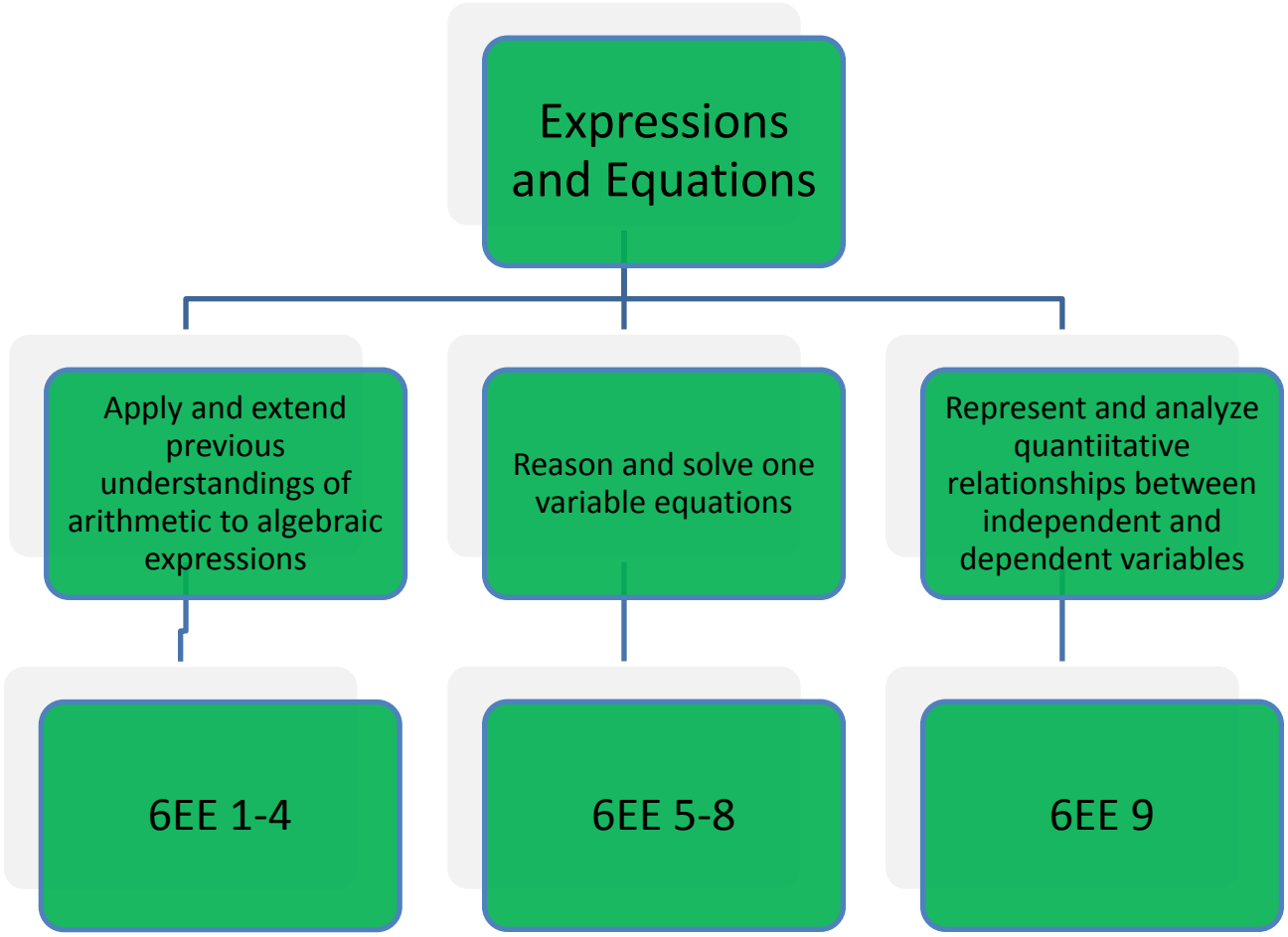
Grade 6
Unit 3
Understanding Expressions and Equations



