Expressions and Equations

Content Area: **Math**
Course(s):
Time Period: **MP2**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
Unit 2 focuses on expressions, equations, and inequalities. Learners construct simple equations and inequalities to solve problems by reasoning about the quantities. They solve simple equations of particular forms fluently, graph the solution set of inequalities, and interpret solutions in the context of the problem. They 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. They apply properties of operations to calculate with numbers in any form and convert between forms as appropriate. Unit 2 also introduces learners to the idea of a function as a precursor to concepts about functions that are included in the high school standards. Learners begin the unit describing qualitatively the relationship between two quantities by analyzing a graph as an informal introduction to functions. They describe a function more formally by identifying it as a rule that assigns to each input exactly one output. In this unit, the concepts developed in grades 6 and 7 such as modeling relationships with variables and equations and ratio and proportional reasoning, are used to make connections between proportional relationships, lines, and linear equations. Learners graph linear functions, construct a function to model a linear relationship, interpret the rate of change and initial value of a linear function in a real-world context, and compare linear functions presented in different ways. The unit concludes with analyzing and solving pairs of simultaneous linear equations. Learners will begin solving systems of linear equations algebraically, and solve real-world mathematical problems leading to two linear equations in two variables.	Unit 2 builds upon students prior knowledge of operations with rational numbers as students develop procedural skills and fluency related to the topic of generating equivalent expressions. Also, Unit 2 builds upon students prior knowledge of solving equations and inequalities as students develop procedural skills and fluency related to the topic of solving problems using equations and inequalities. This unit uses students' prior knowledge of proportional relationships as to develop procedural skills and fluency related to the topics analyzing and solving linear equations.Using equations and functions to model real world situations is a skill that is applicable in real life and will allow students to develop a mathematical problem solving approach to real world situations. A deep understanding of proportional relationships will help students to be informed consumers. These are also foundational skills that will be further developed in upper level mathematics courses. In this unit students also develop conceptual understanding related to this topic.

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MATH.8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
MATH.8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
MATH.8.EE.C.7	Solve linear equations in one variable.
MATH.8.EE.C.7.a	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).
MATH.8.EE.C.7.b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
MATH.7.EE.A	Use properties of operations to generate equivalent expressions
MATH.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
MATH.7.EE.B	Solve real-life and mathematical problems using numerical and algebraic expressions and equations
MATH.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.
MATH.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.
MATH.7.EE.B.4.a	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 with accuracy and efficiency. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
MATH.7.EE.B.4.b	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.

Standards for Mathematical Practice

MATH.K-12.1	Make sense of problems and persevere in solving them
MATH.K-12.2	Reason abstractly and quantitatively
MATH.K-12.3	Construct viable arguments and critique the reasoning of others
MATH.K-12.4	Model with mathematics
MATH.K-12.5	Use appropriate tools strategically
MATH.K-12.6	Attend to precision
MATH.K-12.7	Look for and make use of structure
MATH.K-12.8	Look for and express regularity in repeated reasoning

Unit Focus

Enduring Understandings	Essential Questions
●Algebraic expressions can be used to represent and solve problems in real-world contexts. Rearranging or combining like terms does not change the value of an expression. ● All the like terms must be combined in order for the expression to be simplified. ● Expanded expressions represent an equivalent way to represent the original expression. ● The Distributive Property and common factors are used to factor expressions. ● The same rules apply for coefficients and constants when adding expressions. ● Add the inverse when subtracting expressions. ● Understanding mathematical structure is important for solving deeper, unconventional expressions. ● Equations with more than one operation can be used to represent a situation. ● One- and two-step problems are both solved using the properties of equality. ● The Distributive Property can be used to solve equations in the form . ● Solving inequalities with addition and subtraction is the same as solving equations. The inverse relationship between addition and subtraction is used to isolate the variable. ● Solving inequalities with multiplication and division is very similar to solving equations. In an inequality, when multiplying or dividing by a negative value, the inequality symbol is reversed. ● To solve a two-step inequality, add or subtract the constant, and then multiply or divide to isolate the variable. ● Multi-step inequalities, line two-step inequalities, have more than one step and more than one	● How can algebraic expressions be used to represent and solve problems? What are equivalent expressions? ● How are properties of operations used to simplify expressions? ● How does the value of an expression change when it is expanded? ● How does the distributive property relate to factoring an expression? ● How can properties of operations be used to add expressions? ● How can properties of operations be used to subtract expressions? ● How can writing equivalent expressions show how quantities are related? ● How can properties of operations help to generate equivalent expressions ● How does an equation show the relationship between variables and other quantities in the situation? ● How is solving a two-step equation similar to solving a one-step equation? ● How does the distributive property help you to solve equations? ● How is solving inequalities with addition and subtraction similar to and different from solving equations with addition and subtraction? ● How is solving inequalities with multiplication and division similar to and different from solving equations with multiplication and division? ● How is solving a two-step inequality similar to and different from solving a two-step equation? ● How is solving a multi-step inequality similar to

