

**Unit Title: “Say It with Symbols”**

**Course: Middle School Mathematics**

**Subject Area: Mathematics**

**Time Frame: 20 days**

**Standards**

Middle School Mathematics Standards	Sunshine State Standards Benchmarks	NCEE New Standards
<p>The student will:</p> <p>19.1 Evaluate expressions by applying the rules of order of operations.</p> <p>19.2 Write symbolic sentences that communicate their reasoning.</p> <p>19.3 Develop methods for manipulating symbolic expression in ways that are both connected to and independent from tabular, graphical, and contextualized reasoning.</p> <p>19.4 Make sense of symbolic expressions involving additions subtraction, multiplication, division, and using exponents.</p> <p>19.5 Recognize applications of the commutative and distributive properties.</p> <p>19.6 Recognize and interpret equivalent expressions.</p> <p>19.7 Explain the reasoning underlying the solution of linear equations.</p> <p>19.8 Apply the properties for manipulating expressions to solving linear equations.</p>	<p>MA.A.2.3.1 The student understands and uses exponential and scientific notation.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"><li>• Express rational numbers in exponential notation including negative exponents.</li><li>• Expresses numbers in scientific or standard notation including decimals between 0 and 1.</li><li>• Evaluates numerical or algebraic expression that contain exponential notation.</li></ul> <p>MA.A.3.3.1 The student understands and explains the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationships of positive and negative numbers.</p>	<p>The student:</p> <p>M1a Consistently and accurately adds, subtracts, multiples, and divides rational numbers using appropriate methods and raises rational number to whole number powers.</p> <p>M1b Uses and understands the inverse relationships between addition and subtraction, multiplication and division, and exponentiation and root-extraction; uses the inverse operation to determine unknown quantities in equations.</p> <p>M1d Is familiar with characteristics of numbers (e.g., divisibility, prime factorization) and with properties of operations (e.g., commutativity and associativity), short of formal statements.</p> <p>M3a Discovers, describes, and generalizes patterns, including linear, exponential, and simple quadratic relationships, i.e., those of the form <math>f(n) = n^2</math> or <math>f(n) = cn^2</math>, for constant <math>c</math>, including <math>A = \pi r^2</math>, and</p>

	<p><i>Expectations</i></p> <p>The student:</p> <ul style="list-style-type: none"> <li>• Knows the effects of the four basic operation on whole numbers, fractions, mixed numbers, decimals, and integers.</li> <li>• Knows the inverse relationship of positive and negative numbers.</li> <li>• Applies the properties of real numbers to solve problems (commutative, associative, distributive, identity, equality, inverse, and closure).</li> </ul> <p>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.</p> <p><i>Expectations</i></p> <p>The student:</p> <ul style="list-style-type: none"> <li>• Knows the appropriate operations to solve real-world problems involving integers, ratios, rates, proportions, numbers expressed as percents, decimals, and fractions.</li> <li>• Solves real-world problems involving integers, ratios, proportions, numbers expressed as percents, decimals, and fractions in two- or three-step problems.</li> <li>• Solves real-world problems involving percents including percents greater than 100% (for example percent of change, commission).</li> </ul>	<p>represents them with variables and expressions.</p> <p>M3b Represent relationships with tables, graphs in the coordinate plane, and verbal symbolic rules.</p> <p>M3c Analyzes tables, graphs, and rules to determine functional relationships.</p> <p>M3d Finds solutions for unknown quantities in linear equations and in simple equations and inequalities.</p> <p>M6a Computes accurately with arithmetic operations on rational numbers.</p> <p>M6b Knows and uses the correct order of operations for arithmetic computations.</p> <p>M6f Uses equations, formulas, and simple algebraic notation appropriately.</p>
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	<ul style="list-style-type: none"> <li>Writes and simplifies expressions from real-world situations using the order of operations.</li> </ul> <p>MA.A.3.3.3 The student adds, subtract, multiplies, and divides whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator.</p> <p><i>Expectations</i> The students:</p> <ul style="list-style-type: none"> <li>Solves multi-step real-world problems involving fractions, decimals, and integers using appropriate methods of computation such as mental computation, paper and pencil, and calculator.</li> </ul> <p>MA.D. 2.3.1 The student represents and solves real-world problems graphically, with algebraic expression, equations, and inequalities.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>Translates verbal expressions and sentences into algebraic expressions, equations, and inequalities.</li> <li>Translates algebraic expressions, equations, or inequalities representing real-world relationships into verbal expressions or sentences.</li> <li>Solves single- and multi-step equations</li> </ul>	
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	<p>and inequalities in concrete or abstract form.</p> <ul style="list-style-type: none"> <li>• Graphs linear equations on the coordinate plane using tables of values.</li> <li>• Graphically displays real-world situations represented by algebraic equations or inequalities.</li> <li>• Evaluates algebraic expressions, equations, and inequalities by substituting integral values for variables and simplifying the results.</li> <li>• Simplifies algebraic expressions that represent real-world situations by combining like terms and applying the properties of real numbers.</li> </ul> <p>MA.D.2.3.2 The student uses algebraic problems-solving strategies to solve real-world problems involving linear equations and inequalities.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> <li>• Simplifies algebraic expressions with a maximum of two variables.</li> <li>• Solve single- and multi-step linear equations and inequalities that represent real-world situations.</li> </ul>	
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## Desired Results

