Integrated Mathematics 6

UNIT 1- Expressions and Equations: Area, Algebraic Expressions, and Exponents

ESSENTIAL QUESTION	BIG IDEAS
How can geometric figures and real world scenarios be represented with algebraic expressions?	Students develop methods to determine the area of polygons. Students visualize, fold and construct nets made up of rectangles and triangles to determine surface area. Students write and evaluate expressions using variables to represent unknown quantities. Students find the GCF and LCM of whole numbers.

GUIDING QUESTIONS

Content and Process

- How does decomposing and rearranging polygons with partial squares help to find the area of polygons? **6.G.1**
- How do rectangles and triangles represent 3D figures? **6.G.4**
- How are 3D figures decomposed to help find surface area? **6.G.4**
- How are numbers, letters and operations used to write expressions? **6.EE.2, 6.EE.2a**
- What are the parts of an expression? **6.EE.2b**
- How is the conventional Order of Operations used to evaluate expressions? **6.EE.2c**
- How are expressions with exponents written and evaluated? **6.EE.1**
- How are expressions used to represent real world problems? **6.EE.5**
- How is the LCM or GCF of two numbers found? **6.NS.4**

Reflective

- How can creating nets help you find the surface area of 3D figures?
- How can you tell if a net will work to make a solid?
- How did writing and evaluating expressions help you make sense of real world scenarios?
- What method is most effective for you in determining the GCF and LCM of two numbers?

FOCUS STANDARDS

Standards of Mathematical Practice
MP.6 Attend to precision.
MP.7 Look for and make use of structure.

Content Standards
6.G.1 Find the area of all triangles, special quadrilaterals (including parallelograms, kites and trapezoids), and polygons whose edges meet at right angles (rectilinear figure (See Geometry Progression K-6 Pg. 19

Paragraph 4) 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.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

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

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

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

6.EE.5 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.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*

$18 + 48$ *as* $6(3 + 8)$.

Integrated Mathematics 6

UNIT 2- Decimals and Fractions: Base-Ten Operations, Division with Fractions, and Volume

ESSENTIAL QUESTION	BIG IDEAS
How can models and	Students use efficient algorithms to compute fluently with multi-digit decimals and divide multi-digit whole numbers.

algorithms help us solve real world problems involving fractions and decimals?	Students use number sense to interpret quotients of fractions. Students use models to divide fractions. Students explore and develop methods to calculate the volume of prisms.

GUIDING QUESTIONS

Content and Process

- How does finding the area of the base help determine the volume in a 3D shape? **6.G.2**
- How does a fractional edge impact calculating the volume of a solid? **6.G.2**
- How is an algorithm used to divide multi-digit numbers? **6.NS.2**
- How is an algorithm used to compute with multi-digit decimals? **6.NS.3**
- How does dividing by a fraction affect the quotient? **6.NS.1**
- How are models used to represent finding the quotient of fractions? **6.NS.1**

Reflective

- How would you explain finding the volume of a solid to a friend?
- What strategy do you use to compute with multi-digit decimals?
- How would you explain dividing fractions using a model?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.4 Model with Mathematics.

MP.8 Look for and express regularity in repeated reasoning.

Content Standards

6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by applying the formulas $V = lwh$ and $V = Bh$ (B is the area of the base and h is the height) to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. (Builds on the 5th grade concept of packing unit cubes to find the volume of a rectangular prism with whole number edge lengths.)

6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, requiring multiple exposures connecting various concrete and abstract models.

6.NS.2 Fluently (efficiently, accurately, and flexibly) divide multi-digit numbers using an efficient algorithm.

6.NS.3 Fluently (efficiently, accurately, and flexibly) add, subtract, multiply, and divide multi-digit decimals using an efficient algorithm for each operation.

Integrated Mathematics 6

UNIT 3- Ratio Reasoning: Ratio Concepts and Equivalent Ratios

ESSENTIAL QUESTION	BIG IDEAS
How can ratios help us make sense of the world around us?	Students use ratio language to describe a relationship between two quantities. Students use a variety of strategies to represent and reason about ratio relationships and to solve problems.

