Unit 02: Solving Algebraic Equations

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 4**
Length: **3 Weeks**
Status: **Published**

Unit Overview

In this unit, the students will use the properties of addition and multiplication as well as the distributive property to evaluate expressions. They will identify the parts of an expression. Using inverse operations, students will simplify and write one, two, and multi-step equations having like terms, parentheses, and variables on both sides.

Standards

MA.6.NS.C.7a	Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
MA.7.EE.A.1	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
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.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.
MA.6.EE.A.2b	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
MA.6.EE.A.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).
MA.6.EE.B.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MA.6.EE.B.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.
MA.6.EE.B.8	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real- world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
MA.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables

using graphs and tables, and relate these to the equation.

Essential Questions

- Why are equations and inequalities useful?
- How do the properties contribute to algebraic understanding?
- How can expressions and equations be used to represent practical problems symbolically?
- How is thinking algebraically different from thinking arithmetically?

Application of Knowledge and Skills...

Students will know that...

- The Commutative Property allows you to change the position of numbers when finding a sum or a product.
- The Associative Properties allows you to group numbers together when fiinding a sum or a product.
- The Identity Property states that when 0 is added to any number, or when any number is multiplied by 1, the result is identical to the original number.
- The Zero Property allows you to multiply any real number by zero and obtain a product of 0.
- The Distributive Property allows you to multiply two addends by the same number (x(y +z)= xy +xz).
- The parts to a variable expression are: coefficient, constant, and like terms.
- Like terms must have identical variables and exponents.
- An equation is a mathematical sentence formed by placing an equal sign between two expressions.
- Inverse Operations are operations that undo themselves ie.: addition and subtraction.
- A one-step equation involves one operation, a two-step equation involves two operations, and a multi-step equation involves three or more operations.
- The perimeter of a geometric figure is obtained by adding numeric and variable expressions.
- The area of a geometric figure is obtained by multiplying numeric and variable expressions.

Students will be able to:

- Identify the distributive, associative, commutative, identify and zero properties in equations.
- Use the distributive property to simplify expressions and equations.
- Simplify expressions using like terms.
- Create expressions using knowledge of area and perimeter of squares, rectangles, and triangles.
- Solve one-step equations using inverse operations.

- Solve two-step equations using the distributive property and inverse operations.
- Evaluate word problems involving one- and two-step equations.
- Solve multi-step equations using like terms, the distributive property and inverse operations.
- Solve equations with variables on both sides using like terms, the distributive property and inverse operations.
- Determine if a given solution is an answer to an equation.

Assessments

Daily Formative Assessments
Instructional/Assessment Focus

Formative assessments, such as: Do Now Assignments, Homework Assignments, Tickets to Leave, and Communicators, will provide daily data for teachers.

Small Business Income
Summative: Written Report

Textbook Alternate Assessment: The students will be given a table of net income for a small retail business. They will determine the overall profit or loss for the year and relate these terms to positive and negative numbers. The students will determine the average per year, utilize an algebraic equation to determine the change between a given number of years, and use the information to make conclusions about the success of the business.

Quiz 1
Formative: Other written assessments

The students will demonstrate their understanding of: identifying and utilizing properties, identiying the parts of expressions, simpfying expressions involving like terms, and the Distributive Property.

Solving Algebraic Equations and Expressions Test
Summative: Written Test

Teacher-constructed assessment in which the students will demonstrate their understanding of all the objectives in the Solving Algebraic Equations and Expressions Unit.

Pennies Investigation
Formative: Lab Assignment

Chapter 2 Project/Investigation in which students will measure the height of pennies and relate the measurements to the height of real-world structures using equations, short answer, and open-ended responses to questions.

Telescope Project.
Formative: Lab Assignment

Chapter 3 Cooperative Project: Utilizing specific amounts provided by the teacher, the students will determine how long they will have to save money to reach their goal. This will assess their understanding of evaluating

expressions and solving equations.

Quiz 2
Formative: Written Test

Teacher-constructed assessment in which students will demonstrate their understanding of simplifying expressions and solving one- and two-step equations involving the Distributive Property.

