Unit B - *Relationships (Equations, Inequalities and Functions)*

Overview

Students begin the unit with a quick review of solving equations and inequalities. Focus should be on solving more difficult equations (ie. equations with a variable on both sides) and inequalities (those with negative numbers and with the variable on the right hand side of the inequality). Students are asked to justify their work using math and words. Asking for step by step explanations in words will help them in justifying steps in proof writing in Geometry. The concept of solving equations is expanded to solving literal equations, solving compound equations and solving absolute value equations and inequalities.

Students learn function notation during the second part of this unit. The goal is for them to be able to move fluently between representations of a function.

21st Century Capacities: Analyzing, Product Creation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 3 Construct viable arguments and critiques the reasoning of others.
MP 4 Model with Mathematics
MP 8 Look for and express regularity in repeated reasoning.

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.
A-REI 3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
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 a single entity...
A-SSE 3.Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.
A-CED 1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear ... functions*

Transfer:

Students will be able to independently use their learning in new situations to...
1. Analyze the real world and use mathematics to model complex situations. (Analyzing)
2. Demonstrate fluency with math facts, computation and concepts
3. Justify reasoning using clear and appropriate mathematical language. (Product Creation)

Meaning:

UNDERSTANDINGS: *Students will understand that:*	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*
1. The properties of equality are used to manipulate equations while maintaining equality. 2. Functions represent unique relationships between inputs and outputs that can be represented algebraically, graphically or as a table. 3. Functions are used to represent real world situations including	A. How do I know if my answer is correct? B. Do my answers make sense? C. Could another person understand the steps to my solution? D. How do I interpret this function?

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.* 8.F.1 and F.IF.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.1 8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). 8F 5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. 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 10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). F-IF 1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation $y = f(x)$. F-IF 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F-IF 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative....* F-IF 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F-IF 7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions F-IF 9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	those with one answer, a range of answers or no answer. 4. Creating a clear argument for a solution benefits you and your audience.	

Acquisition:	
Students will know… 1. The properties of equality and inequality 2. How to state a value of an equation that has no, one, multiple, infinite, or bounded solutions. 3. How to identify the independent and dependent variable 4. Vocabulary: algebraic expression, associative property, coefficient, constant, commutative property, distributive property, evaluate, inequality symbol, integers, inverse operations, literal equations, absolute value, real numbers, variable, dependent variable, domain, range, function, input, output, linear function, mapping diagram, non-linear function, relation, table, vertical line test	*Students will be skilled at…* 1. Solving equations including those with a variable on both sides, with fractions, with distributing, combining like terms, with x^2 or x^3 (review) 2. Solving literal equations (review) 3. Solving inequalities on the number line (review) 4. Modeling real world rate/work problems (especially those that involve adding two scenarios to get a whole or setting two scenarios equal to each other) 5. Solving absolute value equations 6. Solving compound inequalities 7. Determining whether a relationship is a function. 8. Applying function notation to solve for inputs and outputs 9. Modeling with function notation, or a table or a graph 10. Interpreting graphs