Mathematics   **Brunswick School Department**
Grade 7
Geometry and Measurement

Essential Understandings	▪ Basic properties about lines, angles, two- and three-dimensional figures can be used to solve a variety of theoretical and practical problems.
Essential Questions	▪ What are the definitions and properties of straight angles, angles at a point, and vertical angles? ▪ How can one find missing angle measures in diagrams involving straight angles, angles at a point, and vertical angles? ▪ How can one find missing angles in a triangle? ▪ What is the relationship between the three sides in a triangle? ▪ How can one illustrate or model the difference between linear, square, and cubic units? ▪ Does finding the sum of the sides for the perimeter apply to all types of polygons? ▪ Why does finding the perimeter of a circle require the circumference formula? ▪ How do the area formulas for triangles, parallelograms, trapezoids and circles work with rational numbers other than whole numbers? ▪ How does one find the areas of figures made up of combined shapes? ▪ How does one find the surface area of a rectangular prism? ▪ How does one find the volume of a rectangular or triangular prism or of a cylinder? ▪ How can one accurately enlarge or reduce a two-dimensional figure? ▪ How does the use of scale factors affect the perimeter, area, and angle measures of a polygon? ▪ What are the characteristics of similar figures? ▪ How can figures be transformed on a coordinate plane? ▪ How can congruent and similar figures be identified when drawn on a coordinate plane?

Essential Knowledge	▪ All types of angles can be named in three different ways depending upon the labels provided in the diagram.
	▪ Straight angles are two adjacent angles that form a straight line and the sum of their measures is 180 degrees.
	▪ The sum of the measures of angles at a point is 360 degrees.
	▪ Vertical angles are two non-adjacent angles which form two intersecting lines; vertical angles are congruent.
	▪ The sum of the measures of the interior angles of a triangle is 180 degrees.
	▪ In a triangle, the sum of any two sides of the triangle must be greater than the third side of the triangle?
	▪ The units to describe perimeter, area, and volume differ in their dimensionality: linear units, square units, cubic units.
	▪ The perimeter of any polygon is the sum of all the sides; while the perimeter of a circle requires the use of a specific formula.
	▪ The area formulas for triangles, parallelograms, trapezoids, and circles can be used with a variety of rational dimensions.
	▪ The area formulas can also be applied to combined figures.
	▪ Finding the surface area of rectangular prisms involves finding the sum of the areas of rectangles.
	▪ Formulas are used to find the volumes of rectangular and triangular prisms and cylinders.
	▪ Scale factors can be used to accurately enlarge or reduce two-dimensional figures.
	▪ Scale factors applied to two-dimensional figures mathematically affect the perimeters, areas, and angles measures in different ways.
	▪ In similar figures the lengths of the corresponding sides are proportional and the measures of the corresponding angles are equal.
	▪ A coordinate plane is useful tool in transforming figures through reflections, rotations, and translations.
	▪ Similar and congruent figures can also be identified when drawn on a coordinate plane.
Vocabulary	▪ <u>Terms</u>: o scale factor, straight angles, transversal, vertical angles

Essential Skills	- Identify and name straight angles, angles at a point, and vertical angles and use their properties to find the measures of unknown angles. (R, A) - Recognize that the measures that form straight angles add to 180 degrees and the measures of angles at a point add to 360 degrees and apply this property to solve problems. (R, A) - Recognize that vertical angles are congruent and apply this property to solve problems. (R, A) - Use properties of angle relationships (adjacent angles, vertical angles, straight angles) resulting from two or three intersecting lines or angles relationships formed by two non-parallel or parallel lines cut by a transversal. (I) - Apply theorems or relationships about triangle inequality and sum of the measures of interior angles to solve problems. (I) - Explain and illustrate the difference between linear, square and cubic units. (R, A) - Solve problems involving the area and perimeter of rectangles, squares, triangles, parallelograms, trapezoids (I, R) and circles with a variety of rational dimensions. (R, A) - Solve problems involving the area of combined figures. (I, R) - Find the surface area of rectangular prisms (I) and volume of rectangular (R, A) and triangular prisms (I) and cylinders (I). - Use scale factors to enlarge and reduce two-dimensional shapes. (I) - Determine how scale factors affect the perimeters, areas and angle measures of given figures (polygons and circles) using models and explanations. (I) - Identify similar figures using proportions and name corresponding parts. (I, R, A) - Use transformations of figures on a coordinate plane. (I) - Identify similar and congruent figures on coordinate planes. (I)

Related Maine Learning Results	C. Geometry
	Geometric Figures
	C1.Students understand angle properties of lines in the plane.
	    a. Identify and name straight angles, angles at a point, and vertical angles and use these measures to find the measures of unknown angles.
	    b. Recognize that the measures that form straight angles add to 180 degrees and the measures of angles at a point add to 360 degrees and apply this property to solve problems.
	    c. Recognize that vertical angles are congruent and apply this property to solve problems.
	G2.Students solve problems involving perimeter and area.
	    a. Solve problems involving the area and perimeter of regions in the plane bounded by line segments and circular arcs.
	    b. Solve problems involving the area of combined figures.
	Transformations
	C3.Students understand and use the concept of scale drawings to enlarge or reduce two-dimensional plane figures.
	    a. Use the concept of scale factors when enlarging or reducing and recognize the invariance of shape.
	    b. Apply the understanding that enlargement or reduction by a scale factor leaves angle measurements unchanged.
	    c. Identify similar figures and name corresponding parts.

NECAP	NECAP
	Geometry and Measurement
	M (G & M) 7-1
	    Uses properties of angle relationships resulting from two or three intersecting lines…or angle relationships formed by two non-parallel lines or two parallel lines cut by a transversal.
	M (G & M) 7-2
	    Applies theorems or relationships (triangle inequality or sum of the measures of interior angles…) to solve problems.
	M (G & M) 7-4
	    Applies the concepts of congruency by solving problems on a coordinate plane involving reflections, translations, or rotations.
	M (G & M) 7-5
	M (G & M) 7-6
	    …understanding of the…surface area of rectangular prisms, or volume of rectangular prisms, triangular prisms, or cylinders…