Unit Title: "The Cola Machine: Functions and Equality"

Course: Algebra I (High School)

Subject Area: Mathematics

Time Frame: 13 days

Standards

Algebra I Standards	**Sunshine State Standards Benchmarks**	**NCEE New Standards**
The student will: 1.4 Evaluate variable expressions for specified values. 2.7 Find the absolute value for specified rational numbers. 3.1 Use the field properties to justify algebraic statements. 3.2 Use the field properties to simplify numerical expressions. 7.1 State the domain and range of specified functions. 7.2 Identify whether given graphs or sets of points are functions. 7.3 Find function values. 9.2 Multiply and divide algebraic fractions.	MA.A.1.4.1 The student will associate verbal names, written word names, and standard numerals with integers, rational numbers, irrational numbers, real numbers, *and complex numbers.* MA.A.1.4.4 The student will understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, *and logarithms.* MA.A.3.4.1 The student will understand and explain the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships.	The student: M7a Uses mathematical language and representations with appropriate accuracy, including numerical tables and equations, simple algebraic equations and formulas, charts, graphs, and diagrams. M1a Consistently and accurately adds, subtracts, multiplies, and divides rational numbers using appropriate methods and raises rational numbers to whole number powers. M1c Consistently and accurately applies and converts the different kinds and form of rational numbers. 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. M3a Discovers, describes, and generalizes patterns, including linear, exponential,

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	MA.A.5.4.1 The student will apply special number relationships such as sequences *and series* to real-world problems. MA.C.3.4.2 The student will use a rectangular coordinate system (graph), apply algebraically verify properties of two- *and three*-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity. MA.D.1.4.2 The student will determine the impact when changing parameters of given functions.	and simple quadratic relationships, i.e., those of the form f(n) n^2 or f(n) = cn^2, for constant c, including A = πr^2, and represents them with variables and expressions. M3b Represents relationships with tables, graphs, in the coordinate plane, and verbal or symbolic rules. M3c Analyzes tables, graphs, and rules to determine functional relationships. M3d Finds solutions for unknown quantities in linear equations and in simple equations and inequalities.

Desired Results

Enduring Understanding	Essential Questions	Knowledge and Skills
Students will understand: • 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 be used to predict values of the other. • The symbolic expression and manipulations for equations is connected to graphs and tables of the equations.	• How can mathematics b 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 is two expressions are equivalent? • Which form of an expression should I use? • 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?	Students will know • Key terms (i.e., change, domain, coordinate pair, function, relationship, variable, range). Students will be able to • Evaluate variable expressions for specified values. • Find the absolute value for specified rational numbers. • 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.

Acceptable Evidence

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
• **Relations** Students are introduced to relations and functions through the	Check-Up 1 Quiz A	Teacher observations of students during work on performance tasks.

Performance Tasks	Quizzes, Test, and Work Samples	Observations and Dialogues
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. • **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. • **Properties of Equality** Students justify steps in given statements by identifying the field property used.	Check-Up 2 Quiz B Unit Test	Accountable talk during work on performance tasks.