**The Shape and Space Strand: Outcome SS4.2**

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| **Outcome** | **Indicators** |
| SS4.2. Demonstrate an understanding of area of regular and irregular 2-D shapes by:   * recognizing that area is measured in square units * selecting and justifying referents for the units cm2 or m2 * estimating area by using referents for cm2 or m2 * determining and recording area (cm2 or m2) * constructing different rectangles for a given area (cm2 or m2) in order to demonstrate that many different rectangles may have the same area.   [C, CN, ME, PS, R, V]  *In support of the K-12 Mathematics goals of Spatial Sense, Number Sense, Logical Thinking and Mathematical Attitude.* | 1. Describe area as the measure of surface recorded in square units. 2. Identify and explain why the square is the most efficient unit for measuring area. 3. Provide a referent for a square centimetre and explain the choice. 4. Provide a referent for a square metre and explain the choice. 5. Determine which standard square unit is represented by a referent. 6. Estimate the area of a 2-D shape using personal referents. 7. Determine the area of a regular 2-D shape and explain the strategy used. 8. Determine the area of an irregular 2-D shape and explain the strategy used. 9. Construct a rectangle for an area. 10. Illustrate, and verify, how more than one rectangles is possible for a given area by drawing at least two different rectangles with that area (e.g., identifying the dimensions of each rectangle drawn, or superimpose the rectangles on each other). |

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| **Learning Space:** [**Top**](#top) |
| Prior to grade four, students have compared and ordered areas by superimposing them on each other and by using non-standard units to develop the notion of area being a measurement of “how much is needed to cover a surface”. In making the transition to standard units in grade 4, it is very important for students to develop the understanding of the difference between linear and area measurement. The first stage of this understanding is to recognize that area is more than a line with bends or curves. From there, the students need to recognize that area is actually defined by two directions of lines (meeting at square corners). In broader terms, the students need to distinguish between one-dimension measurements (such as perimeter) and two-dimensional measurements. It is the relationship of area to two dimensions that explains the use of square units in measuring area. Students should be asked what is needed to go from a line (one-dimension), to typical 2-D shapes, such as squares, triangles, and rectangles – identifying the need for both a length and height (or length and width). Students have not formally studied powers of numbers so the squared notation of the units for area should be explained in terms of the need for two- dimensions to get an area and the notion of using squares, or partial squares to cover a surface to determine the areas.  It is important to note that students should NOT be introduced to formulas for finding area at grade four. Instead, the students should have lots of experiences working with manipulatives and grid paper to develop an understanding of area as a covering of a surface using standardized square units. Part of learning about area also requires the students to distinguish finding area from finding perimeter and to understand that a length unit does not determine area, nor does an area unit work for finding perimeter.  As students think of strategies for determining area, connections should be being made between area and the representations that the students are exploring for multiplication. As well, it is possible to make many connections between the students’ study of area and their other subject areas. Habitats and communities in science might consider estimates of the area of the habitats of plants and animals. Similarly, the students might explore the area of distribution of different rocks and minerals. In physical education, students could determine the area needed for different activities and in arts education there are many contexts possible in which the students might explore area and the covering of a specific area. Student texts in English language arts could explore the impact and importance of personal area. Even the students’ study of Saskatchewan in social studies can involve them in the estimation and determination of different areas. |

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| **What Students Should…** [**Top**](#top) | | |
| **Know**   * the superscript of 2 is used on area units to indicate that the measurement is of area – a two-dimensional measurement. * the term referent. | **Understand**   * area is a two-dimensional measurement. * how area and multiplication are related to each other. * an estimate of an area is a measure of approximately how many square units needed to cover the surface being considered. * different strategies for determining areas. * many different 2-D shapes (rectangles and composite rectangles) can have the same area. * for a given area different perimeters and dimensions are possible (in rectangles and composites of rectangles). * when to use different standard units for area measurements and why. | **Be Able to Do**   * identify the referent used when an estimate of an area measurement is determined. * identify a referent that could be used to estimate an area measurement. * use manipulatives or grid paper to determine the area of a rectangle. * construct different 2-D shapes with the same area using manipulatives or grid paper. * identify situations in which area might be determined. * determine the exact area of a triangle and explain the strategy used. |
| **Key Questions:** [**Top**](#top) | | |
| * How is area different from length? * When would area be used? * Why are the units “squared” for area? * Why can’t you physically hold a 2-D shape? * What is the relationship between a 2-D shape and a 3-D object? * How is perimeter different from area? * Why are standard units for area important? | | |

