Prairie Hills Junior High School

6th Grade Math Curriculum (2018-2019)

In Grade 6, instructional time should focus on four critical areas:

(1) connecting ration and rate to whole number and division and using concepts of ratio and rate to solve problems;

(2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;

(3) writing, interpreting, and using expressions and equations; and developing understanding of statistical thinking.

Quarter 1 **September, October, November**

Unit 1- Fractions and Decimals **Unit 2- Ratios, Rates, and Percent**

Unit 1- Fractions and Decimals

Standard(s):

Apply and extend previous understandings of multiplication and division to divide fractions by fractions

- 6.NS.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. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length3/4 mi and area 1/2 square mi?* **(Mastered)**

Compare fluently with multi-digit numbers and find common factors and multiples

- 6.NS.2 Fluently divide multi-digit numbers using the standard algorithm. (Additional)
- 6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. (Additional)

Transfer: *Students will apply…*

Fraction and decimal concepts and procedures to interpret, solve, and create real-world problem scenarios that involve operations with fractions and/or decimals.

Ex. Create a story context for $\frac{3}{8} \div \frac{2}{9}$ and use a visual fraction model to show the quotient.

Understandings: *Students will understand that …*

- The two types of division – quotative (partitive) and measurement are applied to fractions and decimals as well as to whole numbers.
- Multiplication and division are inverse operations for whole numbers, fractions and decimals.
- The relationship of the location of the digits and the value of the digits is part of understanding multi-digit operations.
- Division of fractions by fractions can be represented using multiple formats (manipulates, diagrams, real-life situations, equations).
- Operations on decimals and whole numbers are based upon place value relationships.

Essential Questions:

- How is division related to realistic situations and to other operations?
- What role does place value play in multi-digit operations?
- How can division be represented and interpreted?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

* **1. Make sense of problems and persevere in solving them.** Students make sense of real-world fraction and decimal problem situations by representing the context in tactile and/or virtual manipulates, visual, or algebraic models.

* **2. Reason abstractly and quantitatively.** Students will reason about the value of numbers as they perform operations. Students use their understanding of multiplication of fractions as scaling to reason about the effects of multiplying or dividing fractions and decimals and the values of the resulting products or quotients.

* **3. Construct viable arguments and critique the reasoning of others.** Students construct and critique arguments regarding the portion of a whole as represented in the context of real-world situations.

* **4. Model with mathematics.** Students will model real-world situations to show multiplication and division of fractions and decimals.

5. Use appropriate tools strategically. Students will use visual or concrete tools for division of fractions with understanding. (Such as fraction square or circle pieces, fraction equivalence towers, bar models, and number line
* diagrams.

6. Attend to precision. Students attend to the language of problems to determine appropriate representations and operations for solving real-world problems. In addition, students attend to the units of measure used in real-world
* problems.

7. Look for and make use of structure. Students examine the relationship of rational numbers to the number line and the place value structure as related to multi-digit operations. They also use their knowledge of problem solving structures to make sense of word problems.

8. Look for and express regularity in repeated reasoning. Students demonstrate repeated reasoning when dividing fractions by fractions by fractions and see the inverse relationship to multiplication

Prerequisite Skills/Concepts: *Students should already be able to:* • Add, subtract and multiply fractions. • Divide fractions by whole numbers and whole numbers by fractions. • Use area models for fraction or decimal computation situations. • Fluently add, subtract, multiply and divide whole numbers. • Use concepts of area, perimeter and volume to solve problems with whole numbers.	**Advanced Skills/Concepts:** *Some students may be ready to:* • Represent and solve multi-step problems involving positive and negative rational numbers with tape diagrams, double number lines, equations and expressions.
Knowledge: **Students will know…** • **Standard algorithms for addition, subtraction, multiplication and division of multi-digit decimals**	**Skills:** **Students will be able to…** • **Compute quotients of fractions divided by fractions. (6.NS.1)** • **Explain the meaning of a quotient determined by division of fractions, using visual fraction models, equations, real-life situations, and language. (6.NS.1)** • **Divide multi-digit numbers fluently using the standard algorithm. (6.NS.2)** • **Fluently add, subtract, multiply and divide decimals to solve problems. (6.NS.3)**

WIDA Standard: English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

- the opportunity to use visual and concrete models in order to understand and apply fraction and decimal concepts and language.
- explicit vocabulary instruction regarding fractions and decimals.