operation. ● Combining like terms that are on one side of an equation makes it easier to solve for the variable by using inverse operations. ● To solve a linear equation that has variable terms on both sides of the equation, first use inverse operations to move all variable terms to one side of the equation and constant terms to the other. Then, isolate the variable. ● The Distributive Property is an important tool for simplifying expressions and combining like terms. ● Equations with one variable can have zero, one, or infinitely many solutions. ● Proportional relationships can be represented using different models, including graphs, tables, and equations. ● Slope is a measure of the steepness of a line and is equal to the rate of change between quantities. In a proportional relationship, slope is the same as the unit rate and the constant of proportionality. ● The slope, constant of proportionality, and unit rate are equal for proportional relationships. ● The y-intercept of a line is the y-coordinate of the point where the graph of the line crosses the y-axis. Its meaning depends on the context of the graph. ● The slope-intercept form of a linear equation, gives information to sketch a graph of the line. It indicates that the point is on the graph of the line and shows that the slope of the line is	and different from solving a multi-step equation? ● How can you solve real-world and mathematical problems with numerical and algebraic equations and inequalities? ● How do you solve equations that contain like terms? ● How do you use inverse operations to solve equations with variables on both sides? ● How can you use the Distributive Property to solve multi-step equations? ● Will a one variable equation always have only one solution? ● How can you compare proportional relationships represented in different ways? ● What is slope? ● How does slope relate to the equation for a proportional relationship? ● What is the y-intercept and what does it indicate? ● What is the equation of a line for a non-proportional relationship? ● How can we analyze connections between linear equations and use them to solve problems?

Instructional Focus

Learning Targets
●Understand how variables are used to represent unknown values in problems ● Recognize when two expressions are equivalent ● Use properties of operations to write equivalent expressions ● Combine like integer and rational terms ● Use the Distributive Property to expand expressions ● Understand expanding an expression is the reverse of factoring ● Identify the GCF of algebraic terms in expressions ● Use properties of operations to add expressions ● Model addition of expressions in real-life applications ● Use properties of operations to subtract expressions

● Model subtraction of expressions in real-life applications
● Write equivalent expressions to show how quantities are related in real-life applications

●Analyze world problems to write two-step equations
● Understand the relationship between the terms of the equation and the values they represent
● Use models to solve two-step equations
● Compare algebraic and arithmetic solutions
● Solve equations using the Distributive Property
● Graph the solutions of an inequality on a number line
● Solve inequalities using the Addition and Subtraction Properties of Inequality
● Write inequalities and solve them using Multiplication and Division Properties of Inequality
● Graph the solutions of an inequality on a number line.
● Write and solve a two-step inequality to solve a problem
● Solve an inequality by multiplying or dividing by a negative rational number
● Explore the relationship between two-step inequalities and multi-step inequalities
● Apply the Distributive Property to simplify and solve multi-step inequalities

Prerequisite Skills

☐Read, write, and interpret algebraic expressions

☐Identify equivalent expressions

☐Evaluate graphs, tables, and number lines

☐Analyze equivalent expressions and solve multi-step equations using the Distributive Property

☐Apply proportional reasoning to solve problems.

Common Misconceptions

The equation has to represent how they would solve the problem, not necessarily what the problem describes as the situation. Solving equations/inequalities also follows the order of operations. Answers must always come out to a whole number. Using inverse operations to both sides of an equation correctly. The variable always needs to be on the left side of the equal or inequality symbol in a solution Inverse of a fraction. Combining like terms. Taking the sign in front of a term. The direction the inequality symbol is pointing is always the direction they shade on the number line. Number line always have to be drawn starting with 0 or 1. Should use reverse order of operations to check solutions. Students may think that all linear relationships are proportional leading them to incorrectly find the slope or equation of the relationship.

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Expressions • Equivalent Expressions • Equations • Inequalities	• Algebraic Expressions (Grade 6) • Equivalency (Grade 6) • Evaluate Expressions,	• Math Diagnostic and Intervention System Activities

• Evaluate Models • Proportional Relationships • Slope • Relations and Functions • Properties of Functions • Qualitative Graphs • Solve Systems of Linear Equations	Equations, and Inequalities (Grade 6) • Rules of Equations and Inequalities (Grade 6) • Evaluate Models (Grade 6 and Grade 7) • Define and Evaluate Expressions (Grade 7) • Proportional Relationships (Grade 7) • Precents (Grade 7) • Proportional Relationships (Grade 8)	

Assessment

Formative Assessment	Summative Assessment
• Homework • Lesson Checks • MathXL • Quizzes • Exit Tickets • Lesson Reflections • Performance Tasks	• Topic Tests (Common Assessments) • Unit 2 Benchmark (Link-It)

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Accelerated Math 7 • Pacing Grade	• IXL • Delta Math • Desmos • Khan Academy

Career Readiness, Life Literacies, and Key Skills

CRP.K-12.CRP2	Apply appropriate academic and technical skills.

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

Interdisciplinary Connections

ELA.L.KL.7.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
ELA.SL.PE.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
ELA.SL.PE.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
ELA.SL.PE.7.1.C	Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
ELA.SL.PE.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
6-8.MS-ETS1-3.4.1	Analyze and interpret data to determine similarities and differences in findings.
6-8.MS-ETS1-3.ETS1.B.1	There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.
6-8.MS-ETS1-3.ETS1.B.2	Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors.