

Richmond Public Schools
Curriculum Framework
Grade 6 Honors (6/7)

Strand: Measurement and Geometry	
<p>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.</p> <p>6.14 The student will</p> <p>a) represent a practical situation with a linear inequality in one variable; and</p> <p>b) solve one-step linear inequalities in one variable, involving addition or subtraction, and graph the solution on a number line.</p>	
Suggested Pacing	
Related Standards	
Spiral Down: 4th Grade: <ul style="list-style-type: none"> • SOL 4.16 5th Grade: <ul style="list-style-type: none"> • SOL 5.19b, c, d 	Spiral Up: 7th Grade: <ul style="list-style-type: none"> • SOL 7.12 • SOL 7.13 8th Grade: <ul style="list-style-type: none"> • SOL 8.17 • SOL 8.18
Essential Questions	Common Misconceptions
<ul style="list-style-type: none"> • How are real world situations expressed and recorded in mathematics? • How are mathematical expressions, equations, and inequalities used to represent and solve real-world and mathematical problems? • How are expressions manipulated to suit various purposes and help solve problems? • Why is it important to be able to model real-life problems using equations and/or inequalities? 	<ul style="list-style-type: none"> • Equations: students forget the process; students misinterpret the practical/word problems when writing the equation • Inequalities: students forget when to reverse the inequality symbol; students lack an understanding of what the inequality solution means; students forget, when graphing, when to use and open or closed endpoint and which direction the arrow should go in
Understanding the Standard	Essential Knowledge and Skills
SOL 6.13:	SOL 6.13:

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- 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., $\frac{3}{4}$, $5x$, $140 - 38.2$, $18 \cdot 21$, $5 + x$.)
- 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.

- 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.
- 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.

SOL 6.14:

- Given a verbal description, represent a practical situation with a one-variable linear inequality. (a)
- Apply properties of real numbers and the addition or subtraction property of inequality to solve a one-step linear inequality in one variable, and graph the solution on a number line. Numeric terms being added or subtracted from the variable are limited to integers. (b)
- Given the graph of a linear inequality with integers, represent the inequality two different ways (e.g., $x < -5$ or $-5 > x$) using symbols. (b)
- Identify a numerical value(s) that is part of the solution set of a given inequality. (a, b)

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- A variable is a symbol used to represent an unknown quantity.
- 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.
 - 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.

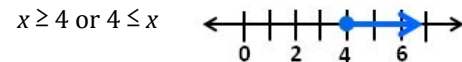
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- Multiplicative property of zero: $a \cdot 0 = 0$ and $0 \cdot a = 0$.
- Division by zero is not a possible mathematical operation. It is undefined.
- Addition property of equality: If $a = b$, then $a + c = b + c$.
- Subtraction property of equality: 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.

SOL 6.14:

- The solution set to an inequality is the set of all numbers that make the inequality true.
- Inequalities can represent practical situations.

Example: Jaxon works at least 4 hours per week mowing lawns. Write an inequality representing this situation and graph the solution.



Students might then be asked: "Would Jaxon ever work 3 hours in a week? 6 hours?"

- The variable in an inequality may represent values that are limited by the context of the problem or situation. Example: if the variable represents all children in a classroom who are taller than 36 inches, the variable will be limited to have a minimum and maximum value based on the heights of the children. Students are not expected to represent these situations with a compound inequality (e.g., $36 < x < 70$) but only recognize that the values satisfying the single inequality ($x > 36$) will be limited by the context of the situation.

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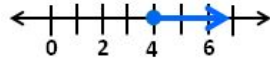
- Inequalities using the $<$ or $>$ symbols are represented on a number line with an open circle on the number and a shaded line over the solution set.

Example: When graphing $x < 4$, use an open circle above the 4 to indicate that the 4 is not included.



- Inequalities using the \leq or \geq symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set.

Example: When graphing $x \geq 4$ fill in the circle above the 4 to indicate that the 4 is included.



- It is important for students to see inequalities written with the variable before the inequality symbol and after. Example: $x > 5$ is not the same relationship as $5 > x$. However, $x > 5$ is the same relationship as $5 < x$.
- A one-step linear inequality may include, but not be limited to, inequalities such as the following:
 $2 + x > 5$; $y - 3 \leq -6$; $a - (-4) \geq 11$.
- 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 inequality can be used to solve inequalities, justify 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):
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<ul style="list-style-type: none"> - 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. - 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 $0 \cdot a = 0$. - Addition property of inequality: If $a < b$, then $a + c < b + c$; if $a > b$, then $a + c > b + c$ (this property also applies to \leq and \geq). - Subtraction property of inequality: If $a < b$, then $a - c < b - c$; if $a > b$, then $a - c > b - c$ (this property also applies to \leq and \geq). - 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			
<p>SOL 6.13</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; text-align: center;">Equation</td> <td style="width: 33%; text-align: center;">Expression</td> <td style="width: 33%; text-align: center;">Solution</td> </tr> </table>	Equation	Expression	Solution	<p>Textbook</p> <p>Notes</p>
Equation	Expression	Solution		

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Verbal Expression	Algebraic Expression	Term	<p>Resources</p> <ul style="list-style-type: none"> ● Print ● Technology-based <p>Station Activities</p>
Variable	Coefficient	One-Step Equation	
Commutative Property	Associative Property	Distributive Property	
Identity Property	Inverse Property	Multiplicative Property of Zero	
Addition Property of Equality	Subtraction Property of Equality	Multiplication Property of Equality	
Division Property of Equality	Substitution Property		
SOL 6.14			
Inequality	Solution Set	Addition Property of Inequality	
Subtraction Property of Inequality			
Assessment			
Cross-Curricular Connections			Tiered Differentiations