Academic Vocabulary:	
Critical Terms: Reciprocal Decompose Inverse operation Compose	**Supplemental Terms:** Quotient Divisor Remainder Dividend Unknown/Variable Problem Solving Structures (Take apart, add to, take from, additive comparison, equal groups, area/array, multiplicative comparison)

Unit 2- Ratios, Rates, and Percent

Standard(s):

Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes." **(Mastered)**

6.RP.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." **(Mastered)**

6.RP.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. **(Mastered)**

a) 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.
b) Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
c) 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.
d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

Represent and analyze quantitative relationships between dependent and independent variables.

6.EE.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. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.* **(Mastered)**

Transfer: *Students will apply…*

Students will apply ratio and rate concepts and procedures to represent and solve real-world and mathematical problems (rate and unit rate problems, scaling, unit pricing, statistical analysis, etc.). Students will be introduced to equations with dependent and independent variables.

Understandings: *Students will understand that …*

- A ratio expresses the comparison between two quantities. Special types of ratios are rates, unit rates, measurement conversions, and percentages.
- Ratio and rate language is used to describe a relationship between two quantities (including "per", "for every", etc. for unit rates).
- A rate is a type of ratio that represents a measure, quantity, or frequency, typically one measure against a different type of measure, quantity, or frequency.
- Ratio and rate reasoning can be applied to many different types of mathematical and real-life problems (rate and unit rate problems, scaling, unit pricing, statistical analysis, etc.).

Essential Questions:

- When is it useful to be able to relate one quantity to another?
- How are ratios and rates similar and different?
- What is the connection between a ratio and a fraction?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

* 1. **Make sense of problems and persevere in solving them.** Students understand the problem context in order to translate
* them into ratios/rates.
2. **Reason abstractly and quantitatively**. Students understand the relationship between two quantities in order to express them mathematically. They use ratio and rate notation as well as visual models and contexts to demonstrate reasoning.
3. **Construct viable arguments and critique the reasoning of others.** Students construct and critique arguments regarding appropriateness of representations given ratio and rate contexts. For example, does a tape diagram adequately
* represent a given ratio scenario.
4. **Model with mathematics.** Students can model problem situations symbolically (tables, expressions or equations), visually (graphs or diagrams) and contextually to form real-world connections.
5. **Use appropriate tools strategically.** Students choose appropriate models for a given situation, including tables, expressions or equations, tape diagrams, number line models, etc.
6. **Attend to precision**. Students use and interpret mathematical language to make sense of ratios and rates.
7. **Look for and make use of structure.** The structure of a ratio is unique and can be used across a wide variety of problem-solving situations. For instance, students recognize patterns that exist in ratio tables, including both the additive and multiplicative properties. In addition, students use their knowledge of the structures of word problems to make sense of real-world problems.
8. **Look for and express regularity in repeated reasoning.** Students utilize repeated reasoning by applying their knowledge of ratio, rate and problem-solving structures to new contexts. Students can generalize the relationship between representations, understanding that all formats represent the same ratio or rate.

Prerequisite Skills/Concepts:

Students should already understand:

- Multiples and Factors
- Divisibility Rules
- Relationships and rules for multiplication and division of whole numbers as they apply to decimal fractions
- Understanding of equivalent fractions

Advanced Skills/Concepts:

Some students may be ready to:

Students will use ratios, rates, unit rates and percent skills:

- in grade 7 when working with proportional relationships and probability
- in geometry and in algebra when studying similar figures and slopes of lines

Knowledge: *Students will know…*	**Skills**: *Students will be able to…*
• A **ratio** compares two related quantities. • Ratios can be represented in a variety of formats including *each, to, per, for each, %, 1/5*, etc. • A **unit rate** is the ratio of two measurements in which the second term is 1. • When it is appropriate to use ratios/rates to solve mathematical or real life problems. • Mathematical strategies for solving problems involving ratios and rates, including tables, tape diagrams, double line diagrams, equations, equivalent fractions, graphs, etc. • A **percent** is a type of ratio that compares a quantity to 100. • Variables change in relationship to one another.	• Use ratio language to describe a ratio relationship between two quantities. (6.RP.1) • Represent a ratio relationship between two quantities using manipulatives and/or pictures, symbols and real-life situations. (*a to b,* a:b, or a/b) (6.RP.1) • Represent unit rate associated with ratios using visuals, charts, symbols, real-life situations and rate language. (6.RP.2) • Use ratio and rate reasoning to solve real-world and mathematical problems. (6.RP.3) • Make and interpret tables of equivalent ratios. (6.RP.3) • Plot pairs of values of the quantities being compared on the coordinate plane. (6.RP.3) • Use multiple representations such as tape diagrams, double number line diagrams, or equations to solve rate and ratio problems. (6.RP.3) • Solve unit rate problems (including unit pricing and constant speed). (6.RP.3) • Solve percent problems, including finding a percent of a quantity as a rate per 100 and finding the whole, given the part and the percent. (6.RP.3) • Describe the independent variable as the variable that you are given or the input. (6.EE.9) • Describe the dependent variable as the variable that changes in relationship to the independent variable or the output. (6.EE.9) • Identify the independent and dependent variable in measurement situations. (6.EE.9)

