Unit Title: "The Kitchen floor: Area and Subproblems"

Course: Algebra I (Middle School)

Subject Area: Mathematics

Time Frame: 14 days

Standards

Algebra I Standards	**Sunshine State Standards Benchmarks**	**NCEE New Standards**
The student will: 1.1 Simplify expressions with and without grouping symbols. 3.3 Use the distributive property to combine similar terms. *Review:* M/J mathematics 1 The student will: 5.1 Find area and perimeters of rectangular shapes and non-rectangular shapes. 5.2 Develop procedures for finding areas and perimeters of rectangles, parallelograms, triangles, and circles. 5.3 Use area and perimeters to solve applied problems.	MA.A.3.3.2 The student selects the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, ratios, proportions, and percents, including the appropriate application of the algebraic order of operations. *Expectations* The student: • Knows the appropriate operations to solve real-world problems involving integers, ratios, rates, proportions, numbers expressed as percents, decimals, and fractions. • Solves real-world problems involving integers, ratios, proportions, numbers expressed as percents, decimals, and fractions in two- or three-step problems. • Solves real-world problems involving percents including percents greater than 100% (for example, percent of change, commission). • Write and simplifies expressions from	The student: M1a Consistently and accurately adds, subtracts, multiplies, and divides rational numbers using methods and raises rational number to whole number powers. M6a Computes accurately with arithmetic operations on rational numbers. M6b Knows and uses the correct order of operations for arithmetic computations. M2d Determines and understands length, area, and volume, including perimeter and surface area; uses units, square units, and cubic units of measure correctly; computes areas of rectangles, triangles, and circles; computes volumes of prisms. M2k Models situations geometrically to formulate and solve problems.

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	real-world situations using the order of operations. MA.B.1.3.1 The student uses concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids and cylinders. *Expectations* The students: (Grade 6) • Uses concrete and graphic models to create formulas for finding perimeter and area. • Uses concrete and graphic models to discover an approximation for π and creates a formula for finding circumference. (Grade 7) • Solves and explains problems involving perimeter, area, and circumference. MA.B.1.3.3 The student understands and describes how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. *Expectations* The student:	

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	• Knows how a change in a figure's dimensions affects its perimeter, area, circumference, surface area, or volume. • Knows how changes in the volume, surface area, area, or perimeter of a figure affect the dimensions of the figure. MA.B.1.3.4 The student constructs, interprets, and uses scale drawings such as those based on number lines and maps to solve real-world problems. *Expectations* The student: • Interprets and applies various scales including those based on number lines, graphs, models, and maps). (Scale may include rational numbers.) • Constructs and uses scale drawings to recreate a given situation. MA.B.2.3.1 Select and use direct (measured) and indirect (not measured) methods of measurement as appropriate. *Expectations* The student: • Finds measure of length, weight or mass, and capacity or volume using proportional relationships and properties of similar geometric figures.	

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	MA.B.2.3.1 The student uses direct (measured) and indirect (not measured) measures to compare a given characteristic in either metric or customary units. *Expectations* The student: • Finds measures of length, weight or mass, and capacity or volume using proportional relationships and properties of similar geometric figures. MA.B.3.3.1 The student solves real-world and mathematical problems involving estimates of measurements including length time, weight/mass, temperature, money, perimeter, are, and volume, in either customary or metric units. *Expectations* The student: • Knows a variety of strategies to estimate, describe, make comparisons, and solve real-world and mathematical problems involving measurements. MA.C.2.3.1 The student understands the geometric concepts of symmetry, reflections, congruency, similarity, perpendicularity, parallelism, and	

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	transformations, including flips, slides, turns, and enlargements. Expectations The student: • Use the properties of parallelism, perpendicularity, and symmetry in solving real-world problems. • Identifies congruent and similar figures in real-world situations and justifies the identification. • Identifies and performs the various transformations (reflection, translation, rotation, dilation) of a given figure on a coordinate plane. MA.C.3.3.1 The student represents and applies geometric properties and relationships to solve real-world and mathematical problems. Expectations The student: Observes, explain, makes and tests conjectures regarding geometric properties and relationships (among regular and irregular shapes of two and three dimensions). Applies the Pythagorean Theorem in real-world problems.	

Desired Results

Enduring Understanding	Essential Questions	Knowledge and Skills
Students will understand: • Breaking larger problems into more manageable parts is a useful problem solving strategy. • The measurement process involves several key elements: o A phenomenon or object is chosen, and an attribute that can be measured is identified. o An appropriate unit is selected. o The unit is used repeatedly to "match" the attribute of the phenomenon or object in an appropriate way. o The number of nits is determined.	• What rules govern the way expressions are evaluated? • Is there more than one way to evaluate an expression? • How can the distributive property be applied to solve problems? • What properties of square tiles and rectangular tiles make them so useful for covering flat surfaces? • How are the perimeter and area of a figure related? • How can we find the area of an irregular figure? • Are there special relationships between perimeter and area for 4-sided figures such as parallelograms? • Is there a relationship between perimeter and area for triangles? • Does a circle have perimeter and area? If so, how can they be found?	Students will know • Key terms (e.g., area, center (of a circle), circle, circumference, diameter perimeter, radius (radii) pi or π, base, height, length, width perpendicular, trapezoid, distributive property). Students will be able to • Simplify expressions with and without grouping symbols. • Find perimeters and areas for rectangles, parallelograms, trapezoids, and circles. • Break larger problems into more manageable parts.

Acceptable Evidence

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
• **The Paint Job** The Paint Job is an opening task to focus students' attention to breaking larger problems into manageable parts. Regardless of whether study teams ultimately get the correct solution, they will be forced to break this problem down into smaller pieces,	Check-Up 1 Quiz A Check-Up 2 Quiz B Unit Test	Teacher observations of students during work on performance tasks. Accountable talk during work on performance tasks.

or "subproblems," even if they are not yet aware of what a subproblem is. • **Area of Triangle Investigations** Students use dot paper and Geometer's SketchPad to investigate the how the areas of triangles may be related to the areas of rectangles. • **Circumference of Circles** Students complete table of values for measurement of circumferences and diameters of circular objects to calculate the value for $\frac{\text{circumference}}{\text{diamter}}$. • **Area of Circles** Students cut given circle in half and then divide each semicircle into sectors leaving the outer edges connected. The "teeth" of the semicircles are fitted together to form a rectangle. The formula for the area of circles may be developed by determining the base of the shape ($\frac{1}{2}$ of the circumference, or πr^2) and the height of the shape (the radius of the circle). • **Multiplying with Algebra Tiles** Students consider the multiplication of polynomials as subproblems of finding areas for various rectangles.		