and applies angle relationships to find unknown angles MA3-16MG	**Language**: Students should be able to communicate using the following language: angle, right angle, straight angle, **angles on a straight line**, angle of revolution, **angles at a point**, **vertically opposite angles**.

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons

Ignition Activities

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
Angles Jeopardy Game **http://www.math-play.com/Angles-Jeopardy/Angles-Jeopardy.html** **(Angles formed by parallel lines is extension)**		Literacy Information and communication technology capability



Explicit Teaching

Teaching and Learning Activities	Notes/ Future Directions/Evaluation	Date/ LAC Icons
Students will learn about: Identifying angle types at intersecting lines including: • right angles,adjacent angles that form a right angle and establish that they add to 90°		

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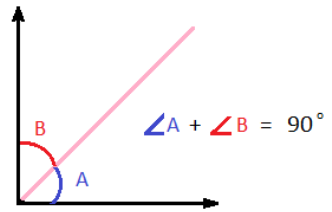
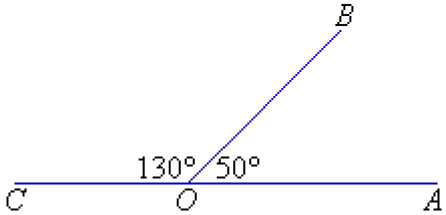
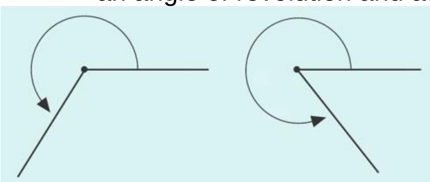


Adjacent Complementary Angles

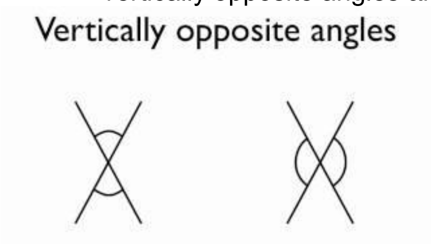
- ‘angles on straight lines and establish that they form a straight angle and add to 180°



- ‘angles at points’ that form an angle of revolution and establish that they form an angle of revolution and add to 360°.



- ‘vertically opposite angles are equal



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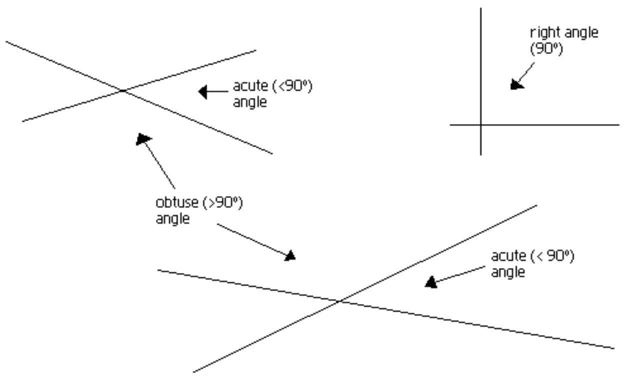
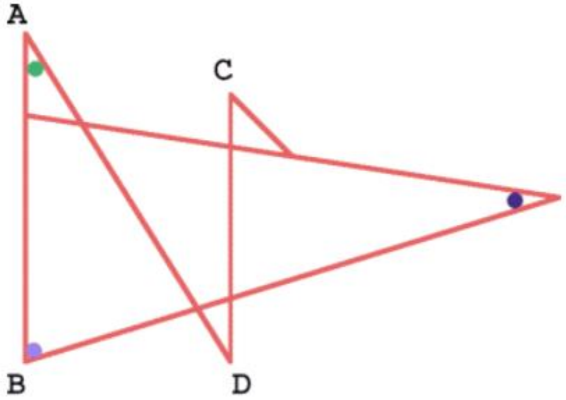
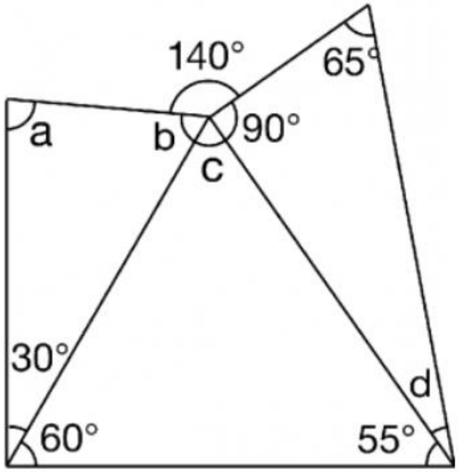
</table>

Angles at Intersecting Lines The teacher identifies different angle types created by intersecting lines in the environment eg doorframes. Students then identify any other angles created by intersecting lines that they can see. Students draw intersecting lines on the computer and label the angle created.  		Critical and creative thinking Information and communication technology capability
Ratty http://nrich.maths.org/712  If you know the sizes of the angles marked with coloured dots in this diagram which angles can you find by calculation? Explain your reasoning. Draw some diagrams of your own and mark in these angles.		Critical and creative thinking