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English Language Learners benefit from:

- Practice with manipulatives (such as fraction-decimal-percent equivalence towers, fraction squares for multiplication and division, etc.) and visuals (such as tape diagrams).
- Explicit vocabulary instruction to connect the content to language.

Academic Vocabulary: **Critical Terms:** Ratio Equivalent Ratio Rate Unit Rate Percent Independent Variable Dependent Variable	**Supplemental Terms:** Tape Diagram Double Number Line Numerator Denominator Conversion Input Output

Quarter 2 **November, December, January**

Unit 3- Rational Numbers **Unit 4- Expressions**

Unit 3- Rational Numbers

Standard(s):

Apply and extend previous understandings of numbers to the system of rational numbers.

6.NS.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. **(Mastered)**

6.NS.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. **(Mastered)**

a) Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.
b) 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.
c) 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.7 Understand ordering and absolute value of rational numbers. **(Mastered)**

a) Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret – 3 > - 7 as a statement that – 3 is located to the right of -7 on a number line oriented from left to right.*
b) Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write -3°C > -7°C to express the fact that -3°C is warmer than - 7°C.*
c) 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. *For example, for an account balance of – 30 dollars, write |-30| = 30 to describe the size of the debt in dollars.*
d) Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than – 30 dollars represents a debt greater than 30 dollars.*

6.NS.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. **(Mastered)**

Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. (Introduced and Supported)

Transfer:

Students will apply concepts and procedures for representing positive and negative numbers in real-world situations and in the coordinate plane.

Understandings: *Students will understand that…*

- Quantities having more or less than zero are described using positive and negative numbers.
- Number lines are visual models used to represent the density principle: between any two whole numbers are many rational numbers, including decimals and fractions.
- The rational numbers can extend to the left or to the right on the number line, with negative numbers going to the left of zero, and positive numbers going to the right of zero.
- The coordinate plane is a tool for modeling real-world and mathematical situations and for solving problems.

Essential Questions:

- How are positive and negative numbers used?
- How do rational numbers relate to integers?
- What is modeled on the coordinate plane?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them.** Students make sense of problems involving points and
* polygons in the coordinate plane.
2. **Reason abstractly and quantitatively.** Students demonstrate abstract reasoning about rational numbers with their visual representations. Students consider the values of these numbers in relation to distance (number lines).
*3. **Construct viable arguments and critique the reasoning of others.** Students construct and critique arguments regarding number line representations and the use of inequalities to represent real-world contexts.
*4. **Model with mathematics.** Students use number lines to compare numbers and represent inequalities in mathematical and real-world contexts.
5. **Use appropriate tools strategically.** Students select and use tools such as two-color counters, number line models and the coordinate plane to represent situations involving positive and negative numbers.
*6. **Attend to precision.** Students attend to the language of real-world situations to determine if positive or negative quantities/distances are being represented.
7. **Look for and make use of structure.** Students relate the structure of number lines to values of rational numbers as they use the coordinate plane.
8. **Look for and express regularity in repeated reasoning.** Students relate new experiences to experiences with similar contexts when studying positive and negative representations of distance and quantity. In the study of absolute value, students demonstrate repeated reasoning by showing that both positive and negative quantities represent the same distance from zero.

Prerequisite Skills/Concepts:	**Advanced Skills/Concepts:**
Students should already be able to:	*Some students may be ready to:*
• Represent positive rational numbers on a number line and compare values of these numbers. • Plot points on the coordinate plane and connect the visual representation to real-life situations, oral/written language, and tables.	• Use coordinates and absolute value to find distances between points where the first coordinate or the second coordinate are not the same. • Create transformations, such as translations, rotations and reflections based on coordinate shifts.

