



UNIT 1

Unit Title: Prime Time

Unit Description: In this unit, students will explore important properties of whole numbers. Many of these properties are related to multiplication and division. The investigations will help students understand relationships among factors, multiple, divisor and products. Students will also learn how the distributive property relates multiplication and addition.

LEARNING GOALS

Enduring Understanding(s):

One representation may sometimes be more helpful than another; and, used together, multiple representations give a fuller understanding of a problem.
 A quantity can be represented numerically in various ways. Problem solving depends upon choosing wise ways.
 Numeric fluency includes both the understanding of and the ability to appropriately use numbers.

Essential Question(s):

How is it helpful to write numbers in different ways?
 How can factors and multiples help us solve fraction problems?
 How can the distributive property help us to rewrite expressions?

Content and Skills:

Number theory – including factors, multiples, primes, composites, prime factorization
 Order of operations
 Distributive Property

Standards Addressed:

6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents.

6.EE.2a Write expressions that record operations with numbers and with letters standing for numbers.
Note: The development in this Unit is primarily with numerical expressions and is further developed with expressions containing variables in *Variables and Patterns*.

6.EE.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.
Note: The words *term* and *coefficient* are developed in *Variables and Patterns*.

6.EE.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).

6.EE.3 Apply the properties of operations to generate equivalent expressions.

6.EE.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).

UNIT 2

Unit Title: Comparing Bits and Pieces

Unit Description: Rational numbers are at the heart of the middle-grades experience with number concepts. The goal of *Comparing Bits and Pieces* is to help students deepen their understanding of equivalent fractions and build on this understanding as they explore ratios. They will become skillful at interpreting the different forms of a rational number, at knowing which form is most appropriate for the solution of a given problem, and at writing and interpreting ratios.

LEARNING GOALS

Enduring Understanding(s):

Rational numbers can be written in fraction or decimal form and can be represented as points or distances on a number-line. A number-line representation is useful for ordering and comparing numbers.

Fractions and decimals can be renamed or repartitioned to find equivalent fractions or decimals. Equivalence is useful for moving between fraction and decimal representations and for solving problems.

Ratios are comparisons between two numbers. You can scale ratios to be make equivalent ratios. Percents are ratios where 100 parts represents the whole
A rate is a particular kind of ratio, where the amounts compared are in different units. A unit rate is a rate that has been scaled to $x : 1$.

A ratio is a number that relates two quantities or measures within a given situation in a multiplicative relationship (in contrast to a difference or additive relationship).

Ratios can express comparisons of a part to whole, (a/b with $b \neq 0$)

Fractions are part-whole ratios, meaning fractions are also ratios. Percentages are ratios and are sometimes used to express ratios.

Both part-to-whole and part-to-part ratios compare two measures of the same type of thing. A ratio can also be a rate.

A rate is a comparison of the measures of two different things or quantities; the measuring unit is different for each value.

Essential Question(s):

When is it better to use a fraction, decimal or percentage?

Content and Skills:

Ratio

Unit Rate

Rate Tables
Rational Numbers
Decimals
Percent
Equivalence
Absolute Value
Number Line

Standards Addressed:

- 6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.2: Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
- 6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.NS.C.5: Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- 6.NS.C.6: Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- 6.NS.C.7: Understand ordering and absolute value of rational numbers.

UNIT 3

Unit Title: Let's Be Rational

Unit Description: The goal of *Let's Be Rational* is to develop meaning for and skill with computations involving fractions. Students will have had some experiences during upper elementary grades with developing fraction operations. Typically, however, students will not have developed a sense of which operation to use in a particular problem situation.

LEARNING GOALS

Enduring Understanding(s):

For each operation, there is an efficient, general algorithm for computing with fractions that works in all cases.
Division and multiplication are inverse operations and, therefore, can be used to check each other

Essential Question(s):

Why is the denominator of a fraction important in solving operations with fractions?
What are some strategies that could be used in solving operations involving fractions?
How do you know when a particular operation is called for to solve a problem?
Why does the division of fractions algorithm work (i.e., multiplying by the reciprocal)?

Content and Skills:

Addition, subtraction, multiplication, division of fractions

Standards Addressed:

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.

6.EE.A.2a Write expressions that record operations with numbers and with letters standing for numbers.

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.

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).

6.EE.A.3 Apply the properties of operations to generate equivalent expressions. *Investigation 2*

Essential for 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).

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.

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.

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.

UNIT4

Unit Title: Decimal Ops

Unit Description: This Unit is driven by four themes. First, many mathematical situations involve rational numbers in decimal and percent form. Second, the critical first task of solving any problem is to identify the operation(s) that will produce useful insights and/or solutions to problems. Students need to consider the results of those arithmetic operations on decimals and percents. Third, both before and after students find exact computations, it is helpful for them to make thoughtful estimates of the expected results. Last, despite the availability of technological tools to perform the exact computations, students should develop proficiency in efficient algorithms for performing those computations.

Thus, the Problems of this Unit are focused on the development of three essential understandings and skills:

- Recognizing which operation(s) will be helpful to solve problems
- Making approximate computations that provide ballpark estimates of exact computations

Performing exact calculations using reasonably efficient methods, including use of a scientific calculator and common algorithms

LEARNING GOALS

Enduring Understanding(s):

Estimation is an important part of reasoning

Essential Question(s):

How do you decide which operations to perform

quantitatively. It helps you make sense of a situation, allow you to recognize errors and compleemtns toher prombel solving skills
 The standard algorithm for dividing decimals is supported by the connections between fraction and decimal operations
 Fluency with decimal operations allow you to solve a variety of problems involving ratios and percents
 Inverse operations can be used to isolate a variable when solving equations

when a problem involves decimals and percents?
 Why is estimating the sum, difference, product, or quotient important to evaluating the reasonableness of an answer?
 How can the sum, difference, and product of two or more decimals be computed?

