Algebra 1 – UNIT 1
Relationships between Quantities and Reasoning with Equations

Critical Area: By the end of eighth grade, students have learned to solve linear equations in one variable and have applied graphical and algebraic methods to analyze and solve systems of linear equations in two variables. This unit builds on these earlier experiences by asking students to analyze and explain the process of solving an equation. Students develop fluency writing, interpreting, and translating between various forms of linear equations and inequalities, and using them to solve problems. They master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations. All of this work is grounded on understanding quantities and on relationships between them.

CLUSTERS	COMMON CORE STATE STANDARDS
(m) Interpret the structure of expressions. *Limit to linear expressions and to exponential expressions with integer exponents.*	**Algebra - Seeing Structure in Expressions** A.SSE.1 Interpret expressions that represent a quantity in terms of its context.★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as single entity. *For example, interpret P(1+r)n as the product of P and a factor not depending on P.*
(m) Understand solving equations as a process of reasoning and explain the reasoning. *Students should focus on and master A.REI.1 for linear equations and be able to extend and apply their reasoning to other types of equations in future courses.*	**Algebra - Reasoning with Equations and Inequalities** A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
(m) Solve equations and inequalities in one variable. *Extend earlier work with solving linear equations to solving linear inequalities in one variable and to solving literal equations that are linear in the variable being solved for. Include simple exponential equations that rely only on application of the laws of exponents, such as* $5x = 125$ *or* $2x = \frac{1}{16}$.	A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. A.REI.3.1 Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context. **CA addition**
(s/a) Reason quantitatively and use units to solve problems. *Working with quantities and the relationships between them provides grounding for work with expressions, equations, and functions.*	**Numbers - Quantities** N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CLUSTERS	COMMON CORE STATE STANDARDS
(m) Create equations that describe numbers or relationships. *Limit A.CED.1 and A.CED.2 to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.* *Limit A.CED.3 to linear equations and inequalities.* *Limit A.CED.4 to formulas which are linear in the variable of interest.*	**Algebra - Creating Equations** A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.
MATHEMATICAL PRACTICES	
1. **Make sense of problems and persevere in solving them.** 2. Reason abstractly and quantitatively. 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics**. 5. Use appropriate tools strategically. 6. **Attend to precision.** 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.	As you begin the year, it is advised that you start with MP1 and MP 3 and MP4 to set up your expectations of your classroom. This will help you and your students become proficient in the use of these practices. All other practices may be evident based on tasks and classroom activities.
LEARNING PROGRESSIONS	
CDE Progress to Algebra K-8 www.cde.ca.gov/be/cc/cd/documents/updateditem12catt3.doc	

(m) Major Clusters – area of intensive focus where students need fluent understanding and application of the core concepts.

(s)Supporting/Additional Clusters – designed to support and strengthen areas of major emphasis/expose students to other subjects.

★Indicates a modeling standard linking mathematics to everyday life, work, and decision-making.

(+) Indicates additional mathematics to prepare students for advanced courses.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	KEY VOCABULARY
• Understand that numbers in real world applications often have units attached to them, and they are considered quantities. • Understand the structure of algebraic expressions and polynomials. • Understand general linear equations ($y=mx+b$, $m\neq0$) and their graphs and extend this to work with absolute value equations, linear inequalities, and systems of linear equations. • Use properties of equality and order of operation to solve an equation by using inverse operations. • Solve equations and inequalities give all the values of a variable that make the equation/inequality true. • The values that define inequalities are graphically represented by either: a set of linear values or the areas represented above or below the linear values. • The order of operations that is used to solve an equation is critical and can drastically change the solutions.	• What are the "pieces" of an algebraic expression? What do they represent in the context of the real-world situation? • What do the parts of an expression tell us in a real-world context? • How would you describe the difference between an expression and an equation? • How do the properties of equality and order of operations extend to support the solving of an equation? • Why is it important to be able to solve linear equations and inequalities in one variable? • How do you graphically represent the solutions to a linear equation? • How do you graphically represent the values that define linear inequalities?	absolute Value coefficient equation equality expression exponent factor graph inequality linear equation linear inequality polynomial system of linear equations variable

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT

LAUSD Adopted Textbooks and Programs
• Big Ideas Learning - Houghton Mifflin Harcourt, 2015: Big Ideas Algebra I
• College Preparatory Mathematics, 2013: Core Connections, Algebra I
• The College Board, 2014:Springboard Algebra I
 	
Materials:
• **Mathematics Assessment Project Formative Assessments/Tasks**
  • Solving Equations in One Variable: (8.EE)
  • Sorting Equations and Identities: (A-SSE, A-REI)
  • Manipulating Polynomials: (A-SSE, A-APR)
	Start by directing students to understand written sequence of steps for solving linear equations which is the code for a narrative line of reasoning that would use words like "if", "then", "for all" and "there exists." In the process of learning to solve equations, students should learn certain "if - then" moves: e.g. "if $x = y$ then $x + c = y + c$ for any c." The first requirement in this domain (REI) is that students understand that solving equations is a process of reasoning (A.REI.1).
	
