



Grade 7 Pre-Algebra - Unit E - Expressions, Equations and Inequalities

Unit Focus

Students begin by representing relationships of two quantities with tape diagrams and with equations noticing that one tape diagram can be described by different (but related) equations. The two main types of situations examined can be modeled with the equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are rational numbers.

Next, students solve equations of the forms $px + q = r$ and $p(x + q) = r$, then solve problems that can be represented by such equations. They begin by considering balanced and unbalanced “hanger diagrams,” matching hanger diagrams with equations, and using the diagrams to understand two algebraic steps in solving equations of the form $px + q = r$: subtract the same number from both sides, then divide both sides by the same number. Like a tape diagram, the same balanced hanger diagram can be described by different (but related) equations, e.g. $2(x + 3) = 18$, and $2x + 6 = 18$. They use the distributive property to transform an equation of one form into the other and note how such transformations can be used strategically in solving an equation.

Students also work with inequalities. They begin by examining values that make an inequality true or false, and using the number line to represent values that make an inequality true. They solve equations, examine values to the left and right of a solution, and use those values in considering the solution of a related inequality. Finally, students solve inequalities that represent real-world situations.

Students also work with equivalent linear expressions, using properties of operations to explain equivalence. They represent expressions with area diagrams, and use the distributive property to justify factoring or expanding an expression.

Finally, students examine equations with variables on both sides of the equation. The goal is to become fluent at examining the equation before attempting to solve it to determine if there is one, none or an infinite number of solutions. As with the equations and inequalities previously worked on in this unit, students are expected to solve these equations by showing a solution pathway that demonstrates an understanding of equality in equations as well as in expressions.

The PBA is an error analysis where students identify common errors and communicate the error to the reader

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 7 - Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. (CCSS.MATH.CONTENT.7.EE.A.1) - Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, $a + 0.05a = 1.05a$ means that increase by 5% is the same as multiply by 1.05. (CCSS.MATH.CONTENT.7.EE.A.2) - Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate	<i>Students will be able to independently use their learning to...</i> T1 Construct viable arguments using clear and appropriate mathematical language and critique the reasoning of others. T2 Demonstrate fluency with mathematical computations and definitions. T3 Identify and generalize patterns and structure in numbers, expressions, data and objects.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians can listen or read the arguments of others, decide whether they make	<i>Students will keep considering...</i> Q1 How do I determine that my answer makes sense?

Stage 1: Desired Results - Key Understandings

with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation. (CCSS.MATH.CONTENT.7.EE.B.3) Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width? (CCSS.MATH.CONTENT. 7.EE.B.4A) Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions. (CCSS.MATH.CONTENT. 7.EE.B.4B) Construct viable arguments and critique the reasoning of others. (CCSS.MATH.MP.3) Attend to precision. (CCSS.MATH.MP.6) Look for and make use of structure. (CCSS.MATH.MP.7)	sense, and ask useful questions to clarify or improve the arguments. U2 Mathematicians monitor progress while problem solving, change course if necessary and evaluate the reasonableness of their solution. U3 Mathematicians attend to the underlying meaning of quantities and symbols.	Q2 Does my abstract representation of these quantities make sense in context? Q3 How do I check my work for accuracy and completeness? Q4 What model best represents this problem?
Acquisition of Knowledge and Skill		
Knowledge		Skill(s)
<i>Students will know...</i> K1 Vocabulary: equivalent expressions, unknown amount, relationship, variable, each side (of an equation), solve, operation, substitute, distribute, inequality, less than, greater than, less than or equal to, greater than or equal to, open/closed circle, solution to an inequality, term, factor (an expression), expand (an expression) combine like terms, commutative (property), associative property, constant term, coefficient K2 that keeping an equation true (balanced) helps find the solution(s) to the equation. K3 any number(s) that make an equation/inequality true is a solution to the equation/inequality. K4 that a situation can be represented by more than one equivalent equation/expression or model. K5 there are different solution pathways to an equation in the form $p(x + q) = r$, where p, q, and r are specific rational numbers. K6 the difference between solutions such as $x > 3$ and $x \geq 3$ and how to represent those solutions on a number line. K7 when and why the sign of an inequality must be flipped when solving the inequality. K8 an algebraic expression has an infinite number of different yet equivalent expressions.		<i>Students will be skilled at...</i> S1 representing situations with equations in the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. S2 solving equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. S3 using substitution to show whether a value is a solution to an equation in the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. S4 finding and graphing solutions to inequalities in the form $px + q > r$ and $p(x + q) > r$, where p, q, and r are specific rational numbers. S5 solving equations of the form $px + q > r$ and $p(x + q) > r$, where p, q, and r are specific rational numbers. S6 using substitution to show whether a value is a solution to an inequation in the form $px + q > r$ and $p(x + q) > r$, where p, q, and r are specific rational numbers. S7 representing situations with inequations in the form $px + q > r$ and $p(x + q) > r$, where p, q, and r are specific rational numbers. S8 distributing to rewrite expressions. S9 factoring using the distributive property to rewrite algebraic expressions.

Mathematics: 8

- Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). (CCSS.MATH.CONTENT.8.EE.C. 7A)
- Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (CCSS.MATH.CONTENT.8.EE.C.7B)

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

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Stage 1: Desired Results - Key Understandings

	K9 The features of linear equations that have one solution, no solution, or many solutions.	S10 combining like terms to rewrite algebraic expressions. S11 Solving an equation where the variable appears on both sides. S12 Determining if an equation or a system of equations has one solution, no solution, or infinite solutions. S13 representing situations with equations that have a variable on both sides of the equal sign. S14 solving equations by showing a solution pathway that demonstrates an understanding of equivalence of expressions as well as equality within an equation.
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