

Strand: Patterns, Functions, and Algebra

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.

Suggested Pacing

First Nine Weeks- 7 Instructional days

Spiraling Standards

3.17 The student will create equations to represent equivalent mathematical relationships.
4.16 The student will recognize and demonstrate the meaning of equality in an equation.
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.

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.
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.
A.4 The student will solve a) multistep linear equations in one variable algebraically; b) quadratic equations in one variable algebraically.

Essential Questions

- How can a model be used to represent an equation?
- How can a model be used to solve an equation?
- How can you check to see if your solution is correct?
- How can a practical situation be represented by a multi-step equation?

Common Misconceptions

- Due to lack of practice/exposure, students are unable to recognize models of equations or to solve equations with models.
- When solving equations, students often don't recognize multiplication and division.

<ul style="list-style-type: none"> • How can understanding properties help when solving an equation? • How is thinking algebraically different from thinking arithmetically? • How does the knowledge of zero pairs help when solving equations? • How is an equation like a double pan balance? • How can you represent an equation in a model? Picture? • How do the properties contribute to algebraic understanding? • What strategies can be used to solve for unknowns in an algebraic expression? • How are the four basic operations related to one another? • What strategies can you use to determine if your solution is correct? • How can you use words to represent an equation or expression? • How are equations used in the real world? 	<ul style="list-style-type: none"> • When solving one-step equations, students fail to recall the process because they recognize the answer through substitution. • Students do not utilize the substitution strategy to confirm the value of the variable.
<p>Understanding the Standard</p>	<p>Essential Knowledge and Skills</p>
<ul style="list-style-type: none"> • A one-step linear equation may include, but not be limited to, equations such as the following: $2x = 5$; $y - 3 = -6$; $\frac{1}{5}x = -3$; $a - (-4) = 11$. • 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. • 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., $\frac{3}{4}$, $5x$, $140 - 38.2$, $18 \cdot 21$, $5 + x$.) 	<p>The student will use problem solving, mathematical communication, mathematical reasoning, connections and representation to</p> <ul style="list-style-type: none"> • Identify examples of the following algebraic vocabulary: equation, variable, expression, term, and coefficient. • Represent and solve one-step linear equations in one variable, using a variety of concrete materials such as colored chips, algebra tiles, or weights on a balance scale.

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| <ul style="list-style-type: none"> • 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. Example, the verbal expression “a number multiplied by 5” could be represented by the variable expression “$n \cdot 5$” or “$5n$.” • An algebraic expression is a variable expression that contains at least one variable (e.g., $x - 3$). • A verbal sentence is a complete word statement (e.g., “The sum of a number and two is five” could be represented by “$n + 2 = 5$”). • An algebraic equation is a mathematical statement that says that two expressions are equal (e.g., $2x = 7$). • A term is a number, variable, product, or quotient in an expression of sums and/or differences. In $7x^2 + 5x - 3$, there are three terms, $7x^2$, $5x$, and 3. • A coefficient is the numerical factor in a term. Example: in the term $3xy^2$, 3 is the coefficient; in the term z, 1 is the coefficient. • An equation is a mathematical sentence stating that two expressions are equal. • A variable is a symbol used to represent an unknown quantity. | <ul style="list-style-type: none"> • Apply properties of real numbers and properties of equality to solve a one-step equation in one variable. Coefficients are limited to integers and unit fractions. Numeric terms are limited to integers. • Confirm solutions to one-step linear equations in one variable. • Write verbal expressions and sentences as algebraic expressions and equations. • Write algebraic expressions and equations as verbal expressions and sentences. • Represent and solve a practical problem with a one-step linear equation in one variable. |
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- The solution to an equation is a value that makes it a true statement. Many equations have one solution and are represented as a point on a number line. Solving an equation or inequality involves a process of determining which value(s) from a specified set, if any, make the equation or inequality a true statement. Substitution can be used to determine whether a given value(s) makes an equation or inequality true.
- Properties of real numbers and properties of equality can be used to solve equations, justify equation solutions, and express simplification. Students should use the following properties, where appropriate, to further develop flexibility and fluency in problem solving (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 neither commutative nor associative.
 - 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 $1 \cdot a = a$.
 - 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.