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| **Suggestions for assessment:** [**Top**](#top) |
| **Big Idea:**  Measuring area.  **Suggestions for assessment tasks:**   1. Provide the students with a 2-D shape and both length and area referents. Ask the students which referent they would use to determine the area of the 2-D shape and why. 2. Ask the students to explain what area means to them and which units are used to express area and why. 3. Ask the students to determine and record the area of a regular 2-D shape and an irregular 2‑D shape. Allow the students to use any tools or referents that they wish. Ask the students to explain what they are doing to determine the areas.   **What to look for:**   * See [*Measuring Area Rubric*](file:///C:\Users\ru593\AppData\Local\Temp\Measuring%20Area%20Rubric.doc)   *.*  **Big Idea:**  Estimating area.  **Suggestions for assessment tasks:**   1. Provide the students with a set of 2-D shapes and ask them to use estimation to compare the shapes and order them from largest area to smallest. Ask the students to explain their reasoning.   **What to look for:**   * See [*Estimating Area Rubric*](file:///C:\Users\ru593\AppData\Local\Temp\Estimating%20Area%20Rubric.doc). |
| **Suggestions for instruction:** [**Top**](#top) |
| **Big Idea:**  Measuring area.  **Suggestions for instructional activities:**   1. Have the students brainstorm everything they remember about measuring. Have the students discuss and generate examples to show the difference between length, perimeter and area measurements. 2. Once the students have discussed what they know about area (which to this point is using non-standard units), give the students the same picture of a 2-D shape and a different non-standard referent and ask them to determine the area of the 2-D shape using their referent. In pairs, have the students compare the area that they determined. Have the students discuss why the areas have different numbers associated with them. Show the students another referent that could have been used and ask the students whether they would expect to get a larger or smaller number from the one they determined when finding the area with that referent. Have the students discuss their strategies in answering the question. This task introduces the students to the notion of needing a standardized unit for measuring areas and also helps them connect their number sense to their geometric sense.      1. Have the class discuss standardized units for length and perimeter. Ask them what they think a standardized unit for area should look like and to explain their reasoning. Once the class has come to accept that it needs to be a 2-D shape (the square being ideal), have them look for referents for 1 cm2 and 1 m2. Have the students identify and explain their choice of referents. Encourage the students to challenge or modify each other’s referents. Some of the referents that the students choose, for example a square on a centimetre grid sheet will be exact representations of the unit, and others, such as their thumbnail will be an estimate. Have the students discuss which of their referents would be useful for determining an exact area and which would be more useful to determine an estimate for an area. 2. Have the students use the referents that they have identified or created to explore the areas of 2-D shapes throughout the classroom, the school, and at home. Have the students make a chart of the 2-D shapes, their areas, the referent and/or strategies used to determine the areas, and classify the 2-D shapes as regular or irregular. 3. Keep a visible record in the classroom of the strategies used to determine areas. Encourage the students to explore how symmetry can be used to help determine areas and capture these ideas on the classroom record.   **Big Idea:**  Estimating area.  **Suggestions for instructional activities:**   1. Have the students discuss what they understand an estimate to be and to predict what they think an estimation of an area would be. Provide the students with sample 2-D shapes for which they are to determine estimates of the areas. Have them share with a partner or in a small group the strategies for determining the estimates that they used. Have the groups then share their strategies with the class. Allow time for the class to discuss the validity and efficiency of the strategies. 2. Ask the students to find or construct two 2-D shapes and use estimates of their areas to compare the two areas. Have the students share their strategies and findings with a partner. |