Knowledge: *Students will know…*	**Skills**: *Students will be able to …*
All standards for this unit go beyond the knowledge level.	• Identify an integer and its opposite and the directions they represent in real-world contexts. (6.NS.5) • Use integers to represent quantities in real-world situations (above/ below sea level) (6.NS.5) • Understand the meaning of 0 and where it fits into a situation(6.NS.5) • Represent and explain the value of a rational number as a point on a number line (6.NS.6) • Recognize that a number line can be both vertical and horizontal (6.NS.6) • Represent a number and its opposite equidistant from zero on a number line. (6.NS.6) • Identify that the opposite of the opposite of the number is itself. (6.NS.6) • Incorporate opposites on the number line or plot opposite points on a coordinate grid where x and y intersect at zero. (6.NS.6) • Represent signs of numbers in ordered pairs as locations in quadrants on the coordinate plane and explain the relationship between the location and the signs. (6.NS.6) • Represent and explain reflections of ordered pairs on a coordinate plane (6.NS.6) • Locate and position integers and other rational numbers on horizontal or vertical number lines (6.NS.6) • Locate and position integers and other rational numbers on a coordinate plane. (6.NS.6) • Identify the absolute value of a number as the distance from zero (6.NS.7) • Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. (6.NS.7) • Use inequalities to order integers relative to their position on the number line(6.NS.7) • Write statements of order for rational numbers in real-world contexts. (6.NS.7) • Interpret statements of order for rational numbers in real-world contexts. (6.NS.7) • Explain statements of order for rational numbers in real-world contexts. (6.NS.7) • Represent the absolute value of a rational number as the distance from zero and recognize the symbol $\lvert x \rvert$. (6.NS.7) • Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. (6.NS.7) • Distinguish comparisons of absolute value from statements about order. (Compare rational numbers using absolute value in real-world situations. For negative numbers, as the absolute values increases, the value of the number decreases.) (6.NS.7)

	• Solve real-world problems by graphing points in all four quadrants of the coordinate plane (6.NS.8) • Use coordinates to find distances between points with the same first coordinate or the same second coordinate. (6.NS.8) • Use absolute value to find distances between points with the same first coordinate or the same second coordinate. (6.NS.8) • Draw polygons in the coordinate plane given the coordinates for the vertices (6.G.3) • Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. (6.G.3) • Solve real-world and mathematical problems involving polygons in the coordinate plane. (6.G.3)

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

- The use of visuals to describe the contexts of positive and negative number situations.
- Awareness that the number line going from smaller numbers on the left to a larger number to the right is similar to reading from left to right. Students whose languages read in different directions may need more explicit practice to master this work using the number line.

Academic Vocabulary	
Critical Terms:	**Supplemental Terms:**
Integers	Coordinate
Rational numbers	Ordered pairs
Quadrants	Input
Line diagrams	Output
Absolute value	x-coordinate
Positive	y-coordinate
Negative	x-axis
Opposite	y-axis
	Origin
	Distance

Unit 4- Expressions

Standard(s):

Apply previous understandings of arithmetic to algebraic expressions

6.EE.1 Write and evaluate numerical expressions involving whole-number exponents. **(Mastered)**

6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers. **(Mastered)**

a) Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*
b) 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 entry. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both as single entity and a sum of two terms.*
c) 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). *For example, use the formulas $V = S^3$ and $A = 6^2$ to find the volume and surface area of a cube with sides of lengths s = 1/2.*

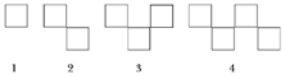
6.EE.3 Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* **(Mastered)**

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). *For example, the expressions y + y + y and 3y are equivalent because the name the same number regardless of which number y stands for.* **(Mastered)**

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. *For example, express 36 + 8 as 4 (9 + 2).***Compare fluently with multi-digit numbers and find common factors and multiples.** **(Additional)**

Transfer:

Students will apply concepts and procedures regarding expressions to represent and interpret real-world and mathematical relationships. Students will gather data from real-life and mathematical situations, identify a variable and develop a general expression to represent relationships in the data.

Ex. Given the situation: How many vertices (corners) are there in 1, 2, 3, 4, 5, 6...n squares when they are arranged in the following way?  One student may come up with the expression $3n + 1$, another student may come up with an expression $4 + 3(n - 1)$. Students will recognize that these expressions are equivalent if the distributive property is applied.

Understandings: *Students will understand that …*

- Properties of operations are used to determine if expressions are equivalent.
- There is a designated sequence to perform operations (Order of Operations).
- Variables can be used as unique unknown values or as quantities that vary.
- Algebraic expressions may be used to represent and generalize mathematical problems and real life situations.