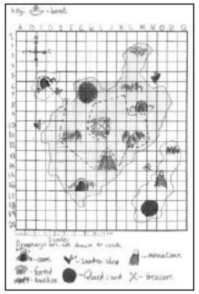
Right Time At the time of writing the hour and minute hands of my clock are at right angles. How long will it be before they are at right angles again?		Literacy Critical and creative thinking
Angle Investigation Pose questions for students using similar structures as below.  What are the easiest angles to find? Why? What do we need to do before we find the value of b? Why?		Literacy

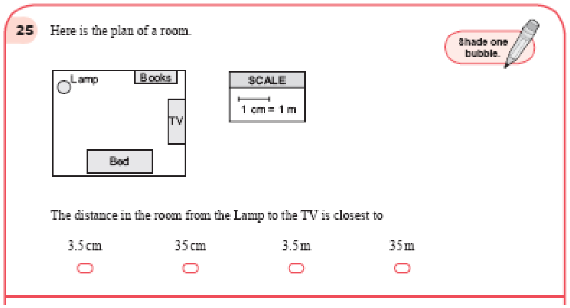
Position

<table>
<tr><td colspan="3">Stage 3 Outcome</td></tr>
<tr><td colspan="2">A student:
› describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM
› locates and describes position on maps using a grid-reference system MA3-17MG</td><td>Language: Students should be able to communicate using the following language: position, location, map, plan, street directory, route, grid, grid reference, legend, key, scale, directions, compass, north, east, south, west, north-east, south-east, south-west, north-west.</td></tr>
<tr><td>Teaching and Learning Activities</td><td>Notes/ Future Directions/Evaluation</td><td>Date LAC/Icons</td></tr>
<tr><td colspan="3">Ignition Activity</td></tr>
<tr><td>Google Maps
Students access ‘Google maps’ via the internet or as a whole class on an interactive whiteboard. Explore the website.
http://maps.google.com.au/maps?hl=en&tab=wl
Explore Earth and Satellite.
Zoom in and out keeping an eye on scale.
View street level and icons. Get directions to a known location.</td><td></td><td>Information and communication technology capability</td></tr>
<tr><td>The Best Route
Students are given a scaled map of their suburb or a section of a city and are asked to locate two points of interest. On the map, students show the shortest or best route between the two points. Students write a description of the route using grid references, compass directions and the approximate distance travelled.
Variation: On a large map of the local area, all students plot their home and the route they use to get to school. They then write a description of their route.</td><td></td><td>Literacy</td></tr>
<tr><td colspan="3">Explicit Mathematical Teaching</td></tr>
<tr><td>At this Stage, a range of mapping skills could be further developed that include the interpretation of scales and simple calculations to find the actual distance between locations on a map.
This topic links to Human Society and Its Environment (HSIE). These skills could be used to explore the sizes of other countries relative to Australia.</td><td></td><td>Literacy</td></tr>
</table>

The word ‘scale’ has different meanings in different contexts. Scale could mean the enlargement or reduction factor for a drawing, the scale marked on a measuring device or a fish scale. **Students need to learn about** • finding a place on a map or in a directory, given its grid references • using a given map to plan or show a route eg route taken to get to the local park • drawing and labelling a grid on a map • recognising that the same location can be represented by maps or plans using different scales • using scale to calculate the distance between two points on a map • locating a place on a map which is a given direction from a town or landmark eg locating a town that is north-east of Broken Hill • drawing maps and plans from an aerial view		
Whole Class Teaching and Learning Activities		
Orienteering Students design and measure a simple orienteering course in the school grounds. They create a set of instructions on a map with a grid, a scale and compass directions to each place to be located. They give their instructions to another student to follow.		Literacy Critical and creative thinking
Distance and Direction Students use the scale on a map of NSW and the compass rose to find a town eg 300 km NE of Broken Hill, 270 km SW of Ballina. Students are encouraged to create their own cards with distance, direction and starting place on one side and the town on the back. They then swap cards with other students in the class. *Variation:* Students source maps on the Internet and write a new set of cards using direction, distance and starting point. They swap with a partner who locates the town or point of interest.		Literacy Critical and creative thinking
Degrees and Robots Students start by facing north and then are instructed to face east. Possible questions include: ▪ what angle have you turned through? ▪ how many degrees is this? Students are encouraged to discuss the angles between other compass points. Students could use this knowledge to play ‘Robots’. In pairs, students label grid paper using the same coordinates and a scale. Student A gives directions while Student B is the robot eg Student A says ‘Face East, go forward 3 paces, turn 90° to the right, go forward 4 paces, turn 180°, ….’ At each instruction Student B tells Student A which direction they are facing. Student B draws the route onto their grid paper. Students compare routes.		Literacy Critical and creative thinking