	Have students reason through problems with careful selection of units, and how to use units to understand problems and make sense of the answers they deduce.
		Formative Assessment
		• **LAUSD Concept Lessons :**
		-**Tommy's T-Shirts** -**Storage Tanks**
		-**Surround the Pool** -**Calling Plan**
		-**Stacking Cups**
		• **Comparing Investments:** **(A-SSE, F-LE)**
		
		LAUSD Assessments
		The district will be using the SMARTER Balanced Interim Assessments. Teachers would use the Interim Assessment Blocks (IAB) to monitor the progress of students. Each IAB can be given twice to show growth over time.

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
• Defining Regions of Inequalities: (A-REI) • Interpreting Algebraic Expressions: (A-SSE, A-APR) **NCTM Illuminations** • Pan Balance – Expressions: • Exploring Equations: • Algebra tiles:	***Example*** As Felicia gets on the freeway to drive to her cousin's house, she notices that she is a little low on gas. There is a gas station at the exit she normally takes, and she wonders if she will have to get gas before then. She normally sets her cruise control at the speed limit of 70 mph and the freeway portion of the drive takes about an hour and 15 minutes. Her car gets about 30 miles per gallon on the freeway, and gas costs $3.50 per gallon. a. Describe an estimate that Felicia might do in her head while driving to decide how many gallons of gas she needs to make it to the gas station at the other end. b. Assuming she makes it, how much does Felicia spend per mile on the freeway? Students will create multiple ways to rewrite an expression that represents its equivalent form. http://a4a.learnport.org/page/algebra-tiles The use of algebraic tiles to establish a visual understanding of algebraic expression and the meaning of terms, factors, and coefficients.	**State Assessments** California will be administering the SMARTER Balance Assessment as the end of course for grades 3-8 and 11. There is no assessment for Algebra 1. The 11th grade assessment will include ítems from Algebra 1, Geometry, and Algebra 2 standards. For examples, visit the SMARTER Balanced Assessment at: SBAC - http://www.smarterbalanced.org/

LANGUAGE GOALS for **low achieving, high achieving, students with disabilities and English Language Learners**
• Students will be able to use mathematical vocabulary to explain orally and in writing parts of an expression/equation/inequality. • Students will describe the relationship between a linear equation and a system of linear equations. • Students will explain orally and in writing how to solve equations and will paraphrase another student's explanation of how to solve the same problem. • Students will construct response to word problems using sequential words.
PERFORMANCE TASKS
LAUSD Concept Lessons – -Tommy's T-Shirts -Storage Tanks **Comparing Investments:** (A-SSE, F-LE) -Surround the Pool -Calling Plan -Stacking Cups

DIFFERENTIATION📖		
UDL/FRONT LOADING	ACCELERATION	INTERVENTION
Prerequisites: Familiarity with g order of operations, exponents, variables, coefficients, functions, domain, quadrants, x-axis, y-axis, line, fractions, integers, equations, rational numbers, irrational numbers, real numbers, expressions by utilizing sentence stems, language frames, visuals, and cloze reading. Experience in problem solving, reading and communicating, estimating and verifying answers and solutions, logical reasoning, and using technology. Students must be able to use the language of mathematics orally and in writing to explain the thinking processes, mathematical concepts and solution strategies they use in solving problems. Students, at least informally, should become familiar with examples of inductive and deductive reasoning. Students should become proficient in the use of scientific calculators and graphing calculators to enhance their understanding of mathematical ideas and concepts.	Due to their intuitive understanding of mathematical function and processes, students who are mathematically gifted may skip over steps and be unable to explain how they arrived at the correct answer to a problem. Utilize Math Practice 3 with them often. Provide students with opportunities to share their previous knowledge and avoid redundant learning by being encouraged to learn the sophisticated and advanced information and skills of the curriculum or related curriculums at their own rate. This also includes the opportunity for students to make personal meaning of the lesson. Provide students with a variety of learning/assessment options. Use engaging, active, and grounded in reality activities. The increased complexity of the problems should require higher order thinking skills and provide opportunities for open-ended responses. Students who are accelerated in mathematics often demonstrate an uneven pattern of mathematical understanding and development, and may be much stronger in concept development than they are in computation. These students often prefer to learn all they can about a particular mathematical idea before leaving it for new concepts. Therefore, a more expansive approach focused on student interest may avoid the frustration that occurs when the regular classroom schedule demands that it is time to move on to another topic.	**Adaptations for students with visual and auditory perceptual difficulties:** • The student is located close to where the teacher is providing instruction, in addition to being able to receive peer assistance. • Visual cues such as linear models are provided on the wall. **Adaptations for students with integrative difficulties such as abstract thinking and conceptualization:** • Teachers utilize concrete models such as Algebra tiles for an extended period of time. • Students verbalize what they are doing through words, pictures, and numbers. • Students are encouraged to justify their thinking using targeted mathematical vocabulary. • Students are encouraged to restate word problems in their own words. • Students are provided opportunities to teach the concept to each other. • An abstract concept is represented in a variety of ways, such as concrete examples, words, symbols, drawings, and acting it out. • Students are placed in heterogeneous groups for peer assistance and modeling

References:

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