Essential Questions:

- What is equivalence?
- How properties of operations used to prove equivalence?
- How are variables defined and used?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them.** Students make sense of expressions by connecting them to real world contexts when evaluating.
* 2. **Reason abstractly and quantitatively.** Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. **Construct viable arguments and critique the reasoning of others.** Students construct and critique arguments regarding the equivalence of expressions and the use of variable expressions to represent real-world situations.
* 4. **Model with mathematics.** Students form expressions, equations, or inequalities from real world contexts and connect symbolic and graphical representations.
5. **Use appropriate tools strategically.** Students determine which algebraic representations are appropriate for given contexts.
6. **Attend to precision.** Students use the language of real-world situations to create appropriate expressions.
* 7. **Look for and make use of structure.** Students apply properties to generate equivalent expressions. They interpret the structure of an expression in terms of a context.
8. **Look for and express regularity in repeated reasoning.** Students can work with expressions involving variables without the focus on a specific number or numbers that the variable may represent, instead they can focus on the patterns that occur. It is these patterns that lead to generalizations that lay the foundation for their future work in algebra.

Prerequisite Skills/Concepts:	**Advanced Skills/Concepts:**
Students should already be able to: • Define a variable. • Identify and differentiate between common factors and common multiples of 2 whole numbers.	*Some students may be ready to:* • Understand that the properties of operations hold for integers, rational, and real numbers. • Use the properties of operations to rewrite equivalent numerical expressions using non-negative rational numbers. • Use variables to represent real-world situations and use the properties of operations to generate equivalent expressions for these situations. • Experience expressions for amounts of increase and decrease. • Use substitution to understand that expressions are equivalent. • Solve complex problems involving expressions.

Knowledge: Students will know…	**Skills: Students will be able to …**
• **Exponential notation is a way to express repeated products of the same number.**	• **Write numerical expressions that have whole number exponents. (6.EE.1)** • **Evaluate numerical expressions that have whole number exponents and rational bases.(6.EE.1)** • **Write algebraic expressions to represent real life and mathematical situations. (6.EE.2)** • **Identify parts of an expression using appropriate terminology. (6.EE.2)** • **Given the value of a variable, students will evaluate the expression. (6.EE.2)** • **Use order of operations to evaluate expressions. (6.EE.2)** • **Apply properties of operations to write equivalent expressions. (6.EE.3)** • **Identify when two expressions are equivalent. (6.EE.4)** • **Prove (using various strategies) that two equations are equivalent no matter what number is substituted. (6.EE.4)** • **Identify the factors of any whole number less than or equal to 100. (6.NS.4)** • **Determine the Greatest Common Factor of two or more whole numbers less than or equal to 100. (6.NS.4)** • **Identify the multiples of two whole numbers less than or equal to 12 and determine the Least Common Multiple. (6.NS.4)** • **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.NS.4)**

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas, and concepts necessary for academic success in the content area of Mathematics.

ELLs will benefit from:

- Explicit instruction in the transfer between verbal descriptions and algebraic expressions.
- Explicit examples of mathematical terms: sum, term, product, factor, quotient, coefficient, etc.
- Manipulatives (such as algeblocks, algebra tiles or hands-on-equations) to model strategies for evaluating expressions.

Academic Vocabulary:	
Critical Terms: Equivalent coefficient exponents power equation expression variables order of operations numerical expression algebraic expression base term distributive property substitute evaluate	**Supplemental Terms:** dividend divisor equation factor multiplier product quotient sum associative property commutative property identity property superscripted numbers prime factorization greatest common factor (GCF) least common multiple (LCM)

Quarter 3 **February, March, April**

Unit 5- Equations and Inequalities **Unit 6- Geometry**

Standard(s):

Reason about and solve one-variable equations and inequalities.

6.EE.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 and explain substitution in order to determine whether a given number in a specified set makes an equation or inequality true. **(Mastered)**

6.EE.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. **(Mastered)**

6.EE.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. **(Mastered)**

6.EE.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. **(Mastered)**

6.EE.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. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.* **(Mastered)**

Transfer:

Students will apply concepts and procedures for writing, interpreting and solving one-variable equations and inequalities that represent real-live and mathematical situations.

Understandings: *Students will understand that …*

- Solving equations is a reasoning process and follows established procedures based on properties.
- Substitution is used to determine whether a given number in a set makes an equation or inequality true.
- Variables may be used to represent a specific number, or, in some situations, to represent all numbers in a specified set.
- When one expression has a different value than a related expression, an inequality provides a way to show that relationship between the expressions: the value of one expression is greater than (or greater than or equal to) the value of the other expression instead of being equal.
- Inequalities may have infinite solutions and there are methods for determining if an inequality has infinite solutions using graphs and equations
- Solutions of inequalities can be represented on a number line.
- Graphs and equations represent relationships between variables.

