02 Foundations for Algebra

Content Area: **Mathematics**
Course(s):
Time Period: **Week1**
Length: **4 Weeks**
Status: **Published**

Stage 1: Desired Results

MA.7.7.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.6.6.NS.C.7c	Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
MA.6.6.NS.C.7d	Distinguish comparisons of absolute value from statements about order.
MA.8.8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions.
MA.6.6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.
MA.6.6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers.
MA.6.6.EE.A.2a	Write expressions that record operations with numbers and with letters standing for numbers.
MA.6.6.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.6.6.EE.A.2c	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
MA.8.8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
MA.7.7.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.6.6.EE.A.3	Apply the properties of operations to generate equivalent expressions.
MA.7.7.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.6.6.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.8.8.NS.A.1	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
MA.8.8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational

	numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2).
MA.7.7.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.

Unit Overview/ Rationale

In the transition from arithmetic to algebra, attention shifts from arithmetic operations to use of the property of these operations. This unit introduces students to variables and expressions and explores real-number operations. By using variables in place of numbers in equations allows the statement of relationships among numbers that are are unknown or unspecified.

Big Ideas - Students will understand that...

-Quantities are used to form expressions, equations, and inequalities.

-An expression refers to a quantity but does not make a statement about it.

-An equation (or an inequality) is a statement about the quantities it mentions.

Essential Questions - What provocative questions will foster inquiry and transfer of learning

How can you represent quantities, patterns, and relationships?

How are properties related to algebra?

How can we compare rational and irrational numbers?

Content - Students will know...

Number System:

-Classifying real numbers

-Irrational and rational numbers

-Square roots

-Estimating square roots

-Exponents

-Comparing real numbers

-Identifying real numbers on a number line

-Absolute value

-Operations with real numbers

Expressions and Equations:
-Writing algebraic expressions
-Evaluating algebraic expressions
-Simplify algebraic expressions
-Combining like terms
-Distributive property
-Order of operations
-Using a Table of values to find a solution
-Using tables, equation, and graphs to describe relationships

Skills - Students will be able to...

-Write algebraic expressions from word phrases and write word phrases from algebraic expressions

-Use the order of operations to evaluate expressions

-Simplify expressions involving exponents (including negative bases)

-Classify, graph, and compare real numbers (rational and irrational)

-Find and estimate square roots

-Find sums, differences, products, and quotients of real numbers

-Use the distributive property to simplify expressions

-Solve equations using symbols and mental math

-Use tables, equations, and graphs to describe relationships

-Simplify algebraic expressions by combining like terms

Stage 2: Assessment Evidence

Assessment

Stage 3: Learning Plan

Learning Activities

Activity:

Introduce the lesson by giving students the following problem:

You have just won a prize you get to choose between two options. Which is the better prize and why?
Prize 1: You get $60 immediately
Prize 2: you get $1 the first day. Then each day for the next 5 days you get twice the previous day's amount.
Have students come up with an algebraic expression to represent the amount received each day. Next, introduce the terms power, exponent and base.
Next review the order of operations including operations with integers. Evaluate algebraic expressions using integers.
Assessment:
Exit Slip: Evaluate:

Activity: Real Numbers and the Number line
Introduce the lesson by giving students the following pattern:
Stage 1: 1 square Stage 2: 4 square Stage 3: 9 squares.
Ask students the following:
What stage will have 144 squares?
Which will be the first stage to have more than 200 squares?
Next introduce the terms square root and radical.
Students will simplify square roots of rational numbers. Next give students examples of rational and irrational numbers. Have students try to generate a definition for rational and irrational numbers. Also introduce the terms natural numbers and integers.
sqr($36x^2y^4$)

Activity: Properties of Real Numbers

Introduce the lesson by giving the students the following task:

Tell whether each pair of expressions is equal by completing each statement with = or not = to.

a. 34+ 12_____ 12+34 b. 18 ÷1/18_____ 1

c. 34-12_____ 12-34 d. 18 •1/18_____ 1

e. 0+180_____ 180

Which expressions include operations with reciprocals? Which of these equal 1? Will this always be true?

Which other statements were equal? Will this always be the case?

Next introduce all of the properties of real numbers and use these properties to simplify algebraic expressions.

Assessment:

Simplify the following. State the property that was used to simplify:

33xy/3x

Activity: The Distributive Property

Have students complete the following mentally

4(99)

5(101)

6(49)

Ask students to explain how their thought process to evaluate the above expressions. Ask students to generalize what they learned using variables:

6(a+b) =

Next students will simplify and expressions using the distributive property.

Example: 2-(3-2x)+6x and (10-2x)/2

Exit Slip:

1. What is the simplified form of the expression:

$14mn+6mn^2-8mn-7mn^2+5m^2n$

2. (12x+6y-3)/3

Lesson: Introduction to Equations

Recognize, express and solve problems that can be modeled using single-variable linear equations. Interpret their solutions in terms of the context of the problem.

Students will write equations, identify solutions of an equation, and determine solutions of an equation.

Student will use mental math, tables, and estimation to find a solution to an equation.

Example: Is x = 5 a solution of the equation 25 = 4x + 10?

Example: Jim spent $200 on gifts for his family. He spent the money on toys, clothes and a $15 DVD. He spent 4 times as much on clothes as he did on toys. Write an equation in one variable that can be used to determine how much money Jim spent on toys. Solve the equation to determine how much Jim spent on toys.

For applications, this includes using and interpreting appropriate units of measurement, estimation and the appropriate level of

precision.

Assessment:

Teacher observations of student work in small-group and independent practice.

Closure/Exit Slip: Explain how you can tell whether a number is a solution to an equation.

Closure/Exit Slip: Give an example of equation that is true, an equation that is false, and an open equation.

Closure/Exit Slip: Use two different methods to find the solution of the equation $x + 14 = 20$.

Graphing Calculator Activity: Solve a problem by making a table on a graphing calculator. A raft floats downriver at 9mi/h. The distance y the rafter travels can be modeled by the equation $y = 9x$, where x is the number of hours. Make a table on a graphing calculator to find how long it takes the raft to travel 153 mi.

Lesson: Patterns, Equations, and Graphs
Students will use tables, equations and graphs to describe linear relationships.

Students will make predictions using tables, an equation, and/or a graph.

Example: Quick Trip rental car agency charges a flat weekly rate of $193.00 and $0.19 per mile. Make a table, write an equation, and a graph to represent the number of miles driven and the total cost of the rental.

For items where a student is required to graph the equation or function, axes and scales should be labeled. If the item is written in a context, the labels and scales must be appropriate within the context of the item, including units (e.g., dollars, seconds, etc).

Assessment:

Teacher observations of student work in small-group and independent practice.

Closure/Exit Slip: Explain how you can tell whether an ordered pair is a solution?

Closure/Exit Slip: Is (-3, -9) a solution of the equation $y = 3x$?

Closure/Exit Slip: Drinks at the fair cost $2.50. Use a table, an equation, and/or a graph to represent the relationship between the number of drinks bought and the cost.

Resources

Pearson Algebra 1 c. 2012

Chapter 1 Foundations for Algebra