GUIDING QUESTIONS

Content and Process

- How can ratios be used to represent a relationship between two quantities? **6.RP.1**
- How does thinking about part-to part and part-to whole relationships help solve ratio problems? **6.RP.1**
- How are tables, graphs, and other strategies used to compare ratios and find missing values? **6.RP.3a**

Reflective

- Where do you see ratios outside the classroom?
- How do you find missing values when comparing ratios?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.2 Reason abstractly and quantitatively.
MP.7 Look for and make use of structure.

Content Standards

6.RP.1. Use ratio language to describe a relationship between two quantities. Distinguish between part-to-part and part-to-whole relationships. *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."*

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 diagram, or using calculations.)*

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

Integrated Mathematics 6

UNIT 4- Ratio Reasoning: Unit Rates and Percent

ESSENTIAL QUESTION	BIG IDEAS
How can rates and percentages help us make sense of the world around us?	Students find unit rates and use them to solve real-world problems. Students use rates to find percentages and convert between units.

GUIDING QUESTIONS

Content and Process

- How is language related to ratio and rate used to understand unit rate? **6.RP.2**
- How can a unit rate be found and used to compute equivalent ratios? **6.RP.3a**
- How is a percent expressed as a ratio? **6.RP.3b**
- How is a rate per 100 used to find the percent of a quantity? **6.RP.3b**
- How can converting units help us compare rates? **6.RP.3c**

Reflective

- What problems in the real world could be solved by finding a unit rate?
- How could you explain to a friend how to convert between units using unit rate?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.1 Make sense and persevere in solving problems.
MP.6 Attend to precision.

Content Standards

6.RP.2 Use unit rate language ("for each one", "for every one" and "per") and unit rate notation to demonstrate understanding the concept of a unit rate

$\frac{a}{b}$ associated with a ratio $a: b \; with \; b \neq 0$,*For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is* $\frac{3}{4}$ *cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Expectations for unit rates in this grade are limited to non-complex fractions.)

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 diagram, or using calculations.)*

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

- **6.RP.3b** Find a percent of a quantity as a rate per 100 *(e.g. 30% of a quantity means* $\frac{30}{100}$ *times the quantity)*; solve problems involving finding the whole, given a part and the percent.
- **6.RP.3c** Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

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UNIT 5- Algebraic Thinking: Equivalent Expressions and Equations with Variables

ESSENTIAL QUESTION	BIG IDEAS
How can situations be expressed with symbols?	Students use the distributive property to express sums of whole numbers. Students generate equivalent expressions. Students write and solve equations with variables. Students will explore relationships between variables.

GUIDING QUESTIONS

Content and Process

- How can the distributive property be used to create equivalent expressions? **6.NS.4**
- How are properties of operations used to simplify expressions? **6.EE.3**
- How does substitution prove an equation to be true? **6.EE.4**
- How are operations used to solve equations? **6.EE.6**
- How are variables identified in real-world problems? **6.EE.8a**
- How are equations used to explain the relationship between two variables? **6.EE.8b**
- How is an equation represented using tables and graphs? **6.EE.8c, 6.RP.8a**
- What makes a variable independent or dependent? **6.RP.8a**

Reflective

- How can you express sums using the distributive property?
- How do symbols help you communicate mathematical ideas?
- How do you know the relationship between variables is the same in your equation, table and graph?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.1 Make sense and persevere in solving problems.

MP.7 Look for and make use of structure.

Content Standards

6.NS.4. ~~Find the greatest common factor of two whole numbers less than or equal to 100 and the least comm 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* $18 + 48$ *as* $6(3 + 8)$.

6.EE.3. Apply the properties of operations and combine like terms, with the conventions of algebraic notation to identify and generate equivalent expressions. *For example, apply the distributive property to the expressio* $3(2 + x)$ *to produce the equivalent expression* $6 + 3x$*; apply properties of operations to* $y + y + y$ *to produce the equivalent expression 3y.*

6.EE.4. Understand solving an equation ~~or inequality~~ as a process of answering a question: which values from 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.6. Write and solve one-step equations involving non-negative rational numbers using addition, subtractic multiplication and division.

6.EE.8. Use variables to represent two quantities in a real-world problem that change in relationship to one another.

- **6.EE.8a.** Identify the independent and dependent variable.
- **6.EE.8b.** 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. *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.*
- **6.EE.8c.** Analyze the relationship between the dependent and independent variables using graphs an tables, and relate these to the equation.