Essential Questions:

- How does the structure of equations help us solve equations?
- How does the substitution process help in solving problems?
- Why are variables used in equations? – What might a variable represent in a given situation?
- How are equalities represented and solved?
- How can algebraic expressions and equations be used to model, analyze and solve real world and math situations?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

*
1. **Make sense of problems and persevere in solving them.** Students choose the appropriate algebraic representations for given contexts and can create contexts given equations or inequalities.
2. **Reason abstractly and quantitatively.** Students represent a wide variety of real world contexts through the use of real numbers and variables in mathematical expressions, equations, and inequalities. Students contextualize to understand the meaning of the number or variable as related to the problem and decontextualize to manipulate symbolic representations by applying properties of operations.
3. **Construct viable arguments and critique the reasoning of others.** Students construct arguments using verbal or written explanations accompanied by expressions, equations, inequalities, models, graphs, and tables.

* 4. **Model with mathematics.** Students model problem situations in symbolic, graphic, tabular, and contextual formats. Students form expressions, equations, or inequalities from real world contexts and connect symbolic and visual representations.

5. **Use appropriate tools strategically.**
6. **Attend to precision.** Students precisely define variables.

* 7. **Look for and make use of structure.** Students seek patterns or structures to model and solve problems using tables, equations and inequalities. Students apply properties to generate equivalent expressions (i.e. $6 + 2x = 2\ (3 + x)$ by distributive property) and solve equations (i.e. $2c + 3 = 15$, $2c = 12$ by subtraction property of equality, $c = 6$ by division property of equality).

8. **Look for and express regularity in repeated reasoning.** Students generalize effective processes for representing and solving equations and inequalities based upon experiences.

Prerequisite Skills/Concepts:	**Advanced Skills/Concepts:**
Students should already be able to: • Use variables in expressions and equations. • Add, subtract, multiply and divide whole numbers, decimals and fractions.	*Some students may be ready to:* • Use properties of operations to create equivalent numerical expressions. • Solve multi-step problems using rational numbers with expressions, equations and inequalities. • Compare word problems and develop solution strategies by comparing the variable and number relationships in the situations. • Recognize that multiplying or dividing an inequality by a negative number reverses the order of the comparison, hence the changes in what is positive or negative. • Find relationships between two quantities and the equation as related to work with functions.

Knowledge: Students will know…	Skills: Students will be able to …
All standards in this unit go beyond the knowledge level.	• **Recognize that solving an equation or inequality is a process of answering a question: which values from a specified set, if any, make the equation or inequality true? (6.EE.5)** • **Determine whether a given number in a specified set makes an equation or inequality true with substitution. (6.EE.5)** • **Write variable expressions when solving a mathematical problem or real-world problem, recognizing that a variable can represent an unknown number or any number in a specified set (6.EE.6)** • **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.7)** • **Write an inequality of the form x > c or x < c to represent a constraint or condition in a mathematical problem or a real-world problem. (6.EE.8)** • **Recognize that inequalities of the form x > c or x < c have infinitely many solutions. (6.EE.8)** • **Represent solutions of inequalities on number line diagrams. (6.EE.8)** • **Define independent and dependent variables. (6.EE.9)** • **Use variables to represent two quantities in a real-world problem that change in relationship to one another. (6.EE.9)** • **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. (6.EE.9)** • **Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. (6.EE.9)**

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

- manipulatives to aid in representing and solving equations and inequalities (such as algebra tiles, algeblocks or hands-on-equations).
- number line representations when representing and solving equations and inequalities.
- strategies for articulating the identity of variables when used in expressions, equations and inequalities that represent real-world situations.

Academic Vocabulary:

Critical Terms:	**Supplemental Terms:**
Infinite Inequalities Equations Variables Analyze Substitution Independent Dependent	Expression Number line diagram Greater than >\ Less than <

Unit 6 Geometry

Standard(s):

Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.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. (Introduced and Supported)

6.G.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. (Introduced and Supported)

6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles. Use the nets to find surface areas of these figures. Apply these techniques in the context of solving real-world and mathematical problems. (Introduced and Supported)

Supporting Standard(s):

Apply and extend previous understandings of multiplication and division to divide fractions by fractions

- 6.NS.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. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with a length of 3/4 mi and an area 1/2 square mi?* **(Mastered)**

Compare fluently with multi-digit numbers and find common factors and multiples.

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

Transfer:

Students will apply concepts and procedures for interpreting, representing, and solving real-world and mathematical problems involving area, surface area, and volume.

For examples, students are redesigning a movie popcorn box. The students need to calculate the amount of ink that they will need to print the box so they need to calculate the surface area. Then the students have to figure out how much popcorn the box will hold given the number of pieces in the volume of 1 cubic inch of popcorn.

