

Richmond Public Schools

Curriculum Framework

7th Grade Math

Strand: Patterns, Functions, and Algebra	
7.12 The student will solve two-step linear equations in one variable, including practical problems that require the solution of a two-step linear equation in one variable.	
Suggested Pacing	
Second Nine Weeks- 8 Instructional Days	
Spiraling Standards	
Spiraling Down: 6.13 The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable. 5.19 The student will a) investigate and describe the concept of variable; b) write an equation to represent a given mathematical relationship, using a variable; c) use an expression with a variable to represent a given verbal expression involving one operation; and d) create a problem situation based on a given equation, using a single variable and one operation.	Spiraling Up: 8.17 The student will solve multistep linear equations in one variable with the variable on one or both sides of the equation, including practical problems that require the solution of a multistep linear equation in one variable
Essential Questions	Common Misconceptions
When solving an equation, why is it important to perform identical operations on each side of the equal sign?	Students may not have a conceptual understanding of negatives and always want to subtract the integer from both sides (even when it is

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<p><i>An operation that is performed on one side of an equation must be performed on the other side to maintain equality.</i></p> <p>What are inverse operations? <i>Inverse operations are the opposite operations. They undo what has been done.</i></p> <p>How can algebraic expressions and equations be written? <i>Word phrases and sentences can be used to represent algebraic expressions and equations</i></p>	<p>already being subtracted). Similarly, students struggle with subtracting negatives and subtracting from a negative.</p> <p>Students may not know what it means when told to perform the inverse operation.</p> <p>Some students are still unsure of what operation is being performed between the coefficient and its variable.</p> <p>When moving integers away from the variable, students may not understand that the operation must be performed on both sides.</p> <p>Students do not understand the difference of less and less than when translating verbal expressions.</p> <p>Students are unclear of how to write “5 and a sum of”. using parentheses.</p>
<p style="text-align: center;">Understanding the Standard</p>	<p style="text-align: center;">Essential Knowledge and Skills</p>
<ul style="list-style-type: none"> ● An equation is a mathematical sentence that states that two expressions are equal. ● The solution to an equation is the value(s) that make it a true statement. Many equations have one solution and can be represented as a point on a number line. ● A variety of concrete materials such as colored chips, algebra tiles, or weights on a balance scale may be used to model solving equations in one variable. ● The inverse operation for addition is subtraction, and the inverse operation for multiplication is division. 	<p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> ● Represent and solve two-step linear equations in one variable using a variety of concrete materials and pictorial representations. ● Apply properties of real numbers and properties of equality to solve two-step linear equations in one variable. Coefficients and numeric terms will be rational. ● Confirm algebraic solutions to linear equations in one variable.

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- A two-step equation may include, but not be limited to equations such as the following:
 $2x + \frac{1}{2} = -5$; $-25 = 7.2x + 1$; $\frac{x-7}{-3} = 4$; $\frac{3}{4}x - 2 = 10$.
- An expression is a representation of quantity. It may contain numbers, variables, and/or operation symbols. It does not have an “equal sign (=)” (e.g., $\frac{3}{4}$, $5x$, $140 - 38.2$, $18 \cdot 21$, $5 + x$).
- An expression that contains a variable is a variable expression. A variable expression is like a phrase: as a phrase does not have a verb, so an expression does not have an “equal sign (=).” An expression cannot be solved.
- A verbal expression can be represented by a variable expression. Numbers are used when they are known; variables are used when the numbers are unknown. For example, the verbal expression “a number multiplied by 5” could be represented by “ $n \cdot 5$ ” or “ $5n$ ”.
- An algebraic expression is a variable expression that contains at least one variable (e.g., $2x - 3$).
- A verbal sentence is a complete word statement (e.g., “The sum of twice a number and two is fifteen.” could be represented by “ $2n + 2 = 15$ ”).
- An algebraic equation is a mathematical statement that says that two expressions are equal (e.g., $2x - 8 = 7$).
- Properties of real numbers and properties of equality can be applied when solving equations, and justifying solutions. Students should use the following properties, where appropriate, to further develop flexibility and fluency in problem solving
- Write verbal expressions and sentences as algebraic expressions and equations.
- Write algebraic expressions and equations as verbal expressions and sentences.
- Solve practical problems that require the solution of a two-step linear equation.