Digits Readiness Assessments: The readiness assessment screens students on their understanding of the prerequisite content of a unit. Students are then assigned invidualized intervention lessons to address specific needs.

Activities

- **Exploring** M**ulti-Step Equations**: Form a group of four students. There is no talking in this game. One person in the group will be handed a piece of paper with an equation printed on the top. That student will perform one step in solving the equation, then pass the paper to the next person in the group. The student receiving the paper must review the work already done and make corrections if necessary. He/She then performs the next step in solving the equation and passes the paper to a third member of the group. Each person receiving the paper must first check the work done by prior group members and then perform an additional step. The person holding the paper when the equation is completely solved brings the paper to the front of the room. When all groups have finished, the final solvers write the solution on the board. The starting position rotates with each new equation.
- **Telescope Real-Word Problems:** Students will choose from a deck of cards to determine the money they have, how much they will save each week, and the total amount they will need. Using these numbers, they will create algebraic equations and answer corresponding questions to determine how different starting values and weekly rates alter their total or final sum. They will repeat this activity 3 times per group. Once students have finished, they will discuss the results as a whole class and how different numbers may affect their final solutions.**digits grade 7 cd:**

- **Digits cd grade 7**

  Launch Activities:

  Choosing a cell Phone Plan r7: In this activity students will solve problems related to choosing a cell phone plan to review writing and evaluating algebraic expressions. Students will review using the distributive property.

  Gym Workouts r8: In this activity students will solve problems related to gym workouts to review solving one step addition, subtraction, multiplication and division equations. Students will review th distributive property.

  Taking Public Transportation r9: In this activity students will solve problems related to taking public transportation to solve one step addition, subtraction multiplication and division inequalities.

Activities to Differentiate Instruction

- **Properties Note Card Activity:** sections of the classroom will be labeled with one of the properties. Students will be given note cards with an example of the property and they will move to the proper place in the classroom. The teacher may provide students with specific cards based on their abilities (provide more advanced students with more challenging equations in which the property is not easily determined). On a large post-it, the students may copy down their examples. As a whole class, determine if all the students are in their correct places.
- **Pennies Hands-on Investigation (pg.114):** the students will measure the height of 10 pennies to indirectly determine the height of one penny. They will use the given verbal model to write an expression to solve for any given number of pennies. Students will then use the equation to solve the equation for one penny, 50 pennies and 2050 pennies. They will then individually answer extension question and make real world connections to the height of Mount Everest and the Empire State Building. Challenging/Extension open-ended response questions are provided for more advanced students. Teachers may provided one-on-one assistance to struggling students. Link attached.
- **Algebra Tiles**: Students will use manipulatives to model one- and two-step equations involving multiplication and addition. They will then use inverse operations to solve the problems. For more advanced students, provide examples in which the equation requires **multiplication and subtraction.** The teacher may also provide examples in which the students have to add like terms before performing inverse operations.

- **Digits Supported Materials:**
    - Math XL Printables
    - Leveled Homework G and K
    - Help Me Solve This: This function scaffolds math problems by asking prompting question at each individual step.
    - View An Example: This function provides a fully worked out step-by-step solution of a similar problem.
    - Readiness Assessment: After a student completes the readiness assessment intervention lessons are individually assigned to address prerequisite skills .
    - Tools: On line manipulatives

Pennies project

Integrated/Cross-Disciplinary Instruction

- **Temperature:** Discuss the difference between Kelvin and Celsius scalea to measure temperature. Provide background information and the formula for how to find Kelvin temperatures given an equivalent Celsius temperature. Relate this to absolute value and absolute zero. To challenge students, have them determine a formula to go from Kelvin to Celsius.

Resources

Kuta software

Digits teacher materials and support: www.pearsonrealize.com

Digits student access and support: www.MyMathUniverse.com

SMART Exchange

Smart Board

-Algebra Tiles

-Graphing Calculators

-Information on Kelvin and Celsius temperatures.

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21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.