Understandings: *Students will understand that …*

- Geometry and spatial sense offer ways to envision, to interpret, and to reflect on the world around us.
- Area, volume, and surface area are measurements that relate to each other and apply to objects and events in our real-life experiences.
- Properties of 2-dimensional shapes are used in solving problems involving 3-dimensional shapes.

- The value of numbers and application of properties are used to solve problems about our world.

Essential Questions:

- How does what we measure influence how we measure?
- How can space be defined through numbers and measurement?
- How does investigating figures help us build our understanding of mathematics?
- What is the relationship between 2-dimensional shapes, 3-dimensional shapes, and our world?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. **Make sense of problems and persevere in solving them**. Given a three dimensional figure, a student will solve for the surface area using the formula or the net with fractional edges and be able to use resources independently.
2. **Reason abstractly and quantitatively.** Students will use their understanding of the value of fractions in solving with area. Students will be able to see and justify the reasoning for decomposing and composing an irregular polygon/nets using area of triangles and quadrilaterals to solve for surface area. Students will use the relationships between two-dimensional and three-dimensional shapes to understand surface area.
3. **Construct viable arguments and critique the reasoning of others**. Students will be able to review solutions to justify (verbally and written) why the solutions are reasonable.
4. **Model with mathematics**. Use hands on/virtual manipulatives (prisms, pyramids, and folding nets) using every day two-dimensional and three-dimensional shapes.
5. **Use appropriate tools strategically**. Students will use a ruler, graph paper two-dimensional and three-dimensional shapes to solve for area, volume and surface area. In addition, students will determine appropriate formulas to use for given situations.
6. **Attend to precision**. Students will use appropriate measurement units (square units vs. cubic units) and correct terminology to justify reasonable solutions.
7. **Look for and make use of structure.** Students will understand the relationship between the structure of a three-dimensional shape and its volume formula. Students will also decompose two-dimensional figures to find areas.
8. **Look for and express regularity in repeated reasoning.** Students will explain why formula or process is used to solve given problems. Students use properties of figures and properties of operations to connect formulas to surface area and volume.

Prerequisite Skills/Concepts:	**Advanced Skills/Concepts:**
Students should already be able to:	*Some students may be ready to:*
• Geometric Measurement: Understand concepts of volume and relate volume to multiplication and to addition. • Perform operations with multi-digit whole numbers and with decimals to hundredths. • Solve problems involving multiplication of fractions and mixed numbers.	• Derive formulas for volume of pyramids and non-rectangular prisms.

Knowledge: *Students will know…*	**Skills**: *Students will be able to …*
• Formula for volume of a right rectangular prism. • Procedures for finding surface area of pyramids and prisms.	• Given irregular figures, students will be able to divide the shape into triangles and rectangles (6.G.1) • Given a polygon, students will find the area using the decomposing shapes. (6.G.1) • Given a polygon students will calculate the area by decomposing it into composite figures (triangles and rectangles). (6.G.1) • 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. This shows that the volume is the same as would be found by multiplying the edge lengths of the prism. (6.G.2) • Calculate the volume of a right rectangular prism. (6.G.2) • Apply the formula to solve real world mathematical problems involving volume with fractional edge lengths. (6.G.2) • Represent 3D figures using nets of triangles and rectangles. (6.G.4) • Solve real world problems involving surface areas using nets. (6.G.4)

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners will benefit from:

- The use of manipulatives and visuals when decomposing 3-dimensional figures into nets.
- Using unit cubes to study the volume of prisms.
- Explicit vocabulary instruction for the types, components, and measurement units of geometric figures.

Academic Vocabulary:	
Critical Terms: Net Surface Area	**Supplemental Terms:** Polygon Quadrilateral Rectangle Triangle Trapezoid Area Base Height Volume Rectangular Prism Decomposing Vertex Face Edge Rhombus Right angle Kites

Quarter 4 **May, June**

Unit 7- Statistics **Unit 8 - Review**

Standard(s):

Develop understanding of statistical variability

6.SP.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.* (Additional)

6.SP.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. (Additional)

6.SP.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. (Additional)

Summarize and describe distributions

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

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

a) Reporting the number of observations.
b) Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
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.
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.

Supporting Standards

Understand ratio concepts and use ratio reasoning to solve problems

6.RP.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. **(Mastered)**

b) Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*

Transfer:

Students will apply concepts and procedures for representing and interpreting data distributions.

