Expressions, Equations, and Inequalities

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

Unit Overview

Unit Summary	Unit Rationale
In this unit students generate equivalent expressions to provide different perspectives on a problem. They make tables of values to compare and identify equivalent expressions. Students understand the pattern and relationship between subtracting integers and subtracting expressions. They will apply the concept of adding the opposite and use the Distributive Property to simplify expressions. Students will also develop a deeper understanding of the properties of operations when manipulating expressions. They will make the connection between the Distributive Property and GCF by factoring different types of expressions. This unit also provides the opportunity for students to model and solve real world problems using equations and inequalities. Students will apply their knowledge of rational numbers to solve equations and inequalities using the properties of equality. Students also interpret what each part of the equation or inequality represents. In this unit students also learn how to use inverse operations to solve equations and inequalities. They understand that the opposite operation will “undo” the calculation and helps them to isolate the variable. This leads students into the concept of properties of equality and how these properties ensure the equation or inequality remains balanced.	Being able to represent a real-world situation is essential to applying Algebra to students’ everyday lives. Using bar diagrams helps students to visually represent unknowns and constants. Models can also help students to conceptually understand the meaning of a solution or analyze how an inequality has an infinite number of solutions. Using expressions, equations, and inequalities to model real world situations are foundational skills that are vital for Algebra I as well as real life application.

NJSLS

7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear

	expressions with rational coefficients.
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.
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.
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.
7.EE.B.4.a	Solve word problems leading to equations of the form □□ + □ = □ and □(□ + □) = □, where □, □, and □ 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.
7.EE.B.4.b	Solve word problems leading to inequalities of the form □□ + □ > □ or □□ + □ < □, where □, □, and □ are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
7.G.B.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
7.G.B.5	Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

Standards for Mathematical Practice

1	Make sense of problems and persevere in solving them
2	Reason abstractly and quantitatively
3	Construct viable arguments and critique the reasoning of others
4	Model with mathematics
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
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	• 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

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. • The measures of angles that are formed by intersecting lines and rays can be determined when the relationships between different types of angles are known. • The circumference and diameter of a circle, regardless of size, have a unique and constant ratio that is an irrational number known as pi. • The formula for the area of a circle, A=pir^2, can be used to solve problems by substituting the known values for area (A) and/or radius (r) to solve for the unknown value.	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 that can be used in solving problems? • 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 and different from solving a multi-step equation? • How can we use the relationships between different types of angles to determine unknown angle measures? • Why is the ratio of a circle's circumference to its diameter always the same, and how does pi describe this relationship? • How can we use the formula for the area of a circle to find an unknown area or radius in real-world problems?

Instructional Focus

Learning Targets

Learners will...

- 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
- Calculate the measures of angles by using angle relationships.
- Apply what I know about solving equations to calculate angle measures.
- Calculate the circumference, radius, or diameter of a circle.
- Apply what I know about equations to be able to find the circumference, radius, or diameter or a circle.
- Recognize the relationship between the circumference and the diameter or a circle and pi.
- Find the area of a circle.
- Use the area to find the radius and diameter.
- Apply what I know about equations to be able to find the area, radius, and diameter of a circle.
- Solve problems involving the area of a circle.

Prerequisite Skills

- Generate equivalent expressions using the properties of operations
- Expressions are equivalent when they name the same number regardless of which value is substituted into them
- Identify when two expressions are equivalent
- Write expressions using variables to represent real-world or mathematical situations
- Write and solve equations for real-world and mathematical problems

- Represent a constraint or condition in a real-world or mathematical problem

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 lines always have to be drawn starting with 0 or 1
- Should use reverse order of operations to check solutions

Spiraling For Mastery

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

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 Math 7 • Pacing Guide	• IXL • Delta Math • Desmos • Khan Academy • Manuevering the Middle

Career Readiness, Life Literacies, and Key Skills

9.4.8.CT	Critical Thinking and Problem-solving
9.4.8.GCA.1	Model how to navigate cultural differences with sensitivity and respect (e.g., 1.5.8.C1a).
9.4.8.GCA.2	Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.4	Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.IML.12	Use relevant tools to produce, publish, and deliver information supported with evidence for an authentic audience.

Interdisciplinary Connections

L.KL.7.2.A	Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases.
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.
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.

SL.PE.7.1.D	Acknowledge new information expressed by others and, when warranted, modify their own views.
6-8.MS-ETS1-3.4	Analyzing and Interpreting Data
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.