GRADE 6 – UNIT 3
Understanding Expressions and Equations

Critical Area: Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

CLUSTERS	COMMON CORE STATE STANDARDS
m[1] Apply and extend previous understandings of arithmetic to algebraic expressions	**Expressions and Equations** 6.EE.1. Write and evaluate numerical expressions involving whole-number exponents. 6.EE.2. Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.* 6.EE.3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* 6.EE.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless*

CLUSTERS	COMMON CORE STATE STANDARDS
	of which number y stands for.
Reason about and solve one-variable equations and inequalities.	6.EE.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. 6.EE.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. 6.EE.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. 6.EE.8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
Represent and analyze quantitative relationships between dependent and independent variables.	6.EE.9.Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.
$(s/a)^2$ Solve real-world and mathematical problems involving area, surface area, and volume.	**Geometry** 6.G.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. 6.G.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. 6.G.4. Represent three-dimensional figures using nets made up of rectangles and triangles,

CLUSTERS	COMMON CORE STATE STANDARDS
	and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
MATHEMATICAL PRACTICES	LEARNING PROGRESSIONS
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the arguments 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.	Click on the link below to access Common Core Standards Writing Team's Grade 6-8 Progression for Expressions and Equations http://commoncoretools.files.wordpress.com/2011/04/ccss_progression_ee_2011_04_25.pdf

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS	KEY VOCABULARY
• Expression and Equations build a ramp from arithmetic in elementary school to more sophisticated work with algebraic expression in high school. • Write and evaluate numerical and variable expressions. Understand numbers in which one or more letters are used to stand for a number which is either unspecified or unknown. • As the complexity of expressions increase, students will see them as being built out of basic operations with products and factors. • Apply the properties of operations to generate equivalent expressions. • Solve real-world and mathematical problems by writing and solving equations. • Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. • Use variables to represent two quantities in a real-world problem that change in relationship to one another. • Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.	How can you apply the properties of operations to generate equivalent expressions? Which values from a specified set, if any, make an equation or inequality true? In what ways can you reason and solve one-variable equations and inequalities? How do expressions and equations apply to real life situations? How might an inequality describe a real-life problem? How can you show that inequalities can have infinitely many solutions? In what ways can you show the relationship between dependent and independent variables?	• Associative property • Coefficient • Commutative property constants • Dependent variable • Distributive property • Equation • Equivalent • Expression • Formulas • Identity properties of addition and multiplication • Independent variable • Inequality • Rational numbers • Solution • Solution set • Terms • Variables

RESOURCES	INSTRUCTIONAL STRATEGIES	ASSESSMENT
LAUSD Adopted Textbook • California Mathematics • College Preparatory Mathematics • Go Math Click on each list above for Textbook Alignment **LAUSD Grade 6 Concept Lessons** Surround the Pool Banquet Table **Illustrative Mathematics** 6.EE Firefighter Allocation 6.EE Rectangle Perimeter 1	Teachers are strongly encouraged to use algebra tiles or "Hands On Equations"© as students are developing a connection from concrete mathematical representations to abstract notions of variables. Spreadsheets are a powerful tool to help students understand the concept of variable because you can use formulas that are dependent on the values in a cell and then change the value in the cell. It is very easy for students to see how changing the value of the variable affects the value of the cell with the formula. Whole class response tools (such as index cards, white boards, and electronic response devices) allow teachers to check for understanding before moving forward with new material.	**Formative Assessment** PARCC - Kelvin's 100 Meter Dash http://www.parcconline.org/sites/parcc/files/PARCC_SampleItems_Mathematics_G6Kelvin_081513_Final.pdf **LAUSD Assessments** District assessments can be accessed through: http://achieve.lausd.net/math http://achieve.lausd.net/ccss Use your Single Sign On to access the Interim Assessments **State Assessment** California will be administering the SMARTER Balance Assessment as the end of course for grades 3-8 and 11. The 11th grade assessment will include ítems from Algebra 1, Geometry, and Algebra 2 standards. For examples, visit the SMARTER Balance Assessment at: SBAC - http://www.smarterbalanced.org/

LANGUAGE GOALS for **low achieving, high achieving, students with disabilities and English Language Learners**

- Students will describe their understanding of properties of operations to generate equivalent fraction, using the words distributive, associative, commutative, and identity properties.
- Students will accurately read equivalent expressions aloud fluently, without hesitating.
- Students will ask and answer why values from a specified set, if any, make an equation or inequality true using equations and expressions.
- Students will write an opinion to show how inequalities can have infinitely many solutions. The key to determining that the inequalities have _____. This is possible because ____. I believe this because ____.

- Students will distinguish between dependent and independent variables and describe the relationship between them using sentence starters such as:
  I think _____ is the dependent variable because _____.
  The relationship between_____ and _____ is _____.

- Students will explain how to use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity. This equation expresses the quantity of _____ because _____.

PERFORMANCE TASKS

Mathematics Assessment Project

Laws of Arithmetic:
http://map.mathshell.org/materials/download.php?fileid=1358

Optimizing: Security Cameras:
http://map.mathshell.org/materials/download.php?fileid=1354

Illustrative Mathematics

6.EE Rectangle Perimeter 3
6.EE Watch out for Parentheses
6.EE The Djinni's Offer
6.EE Seven to the What?!?
6.EE,G Sierpinski's Carpet
6.EE Distance to School
6.EE,RP 7.EE,RP Anna in D.C.

Illustrative Mathematics

6.EE.4 Equivalent Expressions
6.EE.4 Rectangle Perimeter 2
6.EE Triangular Tables
6.EE Busy Day
6.EE.5 Log Ride
6.EE.6 Firefighter Allocation
6.EE.6,NS,RP; 8.EE,F Pennies to heaven
6.EE.7 Firefighter Allocation
6.EE.7 Morning Walk
6.EE.7,RP 7.EE,RP Anna in D.C.
6.RP, 6.EE.7 Fruit Salad
6.EE.8 Fishing Adventures 1
6.EE.9 Chocolate Bar Sales

DIFFERENTIATION 🕮

UDL/ FRONT LOADING	ACCELERATION	INTERVENTION
Students apply and extend understandings using numerical expressions. They use whole number exponents to express powers of 10; using letters to represent an unknown quantity. They also move from viewing expressions as actions describing a calculation to viewing then as objects in their own right (concrete to abstract). In grades k-5 students have been using properties of operations to write expression in different ways. These experiences with properties help students prepare for work with algebraic expressions. For example students in grades k-5 have been writing numerical expressions and simple equations	Acceleration for high achieving students: Encourage students to individualize their learning by providing them with the tools to further investigate concepts that will be developed further in other grade levels. For example, Although the process of reasoning will eventually lead to standard methods for solving equations, students should study examples where looking for structure pays off, such as in $4x + 3x = 3x + 20$, where they can see that $4x$ must be 20 to make the two sides equal. This understanding can be reinforced by comparing arithmetic and algebraic solutions to simple word	Intervention for low achieving students and students with disabilities: Transitioning from concrete to abstract is important and needs to be a part of intervention. A clear connection between symbolic representation and expression is key. • Small teacher to student ratio discussion. For example, describing the relationship between distance and time for a person starting 5 miles from home and walking

involving one operation with a variable.	problems. For example, how many 44-cent stamps can you buy with $11? Students are accustomed to solving such problems by division; now they see the parallel with representing the problem algebraically as 0.44n = 11, from which they use the same reasoning as in the numerical solution to conclude that n = 11/0.44. Interdisciplinary connections can be made to Social Studies units were math enables history to be explained in more concrete ways. For example population growth rates.	away at 5 miles per hour. With these types of discussions students begin to develop an understanding of variables. • Emphasize think-pair-share. • Students can use tabular and graphical representations to develop an appreciation of varying quantities. • Make connections to real life

[1] **Major Clusters – area of intensive focus where students need fluent understanding and application of the core concepts.**

[2] **Supporting/Additional Clusters – designed to support and strengthen areas of major emphasis/expose students to other subjects.**

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