<ul style="list-style-type: none"> - Inverses are numbers that combine with other numbers and result in identity elements (e.g., $5 + (-5) = 0$; $\cdot 5 = 1$). - 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. - 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 $\frac{a}{c} = \frac{b}{c}$. - Substitution property: If $a = b$ then b can be substituted for a in any expression, equation or inequality. 	
Vocabulary	Instructional Activities Organized by Learning Objective
equation variable expression term coefficient variable expression	Textbook <u>Virginia Math Connects, Course 1</u> , ©2012, Glencoe/McGraw-Hill page(s) 314 – 317 (addition) 327-331 (subtraction), 322 – 326 (models), 335 – 338 (multiplication), 339 -343 (division) Extra Practice page –EP 14 - 16 Lessons 6-1 and 6-2

<p>algebraic expression solution commutative property of addition commutative property of multiplication identity property of addition identity property of multiplication inverses inverse property of addition inverse property of multiplication multiplicative property of zero addition property of equality subtraction property of equality multiplication property of equality division property of equality substitution property</p>	<p>Notes</p> <p>Resources</p> <ul style="list-style-type: none"> • Print • Technology-based <p>Brain Pop – Equations with Variables - interactive skill practice https://www.brainpop.com/math/algebra/ Gizmo – Modeling One-step Equations - interactive instructional resource http://www.explorelarning.com/index.cfm?method=cResource.dspDetail&resourceid=109 Smart Exchange - interactive skill practice Solving One-Step Equations [SMART Notebook lesson] Equations [SMART Notebook lesson]</p>
<p>Assessment</p>	<p>Station Activities</p> <p>Virginia Department of Education Balanced – lesson plan Equation Vocabulary - lesson plan Study Jams – Add and Subtract Study Jams – Multiply and Divide</p>
<p>Cross-Curricular Connections</p>	<p>Tiered Differentiations</p>
<p>As students work on sentence and paragraph structure in their Language Arts class, they could use this as an opportunity to create equation scenarios. These scenarios could reflect student creativity</p>	<ul style="list-style-type: none"> • To help students isolate the variable, have them circle or highlight the variable prior to solving. • Make sure students check their work by substituting the value found in for the variable and simplify. • While solving equations, continually reinforce the properties.

<p>and would incorporate math jargon that would signal basic math operations needed for single and multi-step word problems.</p>	<ul style="list-style-type: none"> • Use real situations to help student understand the relevance of this unit. • Have students create scenarios that could be represented by the equation or equation model.
<p>Vocabulary</p>	<p>Instructional Activities Organized by Learning Objective</p>
<p>inequality variable greater than less than greater than or equal to less than or equal to open circle closed circle solution set commutative property of addition commutative property of multiplication identity property of addition identity property of multiplication inverses inverse property of addition inverse property of multiplication multiplicative property of zero addition property of inequality</p>	<p>Textbook <u>Virginia Math Connects, Course 1</u>, ©2012, Glencoe/McGraw-Hill page(s) 387-391 and 396-401 (addition and subtraction), pages 392-(write and graph) <u>Virginia Math Connects, Course 2</u>, ©2012, Price, et al, McGraw-Hill School Education Group 1: One Step Inequalities, page(s) 242 -248.</p> <p>Notes 6.13 Revised Interactive Notes</p> <p>Resources • Print Virginia Coach New SOL Edition Lesson 28, page 212-218</p> <p>• Technology-based <u>BrainPop</u> Graphing and Solving Inequalities</p>

<p>subtraction property of inequality multiplication property of inequality division property of inequality substitution property</p>	<p>Gizmo Lesson – <u>Exploring Linear Inequalities in one Variable</u> <u>Solving Linear Inequalities in one Variable</u></p>
<p>Assessment</p>	<p>Station Activities Virginia Department of Education Lesson Plan(s): <u>Inequalities</u></p>
	<p>Interactive Skills Practice:</p> <ul style="list-style-type: none"> ● <u>Inequality Match</u>- Students will match the inequality graph with two solutions. ● <u>Inequality Match</u>- Students will match a graph, solution and practical situation of the one step inequality. ● <u>Inequality Sort</u>- Students will drag the graph or solution that represents the inequality. ● <u>Additional Practice</u>- Students will solve various inequality problems when given a situation, graph or solution. ● <u>Matching</u>- Students solve one step linear inequalities and find the graph to make a match.
<p>Cross-Curricular Connections</p>	<p>Tiered Differentiations</p>
	<ul style="list-style-type: none"> ● Suggested manipulatives: number lines, algebra tiles, cups and counters, balance scale, cut out arrows, ● Students should be given opportunities to use an open number line and a cut out arrow to practice representing solutions to inequalities. ● To reinforce solution sets, write an inequalities on the board and give students a card with a number on it. Students stand if their card is a solution to the given inequality. ● Have students pull values from the graph to prove and disprove the arrow is in the correct location and pointing in the proper direction.

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