

Unit 3: Expressions, Equations & Inequalities

Content Area: **Mathematics**
Course(s): **Generic Course, Accelerated Math 7**
Time Period: **2nd Marking Period**
Length: **4 weeks**
Status: **Published**

Unit Overview

In this unit, students solve equations of the forms $px + q = r$ and $p(x + q) = r$, and solve related inequalities, e.g., those of the form $px + q > r$ and $px + q \geq r$, where p , x , and r are rational numbers.

Transfer

Students will be able to independently use their learning to solve real world problems involving...

- situations requiring multiple-step equations
- combining like terms to simplify
- using the Distributive Property

Use mathematical expressions, equations, inequalities and graphs to represent and solve real world problems.

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand that...

- Various methods can be used to solve equations and the solution to an equation can be checked by substituting into the original equation.
- The point at which lines intersect is the solution to the system with those lines.
- Equations can be solved using different properties.
- Sometimes there is more than one step to solve in an equation.
- Inequalities are used when solving for real life application problems.
- Properties of functions and their graphs are similar but not identical.

- Slope-intercept form is an easy way of graphing functions.

Essential Questions

Students will keep considering...

- What are numeric and algebraic expressions and how are they evaluated?
- How do you use properties to solve equations and inequalities?
- How can tape diagrams and hangar models represent equations?

Application of Knowledge and Skill

Students will know. . .

- Students will identify constants, coefficients, and variables in an algebraic expression.
- Students will use the distributive property and combine like terms to simplify algebraic expressions, equations and inequalities.
- Students will evaluate algebraic expressions when each variable is assigned a value using substitution and the order of operations
- Students will examine commutative and associative properties of different equations.
- Students will solve multi-step equations involving different techniques.
- Students will be able to graph a line given different forms of the equation.
- Students will be able to describe how slope relates to horizontal and vertical lines.
- Students will be able to graph systems of linear equations or to find a solution.
- Students will understand what a function is and its corresponding graph.
- Students will compare properties of different functions and relate the information to real world situations.

Students will be skilled at...

Students will be skilled at...

Comparing

- stories with corresponding tape diagrams
- tape diagrams with corresponding equations

- hanger diagrams and equations
- solution pathways
- descriptions of situations with corresponding inequalities

Explaining

- strategies for using hanger diagrams to solve equations
- different strategies for solving equations and inequalities
- reasoning about situations, tape diagrams, and equations
- strategies for identifying and writing equivalent expressions

Justifying

- reasoning about inequalities
- reasoning about solutions to inequalities
- the need for specific information in order to write and solve inequalities
- reasoning about the distributive property

Academic Vocabulary

associative property
 balanced hanger
 boundary
 combine like terms
 commutative (property)
 direction (of an inequality)
 distribute
 each side (of an equation)
 equivalent expression
 expand (an expression)
 factor (an expression)
 greater than
 greater than or equal to
 inequality
 less than
 less than or equal to
 open / closed circle
 operation
 relationship
 solution to an inequality
 solve
 substitute
 term
 unknown amount
 variable

Learning Goal 1

Represent relationships of two quantities with tape diagrams and with equations; explain correspondences between the two types of representations. Examine correspondences between equations and tape diagrams, then draw tape diagrams to represent equations, noticing that one tape diagram can be described by different (but related) equations.

Target #1.1 -- DOK: 2 Skill/Concept

SWBAT

- explain how a tape diagram represents parts of a situation and relationships between them.
- use a tape diagram to find an unknown amount in a situation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |

Target #1.2 -- DOK: 2 Skill/Concept

SWBAT

- match equations and tape diagrams that represent the same situation.
- draw a tape diagram to show the same relationship as an equation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |

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| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |

Target #1.3 -- DOK: 2 Skill/Concept

SWBAT

- draw a tape diagram to represent a situation where there is a known amount and several copies of an unknown amount and explain what the parts of the diagram represent.
- find a solution to an equation by reasoning about a tape diagram or about what value would make the equation true.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. |
| MA.7.EE.B.4a | 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. |

Target #1.4 -- DOK: 2 Skill/Concept

SWBAT

- understand the similarities and differences between the two main types of equations we are studying in this unit.
- represent a situation or tape diagram with an equation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.8 | Look for and express regularity in repeated reasoning. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

Learning Goal 2

Solve equations of the forms $px+q=r$ and $p(x+q)=r$, then solve problems that can be represented by such equations. Consider balanced and unbalanced “hanger diagrams,” matching hanger diagrams with equations, and using the diagrams to understand algebraic steps in solving equations.

Target #2.1 -- DOK: 2 Skills/Concept

SWBAT

- explain how a balanced hanger and an equation represent the same situation.
- find an unknown weight on a hanger diagram and solve an equation that represents the diagram.
- write an equation that describes the weights on a balanced hanger.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4a | 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. |

Target #2.2 -- DOK: 2 Skill/Concept

SWBAT

- use the idea of doing the same to each side to solve equations that have negative numbers or solutions.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |

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| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. |
| MA.7.EE.B.4a | 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. |

Target #2.3 DOK: 2 Skill/Concept

SWBAT

- For an equation like $3(x+2) = 15$, I can solve it in two different ways: by first dividing each side by 3, or by first rewriting $3(x+2)$ using the distributive property.
- For equations with more than one way to solve, I can choose the easier way depending on the numbers in the equation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. |

Target #2.4 -- DOK: 3 Strategic Thinking

SWBAT

- solve story problems by drawing and reasoning about a tape diagram or by writing and solving an equation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and |

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| | construct simple equations and inequalities to solve problems by reasoning about the quantities. |
| MA.7.EE.B.4a | 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. |

Target #2.5 -- DOK: 2 Skill/Concept

SWBAT

- solve story problems about percent increase or decrease by drawing and reasoning about a tape diagram or by writing and solving an equation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.A.2 | 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. |
| MA.7.EE.B.3 | 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 with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. |
| MA.7.EE.B.4a | 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. |

Learning Goal 3

Work with inequalities. Examine values that make an inequality true or false, and use the number line to represent values that make an inequality true. Solve equation sand inequalities that represent real-world situations.

Target #3.1 -- DOK: 2 Skill/Concept

SWBAT:

- explain what the symbols \leq and \geq mean.
- represent an inequality on a number line.
- understand what it means for a number to make an inequality true.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. |

Target #3.2 -- DOK: 2 Skill/Concept

SWBAT

- describe the solutions to a inequality by solving a related equation and then reasoning about values that make the inequality true.
- write an inequality to represent a situation.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4b | 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. |

Target #3.3 -- DOK: 2 Skill/Concept

SWBAT

- graph the solutions to an inequality on a number line.
- solve inequalities by solving a related equation and then checking which values are solutions to the original inequality.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the |

quantities.

Target #3.4 -- DOK: 2 Skill/Concept

SWBAT

- match an inequality to a situation it represents, solve it, and then explain what the solution means in the situation.
- explain what the parts of the inequality mean in the context of a situation.
- I can use what I know about inequalities to solve real-world problems.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.B.4b | 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. |

Target #3.5 DOK: 2 Skill/Concept

SWBAT

- organize work when I use the distributive property.
- re-write subtraction as adding the opposite and then rearrange terms in an expression.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.6 | Attend to precision. |
| MA.7.NS.A.1 | Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. |
| MA.7.NS.A.1c | Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. |
| MA.7.EE.A.1 | Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. |

Target #3.6 -- DOK: 2 Skill/Concept

SWBAT

- organize my work when I use the distributive property.
- use the distributive property to rewrite expressions with positive and negative numbers.

- understand that factoring and expanding are words used to describe using the distributive property to write equivalent expressions.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.6 | Attend to precision. |
| MA.K-12.7 | Look for and make use of structure. |
| MA.7.EE.A.1 | Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. |

Target #3.7 -- DOK: 2 Skill/Concept

SWBAT

- I can figure out whether two expressions are equivalent to each other.
- When possible, I can write an equivalent expression that has fewer terms.
- Given an expression, I can use various strategies to write an equivalent expression.

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| MA.K-12.1 | Make sense of problems and persevere in solving them. |
| MA.K-12.2 | Reason abstractly and quantitatively. |
| MA.K-12.3 | Construct viable arguments and critique the reasoning of others. |
| MA.K-12.4 | Model with mathematics. |
| MA.K-12.5 | Use appropriate tools strategically. |
| MA.7.EE.A.1 | Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. |

Formative Assessment and Performance Opportunities

- cK-12 Adaptive Practice
- Exit/Admit ticket
- Kahoot
- My Favorite No
- Strategic questioning
- Student-Teacher conference
- Think-Pair-Share

Summative Assessment

- End of Unit Test
- LinkIt!
- Portfolio

- Pre-Unit Diagnostic Test
- Project
- Quiz

21st Century Life and Careers and Technology

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| CRP.K-12.CRP2 | Apply appropriate academic and technical skills. |
| CRP.K-12.CRP3 | Attend to personal health and financial well-being. |
| CRP.K-12.CRP8 | Utilize critical thinking to make sense of problems and persevere in solving them. |
| CAEP.9.2.8.B.3 | Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career. |
| TECH.8.1.8.E.CS1 | Plan strategies to guide inquiry. |
| TECH.8.1.8.E.CS4 | Process data and report results. |
| TECH.8.1.8.F.CS3 | Collect and analyze data to identify solutions and/or make informed decisions. |

Accommodations & Modifications

- Adaptive Practice (cK-12 modality)
- Algebra tiles
- Base-10 blocks
- Calculator/Graphing calculator
- Centers
- Fraction Tiles
- Modifications as per IEP/504
- PLIX (cK-12 modality)
- Small group instruction
- To challenge students, ask them to write expressions with multiple levels of parentheses that can be simplified using the distributive property

Unit Resources

See also: Illustrative Math Tasks Folder in Curriculum Portal

ALEKS

[cK-12 Accelerated 7th Grade Book](#)

Mr. Morgan's Math Help

[Unit 7.6 Expressions, Equations, and Inequalities](#)

NJCTL (New Jersey Center for Teaching and Learning)

[Expressions](#)

[Equations and Inequalities](#)

cK-12 PLIX:

Simplify Variable expressions: [Circling C](#)

Multi-step inequalities: [Summer Camp](#)

Mental math for single variable equations: [Marble Bag Collector](#)

Balancing equations: [Peanut Butter Sandwich](#)

Desmos activities:

[Equivalent Expressions](#)

[Expressions Mash-Up](#)

[Inequalities on the Number Line](#)

[Make them Balance](#)

Interdisciplinary Connections

Real world applications where the creation of equations/functions is necessary to determine financial gains and losses. (MA.8.F.A.2)

PFL.9.1.8.B.2

Construct a simple personal savings and spending plan based on various sources of income.

PFL.9.1.8.B.8

Develop a system for keeping and using financial records.