Integrated Mathematics 6

UNIT 6- Positive and Negative Numbers: Absolute Value Inequalities, and the Coordinate Plane

ESSENTIAL QUESTION	BIG IDEAS
How are rational numbers used to represent real world	Students will write, solve, and visually represent inequalities on a number line Students understand the meaning of positive and negative numbers and can compare them. Students understand absolute value.

situations?	Students develop an understanding of how plotting on the coordinate plane helps to find distance.

GUIDING QUESTIONS

Content and Process

- How do positive and negative values describe real world situations? **6.NS.5a**
- What is the meaning of zero in situations that have opposite values? **6.NS.5b**
- How does the sign of a number affect its placement on a number line? **6.NS.6a**
- How does reflecting a point across an axis change values in an ordered pair? **6.NS.6b, 6.NS.6c**
- How does substitution prove an inequality to be true? **6.EE.4**
- How are inequalities used to compare rational numbers? **6.NS.7a, 6.NS.7b**
- How are the solutions of inequalities represented on a number line? **6.EE.7**
- How does absolute value explain positive and negative quantities in the real world? **6.NS.7c, 6.NS.7d**
- How are points graphed on a coordinate plane? **6.NS.8**
- How is absolute value used to calculate distances between points with the same first or second coordinate? **6.NS.8**
- How can coordinate points be used to find edge lengths of polygons? **6.G.3**

Reflective

- What do you know about a negative value?
- How does a number line help you compare and order values?
- How would you explain the opposite of a number to a peer?
- How would you convince a friend that distance is always positive?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.2 Reason abstractly and quantitatively.
MP.5 Use appropriate tools strategically.

Content Standards

6.EE.4 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.NS.5 Understand positive and negative numbers 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).*

- **6.NS.5a** Use positive and negative numbers to represent quantities in real-world contexts.
- **6.NS.5b** Explaining the meaning of 0 in each situation.

6.NS.6 Understand a rational number as a point on the number line and a coordinate pair as a location on a coordinate plane.

- **6.NS.6a** 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.
- **6.NS.6b** Recognize signs of numbers in ordered pairs indicate 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.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.7 Understand ordering and absolute value of rational numbers.

- **6.NS.7a** 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.*
- **6.NS.7b** 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* $-7°C$*.*
- **6.NS.7c** Explain 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.*
- **6.NS.7d** 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.

6.EE.7 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.G.3 Draw polygons whose edges meet at right angles (rectilinear figure 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.

Integrated Mathematics 6

UNIT 7- Statistical Thinking: Data Distributions and Measures of Center and Variability

ESSENTIAL QUESTION	BIG IDEAS
How can measures of center, variability and shape be used to analyze data?	Students generate questions that anticipate variability. Students use appropriate measures to analyze data. Students display data visually.

GUIDING QUESTIONS

Content and Process

- What makes a question statistical? **6.SP.1**
- How are measures of center and spread of data identified? **6.SP.2**
- How can individual numbers be used to summarize the center of data and also its variance? **6.SP.3**
- How are dot plots, stem and leaf plots, box plots, and histograms created from data? **6.SP.4**
- How can data be summarized in reference to the context? **6.SP.5a, 6.SP.5b, 6.SP.5c**
- How does the shape of a data set determine the appropriate measure of center? **6.SP.5d**

Reflective

- How would you define “average”?
- How do you determine when to use the appropriate measure of center?
- What does the shape and spread of data tell you?
- How do visuals help you summarize data?

FOCUS STANDARDS

Standards of Mathematical Practice

MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.

Content Standards

6.SP.1 Recognize and generate 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.2 Analyze a set of data collected to answer a statistical question with a distribution which can be described by its center (mean, median and/or mode), spread (range and/or interquartile range), and overall shape (cluster, peak, gap, symmetry, skew (data) and/or outlier).

6.SP.3 Recognize that a measure of center (mean, median and/or mode) for a numerical data set summarizes all of its values with a single number, while a measure of variation (range and/or interquartile range) describes how its values vary with a single number.

6.SP.4 Display numerical data on dot plots, histograms, stem-and-leaf plots, and box plots.

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

- **6.SP.5a** Reporting the number of observations.
- **6.SP.5b** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
- **6.SP.5c** Giving quantitative measures of center (mean, median and/or mode) and variability (range and/or interquartile range), 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.5d.** Relating the choice of measures of center and variability to the distribution of the data.