Content and Skills:

Addition, subtraction, multiplication and division of decimals
 Estimation
 Percents

Standards Addressed:

- 6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a : b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
- 6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.RP.A.3b Solve unit rate problems including those involving unit pricing and constant speed.
- 6.RP.A.3c Find a percent of a quantity as a rate per 100 (e.g. 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
- 6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
- 6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.
- 6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.3 Apply the properties of operations to generate equivalent expressions.
- 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.
- 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.
- 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.

UNIT 5

Unit Title: Variables and Patterns

Unit Description: The overarching objective of the Variables and Patterns Unit is to develop student ability to recognize, describe, and analyze two kinds of relationships between variables: (1) change in the value of a single variable over time; and (2) change in the value of a dependent variable as it responds to change in the value of a related independent variable. Students should learn how to reason about those relationships using numeric, graphic, symbolic, and verbal representations.

LEARNING GOALS

Enduring Understanding(s):

In many real-world situations, one variable quantity depends on another. Tables, graphs, and equations are various representations that can be used to better understand the pattern of change between variable quantities.

Not all relationships are linear. Linear relationships have a constant rate of change between variables and are written in the form $y = mx$, $y = b + x$, and $y = b + mx$.

There is more than one way to write an expression to model a real world situation. Properties of operations allows you to generate equivalent expressions and check equivalence

Solutions for equations and inequalities can be found by examining the table or graph of the equation or by rewriting it as a related equation.

Essential Question(s):

How do you determine if two numbers or expressions are equal?

Content and Skills:

Variables

Variable expressions

Equations

Inequalities

Representations of relationships in tables

Graphs

Equations

Standards Addressed:

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.

6.RP.A.3a Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

6.RP.A.3b Solve unit rate problems including those involving unit pricing and constant speed.

6.RP.A.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

6.NS.C.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

- 6.NS.C.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- 6.NS.C.6c** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- 6.NS.C.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
- 6.EE.A.1** Write and evaluate numerical expressions involving whole-number exponents.
- 6.EE.A.2** Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a** Write expressions that record operations with numbers and with letters standing for numbers.
- 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.
- 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).
- 6.EE.A.3** Apply the properties of operations to generate equivalent expressions.
- 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).
- 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.
- 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.
- 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.
- 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.
- 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.

UNIT 6

Unit Title: Covering and Surrounding

Unit Description: In this unit, students study four kinds of measurements appropriate for Grade 6: perimeter, area, surface area, and volume. Students often have misconceptions about the effects of these measures on each other. Thus, it is critical to study them together in order to understand their relationships.

LEARNING GOALS

Enduring Understanding(s):

The area of a composite figure can be calculated by breaking the figure into regular shapes
A fixed number of area units can be enclosed by

Essential Question(s):

How is shape important when measuring a figure?
How does measurement help you solve problems in everyday life?

many different perimeters, and a fixed number of perimeter units can enclose many different areas.

Formulas for the area and perimeter of a rectangle can help you solve problems by reasoning about the relationship between values.

The volume of a shape consists of the number of cubes that fit inside of the shape with no gaps or overlaps

The volume of a prism can be thought of as multiplying a base layer of rectangles unit cubes by the number of layers needed to fill the prism.

Surface areas of three-dimensional solids can be found by adding the areas of the faces.

Content and Skills:

Area and perimeter relationships

Area and perimeter of polygons

Surface area of rectangular prisms

Volume of rectangular prisms

Standards Addressed:

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.

6.G.A.1: Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

6.G.A.2: Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas

$V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

UNIT 7

Unit Title: Data About Us

Unit Description: In Data About Us, the students will learn about the process of statistical investigations. They will also construct and analyze distributions of data. They will compare data distributions by using what they know about measures of center and spread. Statistical investigations involve a set of four components: posing a question, collecting the data, analyzing the data, and interpreting the results.

LEARNING GOALS

Enduring Understanding(s):

Line plots, Histograms, Box plots are all helpful ways to summarize and display numerical data for organizational purposes and analysis.

Measures of center and variations and distributions can describe a data set's center, spread and overall shape.

Median, mode and mean are data analysis tools that summarize all of a data set's values with a single number. They are helpful in describing the overall shape of the data.

Interquartile range and mean absolute deviation are data analysis tool that describes how a data set's values vary with a single number. They are helpful in describing the spread of the data.

Essential Question(s):

Why is it important to summarize and display numerical data?

What are measures of center and how are they helpful in describing data?

What are measures of variation and how are they helpful in describing data?

Content and Skills:

Understand and use the process of data investigation: posing questions, collecting and analyzing data, distributions, and making interpretations to answer questions.

Represent distributions of data using line plots, bar graphs, stem-and-leaf plots, and coordinate graphs.

Compute the mean, median, mode and range of the data.

Distinguish between categorical data and numerical data and identify which graphs and statistics may be used to represent each kind of data.

Make informed decisions about which graph(s) and which of the measures of center (mean, median, or mode) and range may be used to describe a distribution of data.

Develop strategies for comparing distributions of data.

Standards Addressed:

6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.B.5 Summarize numerical data sets in relation to their context, such as by:

6.SP.B.5.A Reporting the number of observations.

6.SP.B.5.B Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

6.SP.B.5.C Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the

overall pattern with reference to the context in which the data were gathered.

6.SP.B.5.D Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.