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(limitations may exist for the values of a , b , or c in this standard):

- Commutative property of addition: $a + b = b + a$.
- Commutative property of multiplication: $a \cdot b = b \cdot a$.
- Subtraction and division are not commutative.
- The additive identity is zero (0) because any number added to zero is the number. The multiplicative identity is one (1) because any number multiplied by one is the number. There are no identity elements for subtraction and division.
- Identity property of addition (additive identity property):
 $a + 0 = a$ and $0 + a = a$.
- Identity property of multiplication (multiplicative identity property): $a \cdot 1 = a$ and $1 \cdot a = a$.
- Inverses are numbers that combine with other numbers and result in identity elements
 $\frac{1}{5}$
(e.g., $5 + (-5) = 0$; $5 \cdot \frac{1}{5} = 1$).
- Inverse property of addition (additive inverse property):
 $a + (-a) = 0$ and $(-a) + a = 0$.
- Inverse property of multiplication (multiplicative inverse property): $a \cdot \frac{1}{a} = 1$ and $\frac{1}{a} \cdot a = 1$.
- Zero has no multiplicative inverse.
- Multiplicative property of zero: $a \cdot 0 = 0$ and $0 \cdot a = 0$.
- Division by zero is not a possible mathematical operation. It is undefined.

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<ul style="list-style-type: none"> - Substitution property: If $a = b$, then b can be substituted for a in any expression, equation, or inequality. - Addition property of equality: If $a = b$, then $a + c = b + c$. - Subtraction property of equality: If $a = b$, then $a - c = b - c$. - Multiplication property of equality: If $a = b$, then $a \cdot c = b \cdot c$. - Division property of equality: If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$. 	
Vocabulary	Instructional Activities Organized by Learning Objective
<p>Equation Numerical Expression Algebraic Expression Algebraic Equation Inverse Operations Balance Variable Linear Equation Simplify Model Illustrate Identify Evaluate Apply Translate Commutative Property of Addition Commutative Property of Multiplication Associative Property of Addition Associative Property of Multiplication Distributive Property (over addition/subtraction)</p>	<p>VDOE <u>Solve One and Two Step Equations</u> <u>Translate and Evaluate</u>(pages 1-5)</p> <p>Textbook Virginia Math Connects, Course 2, ©2012, Price, et al, McGraw-Hill School Education Group 1: Two Step Equations, page(s) 228 – 234; Writing Algebraic Expressions page(s): 34 - 37(in part)</p> <p>Notes <u>2-Step Equations</u> <u>Algebraic Expressions</u></p> <p>Resources</p> <ul style="list-style-type: none"> ● Print <ul style="list-style-type: none"> ○ Virginia Coach, New SOL Edition, Math 7, @2018, Triumph Learning, LLC. pgs 180 - 193

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<p>Additive Identity Multiplicative Identity Identity Property of Addition (Additive Identity Property) Identity Property of Multiplication (Multiplicative identity property) Inverse Property of Addition (Additive inverse property) Inverse Property of Multiplication (Multiplicative inverse property) Multiplicative Property of Zero Substitution Property</p>	<ul style="list-style-type: none"> ● Technology-based <ul style="list-style-type: none"> ○ Khan Academy <ul style="list-style-type: none"> ■ Two-Step Equations ○ Algebra Labs <ul style="list-style-type: none"> ■ Two-Step Equations ○ ClassTools <ul style="list-style-type: none"> ■ Two Step Equation Game ○ Quia <ul style="list-style-type: none"> ■ Verbal Expressions ○ Math-Play.com <ul style="list-style-type: none"> ■ Expressions Millionaire Game <p>Stations <u>Solving Two Step Equations</u> <u>Two Step Equations Guided Notes and Examples</u></p>
<p>Assessment</p>	
<p>Cross-Curricular Connections</p>	<p>Tiered Differentiations</p>
<p>Foreign Language – Students related operational words like going to a foreign country and having a translator dictionary. Have students create a translation dictionary that includes the English Word and a Foreign Language Translation. Example: Words for Addition (Además): English: Sum Spanish: Suma.</p> <p>Science- Use science formulas such as Speed and Velocity to solve real world problems.</p>	<p>Tier 1 – Students are given two step equations task cards with fractional coefficients. Once completed students are given task cards that require students to combine like terms.</p> <p>Tier 2 – Students are given two step equations task cards with integer coefficients. Students are asked to write the operation used next to each step when completing the problem.</p> <p>Tier 3 – Students are given two step equation task cards with whole number coefficients. Students are asked to list the operations performed prior to completing any work. Once checked, students will move on to completing the written steps.</p>

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