Making Connections in Math From 7-9 in Measurement: Area

Grade 7	Grade 8	Grade 9 Applied
– research and report on real-life applications of **area** measurements (e.g., building a skateboard; painting a room).	– represent the multiplication and division of fractions, using a variety of tools and strategies (e.g., use an **area** model to represent 1/4 muitiplied by 1/3);	– describe the relationship between the algebraic and geometric representations of a single-variable term up to degree three [i.e., length, which is one dimensional, can be represented by x; **area**, which is two dimensional, can be represented by (x)(x) or x2; volume, which is three dimensional, can be represented by (x)(x)(x), (x2)(x), or x3];
– solve problems that require conversion between metric units of **area** (i.e., square centimetres, square metres) (Sample problem: What is the ratio of the number of square metres to the number of square centimetres for a given **area**? Use this ratio to convert 6.25 m2 to square centimetres.);	– estimate, and verify using a calculator, the positive square roots of whole numbers, and distinguish between whole numbers that have whole-number square roots (i.e., perfect square numbers) and those that do not (Sample problem: Explain why a square with an **area** of 20 cm2 does not have a whole-number side length.).	– determine the maximum **area** of a rectangle with a given perimeter by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, toothpicks, a pre-made dynamic geometry sketch), and by examining various values of the **area** as the side lengths change and the perimeter remains constant;
– solve problems involving the estimation and calculation of the **area** of a trapezoid;	– solve problems that require conversions involving metric units of **area**, volume, and capacity (i.e., square centimetres and square metres; cubic centimetres and cubic metres; millilitres and cubic centimetres) (Sample problem: What is the capacity of a cylindrical beaker with a radius of 5 cm and a height of 15 cm?);	– determine the minimum perimeter of a rectangle with a given **area** by constructing a variety of rectangles, using a variety of tools (e.g., geoboards, graph paper, a premade dynamic geometry sketch), and by examining various values of the side lengths and the perimeter as the **area** stays constant;
– estimate and calculate the **area** of composite two-dimensional shapes by decomposing into shapes with known **area** relationships (e.g., rectangle, parallelogram, triangle) (Sample problem: Decompose a pentagon into shapes with known **area** relationships to find the **area** of the pentagon.);	– determine, through investigation using a variety of tools (e.g., cans and string, dynamic geometry software) and strategies, the relationships for calculating the circumference and the **area** of a circle, and generalize to develop the formulas (Sample problem: Use string to measure the circumferences and the diameters of a variety of cylindrical cans, and investigate the ratio of the circumference to the diameter.);	– solve problems that require maximizing the **area** of a rectangle for a fixed perimeter or minimizing the perimeter of a rectangle for a fixed **area** (Sample problem:You have 100 m of fence to enclose a rectangular **area** to be used for a snow sculpture competition. One side of the **area** is bounded by the school, so the fence is required for only three sides of the rectangle. Determine the dimensions of the maximum **area** that can be enclosed.).

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– determine, through investigation using a variety of tools (e.g., nets, concrete materials, dynamic geometry software, Polydrons), the surface **area** of right prisms;	– solve problems involving the estimation and calculation of the circumference and the **area** of a circle;	– solve problems involving the **areas** and perimeters of composite two-dimensional shapes (i.e., combinations of rectangles, triangles, parallelograms, trapezoids, and circles) (Sample problem: A new park is in the shape of an isosceles trapezoid with a square attached to the shortest side.The side lengths of the trapezoidal section are 200 m, 500 m, 500 m, and 800 m, and the side length of the square section is 200 m. If the park is to be fully fenced and sodded, how much fencing and sod are required?);
– solve problems that involve the surface **area** and volume of right prisms and that require conversion between metric measures of capacity and volume (i.e., millilitres and cubic centimetres) (Sample problem: An aquarium has a base in the shape of a trapezoid. The aquarium is 75 cm high. The base is 50 cm long at the front, 75 cm long at the back, and 25 cm wide. Find the capacity of the aquarium.).	– determine, through investigation using a variety of tools and strategies (e.g., generalizing from the volume relationship for right prisms, and verifying using the capacity of thin-walled cylindrical containers), the relationship between the **area** of the base and height and the volume of a cylinder, and generalize to develop the formula (i.e., Volume = **area** of base x height);	
	– determine, through investigation using concrete materials, the surface **area** of a cylinder (Sample problem: Use the label and the plastic lid from a cylindrical container to help determine its surface **area**.);	
	– solve problems involving the surface **area** and the volume of cylinders, using a variety of strategies (Sample problem: Compare the volumes of the two cylinders that can be created by taping the top and bottom, or the other two sides, of a standard sheet of paper.).	
	– determine, through investigation using a variety of tools (e.g., dynamic geometry software, concrete materials, geoboard), relationships among **area**, perimeter, corresponding side lengths, and corresponding angles of similar shapes (Sample problem: Construct three similar rectangles, using grid paper or a geoboard, and compare the perimeters and **areas** of the rectangles.);	