Enduring Understanding	Essential Questions	Knowledge and Skills
<p>Students will understand:</p> <ul style="list-style-type: none"> <li>The focus for school algebra is shifting toward greater emphasis on non-symbolic representations such as graphs and tables rather than proficiency in working with symbolic expressions.</li> </ul>	<ul style="list-style-type: none"> <li>What rules govern the way expressions are evaluated?</li> <li>Is there more than one way to evaluate an expression?</li> <li>What are the ways to tell whether two expressions are equivalent?</li> <li>What additional information does an equivalent form of an expression reveal?</li> <li>What properties of real numbers are useful in confirming that two or more expressions are equivalent?</li> <li>How can the distributive and commutative properties be applied in solving problems?</li> <li>What properties of real numbers are needed to solve linear and quadratic equations?</li> </ul>	<p>Students will know</p> <ul style="list-style-type: none"> <li>Key terms (e.g., commutative property of addition, commutative property of multiplication, distributive property, equivalent expressions, expanded form, factored form, parabola, roots, term, function, linear relationship quadratic relationship).</li> </ul> <p>Students will be able to</p> <ul style="list-style-type: none"> <li>Evaluate expressions by applying the rules of order of operations.</li> <li>Write symbolic sentences that communicate their reasoning.</li> <li>Explain the reasoning underlying the solution of linear equations.</li> <li>Apply the properties for manipulating expression to solving linear equations.</li> <li>Solve simple quadratic equations with some sense of basic factoring and “undoing” techniques.</li> </ul>

## Acceptable Evidence

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
<ul style="list-style-type: none"> <li><b>Order of Operations</b> Students develop their intuition about the order in which operations in symbolic expression should be performed. The problems students encounter highlight conventions of mathematical notation governing order of operations and</li> </ul>	<p>Check-Up 1 Quiz A Check-Up 2 Quiz B Unit Test</p>	<p>Teacher observations of students during work on performance tasks. Accountable talk during work on performance tasks.</p>

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
<p>evaluating expressions that involve addition, subtraction, multiplication, division, and exponents. Real-world context help students uncover and apply rules to order of operations.</p> <ul style="list-style-type: none"> <li>• <b>Equivalent Expressions</b> Students justify, in their own way, the equivalence of two or more symbolic expression for the same situations. They are encouraged to think about problems in a variety of ways, leading to different, yet equivalent, expressions. They also compare graphs and tables for equivalent expressions. Through the investigations, students will develop a strong sense of the distributive property.</li> <li>• <b>Some Important Properties</b> Students acquire formal vocabulary for describing their experiences, learning the names for the distributive property. To achieve fluency with algebraic skills, students talk about the ideas, devise heir own examples, embed the properties in different contexts, and have an opportunity to uncover them in disguised situations.</li> <li>• <b>Solving Equations</b> Students bring together their experiences to establish systematic methods of solving equations. They learn more about symbolic strategies for solving equations of the forma <math>ax + b = cx + d</math>.</li> <li>• <b>Writing Expressions for Surface Area</b> Students are asked to find an expression for the surface area of a staggered stack of N rods of a particular length. The problem can be approached in several ways, and the various ways of reasoning lead to different, but equivalent expressions for modeling the data.</li> </ul>		

