

Unit Title: “The Cola Machine: Functions and Equality”

Course: Algebra I (Middle School)

Subject Area: Mathematics

Time Frame: 13 days

Standards

Algebra I Standards	Sunshine State Standards Benchmarks	NCEE New Standards
<p>The student will:</p> <p>1.4 Evaluate variable expressions for specified values.</p> <p>2.7 Find the absolute value for specified rational numbers.</p> <p>3.1 Use the field properties to justify algebraic statements.</p> <p>3.2 Use the field properties to simplify numerical expressions.</p> <p>7.1 State the domain and range of specified functions.</p> <p>7.2 Identify whether given graphs or sets of points are functions.</p> <p>7.3 Find function values.</p> <p>9.2 Multiply and divide algebraic fractions.</p>	<p>MA.A.1.3.1 The student associates verbal names, written word names, and standard numerals with integers, fractions, decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute value; and ratios.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none">Knows word names and standard numerals for integers, fractions, decimals, numbers expressed as percents, numbers with exponents, numbers expressed in scientific notation, absolute value, radicals, and ratios. <p>MA.A.1.3.4 The student understands that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, and absolute value.</p>	<p>The student:</p> <p>M7a Uses mathematical language and representations with appropriate accuracy, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs, and diagrams.</p> <p>M1a Consistently and accurately adds, subtracts, multiplies, and divides rational numbers using appropriate methods and raises rational numbers to whole number powers.</p> <p>M1c Consistently and accurately applies and converts the different kinds and form of rational numbers.</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,</p>

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	<p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> • Knows the relationships among fractions, decimals, and percents given a real-world context. • Simplifies expressions using integers, exponents, and radicals. • Knows equivalent forms for large and small numbers in scientific and standard notation. • Identifies and explains the absolute value of a number. <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><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> • Knows the effects of the four basic operations on whole numbers, fractions, mixed numbers, decimals, and integers. • Knows the inverse relationship of positive and negative numbers. • Applies the properties of real numbers to solve problems (commutative, associative, distributive, identity, equality, inverse, and closure). 	<p>and simple quadratic relationships, i.e., those of the form $f(n) = n^2$ or $f(n) = cn^2$, for constant c, including $A = \pi r^2$, and represents them with variables and expressions.</p> <p>M3b Represents relationships with tables, graphs, in the coordinate plane, and verbal or 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>

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	<p>MA.A.5.3.1 The student uses concepts about numbers, including primes, factors, and multiples to build number sequences.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> • Knows if numbers are relatively prime. • Applies number theory concepts to determine the terms in a real number sequence. • Applies number theory concepts, including divisibility rules to solve real-world or mathematical problems. <p>MA.C.3.3.2 The student identifies and plots ordered pairs in all four quadrants of a rectangular coordinate system and applies simple properties of lines.</p> <p><i>Expectations</i> The student:</p> <ul style="list-style-type: none"> • When given an equations or its graph, find ordered-pair solutions. • When given the graph of a line, identifies the slope of the line (including the slope of vertical and horizontal lines). • When given the graph of a linear relationship, determine the x- and y-intercepts of the line. • When given the graph of a linear relationship, applies and explains the 	

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	<p>properties of lines on a graph.</p> <p>MA.D.1.3.2 The student uses algebraic problem-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"> • Simplifies algebraic expressions with a maximum of two variables. • Solve single- and multi-step linear equations and inequalities that represent real-world situations. 	

Desired Results

Enduring Understanding	Essential Questions	Knowledge and Skills
<p>Students will understand:</p> <ul style="list-style-type: none"> • The relationship between two variables – in particular, the way in which one variable changes in relation to another – is central to understanding functions and concepts in calculus. • One of the most important ideas in the study of algebra is the relationship between two variables and how one can 	<ul style="list-style-type: none"> • How can mathematics be used to show how quantities change over time? • What does it mean when we see regular and predictable changes in a table of data or a graph? • Where in the world around us can we find these patterns? • How can I tell if two expressions are equivalent? • Which form of an expression should I 	<p>Students will know</p> <ul style="list-style-type: none"> • Key terms (i.e., change, domain, coordinate pair, function, relationship, variable, range). <p>Students will be able to</p> <ul style="list-style-type: none"> • Evaluate variable expressions for specified values. • Find the absolute value for specified rational numbers.

<p>be used to predict values of the other.</p> <ul style="list-style-type: none"> The symbolic expression and manipulations for equations is connected to graphs and tables of the equations. 	<p>use?</p> <ul style="list-style-type: none"> What properties of real numbers are useful to help confirm that two or more expressions are equivalent? How can the distributive property be applied to solve problems? What properties of real numbers are needed solve linear equations? 	<ul style="list-style-type: none"> Use the field properties to justify algebraic statements. Use the field properties to simplify numerical expressions. State the domain and range of specified functions. Identify whether given graphs or sets of points are functions. Find function values. Multiply and divide algebraic fractions.
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Acceptable Evidence

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
<ul style="list-style-type: none"> Relations Students are introduced to relations and functions through the images of “machines” with inputs and outputs. Systems of Linear Equations Students determine solutions to systems of two linear equations in two variables by using the linear combination method. Multiplying and Dividing Rational Expressions Students’ knowledge of rational expression is extended to include multiplication and division. Multiplication and division of rational expression is related to multiplication and division of rational numbers. The Cola Machine The Cola Machine introduces the concept of a function. Students focus on the notion of determining a single output from a given input. 	<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
<ul style="list-style-type: none"> <li data-bbox="184 305 991 425">• What is the Difference? Examples of situations in which a positive difference is needed leads the introduction to working to find solutions to absolute value equations and inequalities. <li data-bbox="184 425 991 519">• Properties of Equality Students justify steps in given statements by identifying the field property used. 		