# Area 1

**Stage 3 Outcome**

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| A student:<br>› describes and represents mathematical situations in a variety of ways using mathematical terminology and some conventions MA3-1WM<br>› 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**.<br><br>$m^2$ is read as 'square metre(s)' and not 'metre(s) squared' or 'metre(s) square'.<br><br>$cm^2$ is read as 'square centimetre(s)' and not 'centimetre(s) squared' or 'centimetre(s) square'. |

| Teaching and Learning Activities | Notes/ Future Directions/Evaluation | Date<br>LAC Icons |
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| **Ignition Activity**<br>**Yes/No**<br>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**<br><br>Students should have a clear understanding of the distinction between perimeter and area.<br><br>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 | | |

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| these surfaces are usually not measured, nor are other hard to measure areas, such as curved or irregular surfaces.<br>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.<br><br>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.<br>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?' | | |
| **Whole Class Teaching**<br>**Bits and Pieces**<br>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.<br><br>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<br><br>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**<br>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.<br>Discuss: *How would you describe this sequence of multiples?* | | Literacy |

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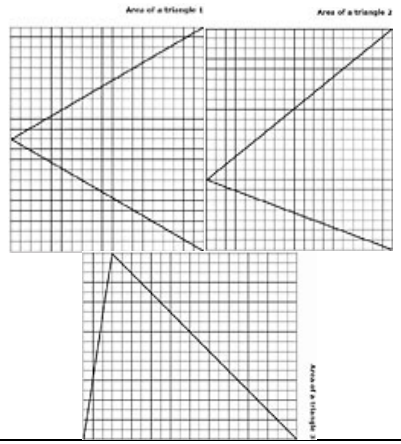
| **Cut and compare (refer to lesson for more detail)**<br>Pairs or individual students commence by taking a rectangle such as an A4 sheet of paper or smaller. Students draw and cut along one diagonal and investigate whether the two triangles which have been made are the same size. Students continue 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<br>Critical and creative thinking |
| **Investigation**<br>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.<br>  | | Literacy<br>Critical and creative thinking |
| **How Big is One Hectare?**<br><br>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:<br><br>➢ "Could we make a hectare with newspaper?"<br>➢ "Are all hectares the same shape?"<br>➢ "What is this measurement used for?"<br><br>Students recognise that there are 10 000 square metres in one hectare, ie 10 000 square metres = 1 hectare | | Literacy<br>Critical and creative thinking |

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| • equate one hectare to the area of a square with side lengths of 100 m<br>• 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)<br>• determine the dimensions of different rectangles with an area of one hectare<br>• record areas using the abbreviations for square kilometres ($km^2$) and hectares (ha)<br><br>• 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.<br>• 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".<br>Discuss the area of a hectare being equal to 10 000 square metres. | | |
| **Believe It or Not!**<br>*How many Year 5 or Year 6 students could stand, shoulder to shoulder, in a square hectare?*<br>*How many Year 5 or Year 6 students could stand, shoulder to shoulder, in a square kilometre?*<br>Extension: *If the world's population was standing shoulder to shoulder, what area would be covered?*<br><br>How many students standing (in)(standing) shoulder to shoulder would fit in 1 hectare?<br>1 hectare = 10000m²<br>14 people can fit in a square metre.<br>•We measured 1 square metre on the floor.<br>•We worked out how many people would fit in a square metre. 14.<br>•We multiplied that by 10000 because there are 10000 square metres in 1 hectare.<br>14 x 10 000 = 140 000<br>∴ 140000 people would fit in a hectare.<br><br>• 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:<br>➢ "What is the most common area given in the advertisements?"<br>➢ "Can you draw the shape of the land from the information given in the advertisements?"<br>➢ "What additional information would you like to see in the advertisements?" | | Literacy<br>Critical and creative thinking |

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| **Largest Area, or Longest Borders?(Integrate in HSIE)**<br>Students investigate:<br>➢ Which Australian state has the largest area?<br>➢ Can you compare this with the state that has the smallest area?<br>➢ Which state has the longest borders?<br>Students explain how they calculated their answers. | | Literacy<br>Critical and creative thinking |
| **<u>Guided Group/Independent Activities</u>**<br><br>**Calculating areas**<br>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**<br>Use tiles that are 1cm ² to make three different rectangles that have areas of 24cm². 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.<br><br>Establish the relationship between the lengths, widths and areas of rectangles (including squares)<br><br>Explain that the area of a rectangle can be found by multiplying the length by the width | | Literacy |
| **Area of squares and rectangles**<br>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**<br>Measure the surface area of rectangular prisms by using a square centimetre grid overlay or by counting unit squares. | | |

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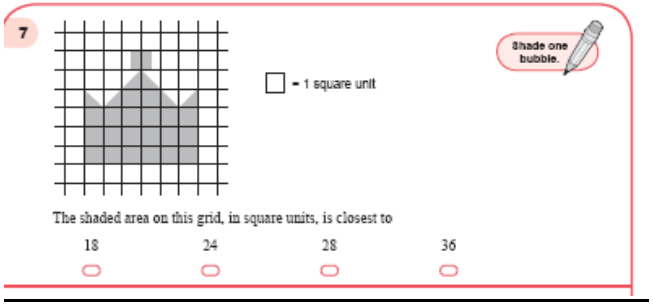
| **Integrated Task:**<br>**Digging around the vegetable garden**<br>http://efs.tki.org.nz/Curriculum-resources-and-tools/Digging-around-for-a-good-idea<br><br>Education for SUSTAINABILITY | | Sustainability<br>Critical and creative thinking |
| **Previous NAPLAN Question**<br><br>**NAPLAN 2008**<br>  <br>7<br>Shade one bubble.<br>= 1 square unit<br>The shaded area on this grid, in square units, is closest to<br>18 24 28 36 | | Literacy |