

Richmond Public Schools
Curriculum Framework
Grade 7 Honors (7/8)

Strand: Measurement and Geometry	
8.18	The student will solve multistep linear inequalities in one variable with the variable on one or both sides of the inequality symbol, including practical problems, and graph the solution on a number line.
7.13	The student will solve one- and two-step linear inequalities in one variable, including practical problems, involving addition, subtraction, multiplication, and division, and graph the solution on a number line.
Suggested Pacing	
Related Standards	
Spiral Down: 6 th Grade: <ul style="list-style-type: none"> ● SOL 6.14a,b 	Spiral Up: Algebra: <ul style="list-style-type: none"> ● SOL A.5a
Essential Questions	Common Misconceptions
<ul style="list-style-type: none"> ● How are inequalities used to represent real-life situations? ● What does the solution to an inequality mean? 	<ul style="list-style-type: none"> ● 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
<ul style="list-style-type: none"> ● SOL 8.18: ● A multistep inequality may include, but not be limited to inequalities such as the following: $2x + 1 > \frac{x}{4}$; $-3(2x + 7) \leq \frac{1}{2}x$; $2x + 7 - 5x < 27$; $-5x - (x + 3) > -12$. ● When both expressions of an inequality are multiplied or divided by a negative number, the inequality sign reverses. 	<ul style="list-style-type: none"> ● SOL 8.18: <ul style="list-style-type: none"> – Apply properties of real numbers and properties of inequality to solve multistep linear inequalities (up to four steps) in one variable with the variable on one or both sides of the inequality. Coefficients and numeric terms will be rational. Inequalities may contain expressions that need to be expanded (using the distributive property) or require collecting like terms to solve.

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| <ul style="list-style-type: none">● A solution to an inequality is the value or set of values that can be substituted to make the inequality true.● In an inequality, there can be more than one value for the variable that makes the inequality true. There can be many solutions. (i.e., $x + 4 > -3$ then the solutions is $x > -7$. This means that x can be any number greater than -7. A few solutions might be $-6.5, -3, 0, 4, 25$, etc.)● Real-world problems can be modeled and solved using linear inequalities.● The 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).<ul style="list-style-type: none">– Commutative property of addition: $a + b = b + a$.– Commutative property of multiplication: $a \cdot b = b \cdot a$.– Associative property of addition: $(a + b) + c = a + (b + c)$.– Associative property of multiplication: $(a \cdot b) \cdot c = a \cdot (b \cdot c)$.—Subtraction and division are neither commutative nor associative.
—Distributive property (over addition/subtraction):
$a \cdot (b + c) = a \cdot b + a \cdot c$ and $a \cdot (b - c) = a \cdot b - a \cdot c$.<ul style="list-style-type: none">– 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 $1 \cdot a = a$. | <ul style="list-style-type: none">– Graph solutions to multistep linear inequalities on a number line.– Write verbal expressions and sentences as algebraic expressions and inequalities.– Write algebraic expressions and inequalities as verbal expressions and sentences.– Solve practical problems that require the solution of a multistep linear inequality in one variable.– Identify a numerical value(s) that is part of the solution set of a given inequality. |
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- 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.
- Substitution property: If $a = b$, then b can be substituted for a in any expression, equation, or inequality.
- Addition property of inequality: If $a < b$, then $a + c < b + c$; if $a > b$, then $a + c > b + c$.
- Subtraction property of inequality: If $a < b$, then $a - c < b - c$; if $a > b$, then $a - c > b - c$.
- Multiplication property of inequality: If $a < b$ and $c > 0$, then $a \cdot c < b \cdot c$; if $a > b$ and $c > 0$, then $a \cdot c > b \cdot c$.
- Multiplication property of inequality (multiplication by a negative number): If $a < b$ and $c < 0$, then $a \cdot c > b \cdot c$; if $a > b$ and $c < 0$, then $a \cdot c < b \cdot c$.
- Division property of inequality: If $a < b$ and $c > 0$, then $\frac{a}{c} < \frac{b}{c}$; if $a > b$ and $c > 0$, then $\frac{a}{c} > \frac{b}{c}$.
- Division property of inequality (division by a negative number): If $a < b$ and $c < 0$, then $\frac{a}{c} > \frac{b}{c}$; if $a > b$ and $c < 0$, then $\frac{a}{c} < \frac{b}{c}$.

SOL 7.13:

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- A one-step inequality may include, but not be limited to, inequalities such as the following: $2x > 5$; $y - \frac{2}{3} \leq -6$; $\frac{1}{5}x < -3$; $a - (-4) \geq \frac{11}{2}$.
- A two-step inequality may include, but not be limited to inequalities such as the following:
 $2x + 1 < -25$; $2x + \frac{1}{2} \geq -5$; $-25 > 7.2x + 1$; $\frac{x-7}{-3} \leq 4$; $\frac{3}{4}x - 2 \leq 10$.
- The solution set to an inequality is the set of all numbers that make the inequality true.
- The inverse operation for addition is subtraction, and the inverse operation for multiplication is division.
- The procedures for solving inequalities are the same as those to solve equations except for the case when an inequality is multiplied or divided on both sides by a negative number. Then the inequality sign is changed from less than to greater than, or greater than to less than.
- When both expressions of an inequality are multiplied or divided by a negative number, the inequality symbol reverses (e.g., $-3x < 15$ is equivalent to $x > -5$).
- Solutions to inequalities can be represented using a number line.
- In an inequality, there can be more than one value for the variable that makes the inequality true. There can be many solutions. (i.e., $x + 4 > -3$ then the solution is $x > -7$. This means that x can be any number greater than -7 . A few solutions might be $-6.5, -3, 0, 4, 25$, etc.)
- 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).
 - 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

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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 $0 + a = a$.
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- Inverses are numbers that combine with other numbers and result in identity elements
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<ul style="list-style-type: none"> - Division property of inequality: If $a < b$ and $c > 0$, then $\frac{a}{c} < \frac{b}{c}$; if $a > b$ and $c > 0$, then $\frac{a}{c} > \frac{b}{c}$. - Division property of inequality (division by a negative number): If $a < b$ and $c < 0$, then $\frac{a}{c} > \frac{b}{c}$; if $a > b$ and $c < 0$, then $\frac{a}{c} < \frac{b}{c}$. 													
Vocabulary	Instructional Activities Organized by Learning Objective												
SOL 8.18/SOL 7.13: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <tr> <td style="padding: 5px;">Inequality</td> <td style="padding: 5px;">Commutative Property</td> <td style="padding: 5px;">Associative Property</td> </tr> <tr> <td style="padding: 5px;">Distributive Property</td> <td style="padding: 5px;">Inverse Property</td> <td style="padding: 5px;">Identity Property</td> </tr> <tr> <td style="padding: 5px;">Multiplication Property of Zero</td> <td style="padding: 5px;">Addition Property of Inequality</td> <td style="padding: 5px;">Subtraction Property of Inequality</td> </tr> <tr> <td style="padding: 5px;">Multiplication Property or Inequality</td> <td style="padding: 5px;"></td> <td style="padding: 5px;"></td> </tr> </table>	Inequality	Commutative Property	Associative Property	Distributive Property	Inverse Property	Identity Property	Multiplication Property of Zero	Addition Property of Inequality	Subtraction Property of Inequality	Multiplication Property or Inequality			Textbook Notes Resources <ul style="list-style-type: none"> ● Print ● Technology-based
Inequality	Commutative Property	Associative Property											
Distributive Property	Inverse Property	Identity Property											
Multiplication Property of Zero	Addition Property of Inequality	Subtraction Property of Inequality											
Multiplication Property or Inequality													
Assessment	Station Activities												
Cross-Curricular Connections	Tiered Differentiations												