For example, students develop a statistical question about a population, such as "How many text messages did you send over the school year?" The students would develop a plan for collecting data. The students would then present their findings in a presentation with at least 2 different displays one of which has to be a box plot. In their presentation the students will explain the shape of the data and describe any overall pattern or striking deviations (outliers) from the

overall pattern, compare mean and median as the measure of center – Which is better? Does it matter? And Analyze variation using interquartile range (IQR) and mean absolute deviation (MAD).

Understandings: *Students will understand that …*

- Statistical questions and the answers account for variability in the data.
- The distribution of a data set is described by its center, spread, and overall shape.
- Measures of center for a numerical set of data are summaries of the values using a single number.
- Measures of variability describe the variation of the values in the data set using a single number.

Essential Questions:

- How do we analyze and interpret data sets?
- When is one data display better than another? How do mathematicians choose to display data in strategic ways?
- When is one statistical measure better than another?
- What makes a good statistical question?

Mathematical Practices: (Practices to be explicitly emphasized are indicated with an *.)

1. * **Make sense of problems and persevere in solving them.** Students will make sense of the data distributions by interpreting the measures of center and variability in the context of the situations they represent.
2. **Reason abstractly and quantitatively.** Students reason about the appropriate measures of center or variability to represent a data distribution.
3. **Construct viable arguments and critique the reasoning of others.** Students construct arguments regarding which measures of center or variability they would use to represent a particular data distribution. They may critique other students' choices when considering how outliers are handled in each situation.
4. * **Model with mathematics.** Students begin to explore covariance and represent two quantities simultaneously. They use measures of center and variability and data displays (i.e. box plots and histograms) to draw inferences about and make comparisons between data sets. Students need many opportunities to connect and explain the connections between the different representations. Students collect data regarding real-world contexts and create models to display and interpret the data.
5. * **Use appropriate tools strategically.** Students consider available tools (including estimation and technology) when answering questions about data or representing data distributions. They decide when certain tools might be helpful. For instance, students in grade 6 may decide to represent similar data sets using dot plots with the same scale to visually compare the center and variability of the data.
6. **Attend to precision.** Students use appropriate terminology when referring data displays and statistical measures.
7. **Look for and make use of structure.** Students examine the structure of data representations by examining intervals, units, and scale in box plots, line plots, histograms and dot plots.
8. **Look for and express regularity in repeated reasoning.** Students recognize typical situations in which outliers skew data. They can explain patterns in the way data is interpreted in the various representations they study throughout this unit.

Prerequisite Skills/Concepts: *Students should already be able to:* View statistical reasoning as a four-step investigative process: 1) Formulate questions that can be answered with data. 2) Design and use a plan to collect relevant data. 3) Analyze the data with appropriate methods. 4) Interpret results and draw valid conclusions from the data that relate to the questions posed.	**Advanced Skills/Concepts:** *Some students may be ready to:* • Examine and compare measures of center and variability for random samples.
Knowledge: *Students will know…* • Median and mean are measures of center. • Interquartile range and mean absolute deviation are measures of variability. • The distribution is the arrangement of the values in a data set.	**Skills**: *Students will be able to …* • Identify statistical questions. (6.SP.1) • Determine if questions anticipate variability in the data related to the question and account for it in the answers. (6.SP.1) • Represent a set of data collected to answer a statistical question and describe it by its center, spread, and overall shape. (6.SP.2) • Represent and explain the difference between measures of center and measures of variability. (6.SP.3) • Display numerical data in plots on a number line. (6.SP.4) • Display numerical data in dot plots. (6.SP.4). • Display numerical data in histograms. (6.SP.4) • Display numerical data in box plots. (6.SP.4) • Use language to summarize numerical data sets in relation to their context. (6.SP.5) • Report the number of observations. (6.SP.5) • Describe the nature of the attribute under investigation. (6.SP.5) • Give quantitative measures of center and variability 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.5) • Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. (6.SP.5)

WIDA Standard: (English Language Learners)

English language learners communicate information, ideas and concepts necessary for academic success in the content area of Mathematics.

English language learners benefit from:

- explicit instruction with regard to the components of visual and symbolic data representations.
- explicit vocabulary instruction and attention to units represented in data distributions.
- hands-on activities to experience data collection (such as coin flips, spinners, dice rolls, etc.).

Academic Vocabulary:

Critical Terms:	**Supplemental Terms:**
Measure of Variation Number line Dot plot Histogram Box plot Data Sets Mode Median Mean Outliers Measures of center Variability Spread Data Interquartile range Distribution Skew	Mean absolute deviation Cluster Peak Gap Frequency table Symmetrical Upper/lower quartile