Enlarge Me/Reduce Me Students are given a simple map, with a scale, covered by a two-centimetre grid. On a separate piece of paper they draw a four-centimetre grid and copy the map. They then draw a one centimetre grid and copy the map. Possible questions include: ▮ did doubling/halving the size of the grid double/halve the scale? Why? ▮ did doubling/halving the size of the grid double/halve the size of the map? Why? ▮ how could you use this method to enlarge/reduce a smaller section of the map?		Literacy Critical and creative thinking
Aerial Photo The teacher sources photographs of the local area from the Department of Lands. Students examine the aerial photographs. Possible questions include: ▮ what natural features can you locate? ▮ what man-made features can you see? ▮ how do they look different? ▮ are there any distinctive features eg rivers, valleys? Students investigate who uses aerial photographs and why they are used. Students make a sketch of the aerial photographs, drawing main roads, buildings and distinctive features. They discuss and annotate their sketches. *Variation:* Teachers or students source aerial photographs of unfamiliar locations either from the Department of Lands or the Internet and repeat the activity.		Literacy Critical and creative thinking
Open Ended Questions/Investigations • Find your school in a street directory or Google maps. Where could you go that is close to 1km away from the school? Note the children who use the scale provided to work this out. Are they able to use it confidently and correctly? • I want to go on a long bike trip. I want to rise at least 1000 km but not more than 1200 km. Where might I travel? The children need to use a detailed map with a scale rather than one with distances marked on it. They should justify their answers. They might like to discuss how they measured the distance along curved roads. • Redesign this classroom using the same furniture as we have already. Present your design on a map or plan drawn to scale. Children may like to use grid paper. Have them explain their designs to the class. It is important that the designs are functional. • Find a location on a map that is in a given direction from a town or landmark, eg locate a town that is north-east of Broken Hill. Describe the direction of one location relative to another, eg 'Darwin is north-west of Sydney'		Literacy Information and communication technology capability Critical and creative thinking Aboriginal and Torres Strait Islander histories

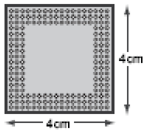
• Follow a sequence of two or more directions, including compass directions, to find and identify a particular location on a map • Use a map, street directory or online map to plan and show a route from one location to another, eg draw a possible route to the local park or use an Aboriginal land map to plan a route • Describe a route taken on a map using landmarks and directional language, including compass directions, eg 'Start at the post office, go west to the supermarket and then go south-west to the park'		
<u>**Guided Group/Independent Activities**</u> **Treasure Island** Students draw a 'Treasure Island' map, creating a scale and compass rose, and imposing a grid and coordinates. They write a set of directions, using compass points and grid coordinates, to the location of a hidden treasure on their map. Students exchange maps and follow the directions to find the treasure. They are encouraged to comment on the scale used. *Variation:* Students could reproduce their maps on a computer. 		Literacy Information and communication technology capability Critical and creative thinking
Paper Rounds In pairs, students are given a street directory of the local area. The teacher gives them the addresses of the places where they will start and finish their paper delivery and students use coordinates to find these places. They design a route for effective delivery of the papers and calculate the distance travelled using the scale. Possible questions include: ▮ how long is your route? ▮ can you devise a shorter route?		Literacy Critical and creative thinking

Follow My Directions Students work in pairs with a barrier between them, each with the same map of the school or local area. Student A marks two landmarks on the map and gives the grid references for one of these to Student B. Student A describes the route taken between the two landmarks using directions, distances and grid coordinates while Student B marks in the route on their map. Students compare their routes and discuss the appropriateness of the given instructions. Students can then swap roles and repeat the activity. Variation: Students could play Battleships on grid paper with coordinates.		Literacy Critical and creative thinking
House Plans The teacher provides several examples of house plans. Students use the scale on the plans to determine the size of objects eg kitchen bench, living room, verandah. The teacher sources house plans and perspective drawings from a builder and makes cards for students to match. Students shuffle the cards and match each plan to the perspective drawings. *Variations*: Students could source plans off the Internet to compare and contrast different styles of houses and repeat the activity.		Information and communication technology capability Critical and creative thinking
Spreadsheet Designs Students plot coordinates on a spreadsheet to create a picture or pattern. They write a list of instructions using coordinates that describes their picture or pattern. Another student uses the coordinates to reproduce the picture or pattern.		Literacy Critical and creative thinking
<u>Previous NAPLAN/BST Questions</u> **NAPLAN – Year 5-Question 25**  25 Here is the plan of a room. The distance in the room from the Lamp to the TV is closest to 3.5 cm 35 cm 3.5 m 35 m		Information and communication technology capability

NAPLAN Year 7-Question 12

12 A computer chip has dimensions 8 mm × 8 mm.
A scale drawing is shown below.

Shade one bubble.



What scale is used in the drawing?

- ⬭ 1 cm represents 5 mm
- ⬭ 1 cm represents 2 mm
- ⬭ 2 cm represents 1 mm
- ⬭ 5 cm represents 1 mm