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

Overview

In this unit students solve and model with equations and inequalities. Students are asked to justify their work using math and words. Asking for step by step explanations in words will help them solidify their understanding and later will help in justifying steps in proof writing in Geometry. The concept of solving equations is expanded to solving literal equations, solving compound equations and inequalities.

During the second part of this unit, students are introduced to the concept of a function. Focus includes identification of relationships that are not functions, defining the domain and range of a function and distinguishing between linear and non-linear functions. Students then go on to practice applying functions through various contextual problems. Students collect data, make a table and graph data then identify the type of function. Students learn function notation during this unit. The goal is for them to be able to move fluently between representations of a function.

21st Century Capacities: Analyzing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP 3 Construct viable arguments and critiques the reasoning of others.
MP 4 Model with Mathematics

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,

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

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. The properties of equality are used to manipulate equations while maintaining equality.

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How do I know if my answer is correct?
B. Do my answers make sense?

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<td rowspan="3">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

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.

A-CED 2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

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</td>
<td>2. Creating a clear argument for a solution benefits you and your audience.
3. Functions represent unique relationships between inputs and outputs that can be represented algebraically, graphically or as a table.
4. Functions are used to represent real world situations including those with one answer, a range of answers or no answer.</td>
<td>C. Could another person understand the steps to my solution?
D. How do I interpret this function?</td>
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<td colspan="2">Acquisition:</td>
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<td>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. Why an equation in the form $x^2 = c$ has two solutions.
4. How to identify the independent and dependent variable
5. Vocabulary: algebraic expression, associative property, coefficient, constant, commutative property, distributive property, evaluate, inequality symbol, integers, inverse operations, literal equations, absolute value, real numbers,
6. Real numbers, variable , dependent variable, domain, range,function, input, output, linear function, mapping diagram, non-linear</td>
<td>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. Simplifying radicals
5. 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)
6. Solving absolute value equations
7. Solving compound inequalities
8. Modeling real world rate/work</td>
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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 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).	function, relation, table, vertical line test	problems (especially those that involve adding two scenarios to get a whole or setting two scenarios equal to each other) 9. Determining whether a relationship is a function. 10. Applying function notation to solve for inputs and outputs 11. Modeling with function notation, or a table or a graph 12. Interpreting graphs