North Gibson School Corporation

Grade 6 Mathematics
SY 2022/2023

Grade 6 Mathematics

Units of Study

Unit 1:	Ratios and Rates	24 days	1st semester
Unit 2:	Fractions, Decimals, and Percents	18 days	1st semester
Unit 3:	Compute with Multi-Digit Numbers and Fractions	24 days	1st semester
Unit 4:	Integers, Rational Numbers, and the Coordinate Plane	17 days	1st semester
Unit 5:	Numerical and Algebraic Expressions	20 days	2nd semester
Unit 6:	Equations and Inequalities	18 days	2nd semester
Units 8 & 9:	Area, Volume, and Surface Area	22 days	2nd semester
Unit 10:	Statistical Measures and Displays	14 days	2nd semester

Appendices

Appendix A: Proficiency Scale Template

Appendix B: Curriculum Refinement Form

Appendix C: North Gibson Priority Standards Vertical Articulation Document

Grade 6 Priority Standards

Priority Standards	**6.AF.1**	Evaluate expressions for specific values of their variables, including expressions with whole-number exponents and those that arise from formulas used in geometry and other real-world problems.
	6.AF.3	Define and use multiple variables when writing expressions to represent real-world and other mathematical problems, and evaluate them for given values.
	6.AF.5	Solve equations of the form x + p = q, x – p = q, px = q, and x/p = q fluently for cases in which p, q and x are all nonnegative rational numbers. Represent real world problems using equations of these forms and solve such problems.
	6.AF.8	Solve real-world and other mathematical problems by graphing points with rational number coordinates on a coordinate plane. Include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
	6.C.1	Divide multi-digit whole numbers fluently using a standard algorithmic approach.
	6.C.2	Compute with positive fractions and positive decimals fluently using a standard algorithmic approach.
	6.C.6	Apply the order of operations and properties of operations (identity, inverse, commutative properties of addition and multiplication, associative properties of addition and multiplication, and distributive property) to evaluate numerical expressions with nonnegative rational numbers, including those using grouping symbols, such as parentheses, and involving whole number exponents.
	6.DS.4	Summarize numerical data sets in relation to their context in multiple ways, such as: report the number of observations; describe the nature of the attribute under investigation, including how it was measured and its units of measurement; determine quantitative measures of center (mean and/or median) and spread (range and interquartile range); describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; relate the choice of measures of center and spread to the shape of the data distribution and the context in which the data were gathered
	6.GM.4	Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems.
	6.NS.1	Understand that positive and negative numbers are used 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 and compare quantities in real-world contexts, explaining the meaning of 0 in each situation.
	6.NS.10	Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
	6.NS.3	Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
	6.NS.5	Know commonly used fractions (halves, thirds, fourths, fifths, eighths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.

Standards Breakdown

★: Priority Standards ●: Supporting Standards —: Additional Standards

STANDARDS

		1	2	3	4	5	6	8/9	10
Number Sense	1				★				
	2				●				
	3				★				
	4				●				
	5		★						
	6					—			
	7					—			
	8	●							
	9	—							
	10	★	★						
Computation	1			★					
	2			★					
	3			●					
	4			●					
	5					●			
	6					★			
Algebra and Functions	1					★			
	2					●			
	3					★			
	4						●		
	5						★		
	6						●		
	7				●				
	8				★				
	9	●							
	10	●							
Geometry	1	—							
	2							●	
	3							●	
	4							★	
	5							●	
	6							●	
Data Analysis and Statistics	1								●
	2								●
	3								●
	4								★

Unit 1: Ratios and Rates (24 days, 1st semester)

General Description of the Unit

In this unit, students will be introduced to ratios and unit rates. Students will use tables of equivalent ratios, tape diagrams, double number lines, and equations. They will work to interpret and model ratios by comparing relative sizes of quantities. They will create tables of equivalent ratios and will use those tables to discover missing values and plot values on the coordinate plane.

Note that supplemental resources are required for 6.AF.10; Module 7 (Relationships between Two Variables) could be used from the second student workbook. Converting between measurement systems also need supplementation.

Priority Standards

- **6.NS.10:** Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).

Supporting Standards

- **6.AF.10:** Use variables to represent two quantities in a proportional relationship in a real-world problem; write an equation to express one quantity, the dependent variable, in terms of the other quantity, the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
- **6.AF.9:** 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.
- **6.NS.8:** Interpret, model, and use ratios to show the relative sizes of two quantities. Describe how a ratio shows the relationship between two quantities. Use the following notations: a/b, a to b, a:b.

Additional Standards

- **6.GM.1:** Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.
- **6.NS.9:** Understand the concept of a unit rate and use terms related to rate in the context of a ratio relationship.

Enduring Understandings

- Ratios, unit rates, and proportions can all be represented in multiple ways, including: tables, tape diagrams, double number lines, and equations. Determining the relationship between numbers in a model can help to find missing numbers.
- Unit rates represent a value for one single unit.
- Proportional relationships between dependent and independent variables can be represented with equations, in tables, and on graphs.
- In a proportional relationship, as one variable changes, the other variable changes in a directly related way.

Essential Questions

- How would you describe a proportion? What real-life examples can you think of that are proportional to one another?
- When might it be useful to calculate a unit rate? Why?
- What types of real-world situations can you think of that have an independent and dependent variable?

Key Concepts	Related Concepts	Vocabulary
• I can use reasoning to model real-world problems involving rates. (6.NS.10) • I can use reasoning to model real-world problems involving ratios. (6.NS.10) • I can represent real world and other mathematical problems with rates and ratios. (6.NS.10)	• I can use variables to represent quantities in proportional relationships in real-world problems. (6.AF.10) • I can write an equation expressing the dependent variable in terms of the independent variable. (6.AF.10) • I can use graphs to analyze the relationship between dependent and independent variables. (6.AF.10) • I can use tables to analyze the relationship between dependent and independent variables. (6.AF.10) • I can demonstrate how graphs and tables depicting the relationship between dependent and independent variables relate to equations. (6.AF.10) • I can create tables of equivalent ratios with whole-number measurements. (6.AF.9) • I can find missing values in tables showing equivalent ratios with whole-number measurements. (6.AF.9) • I can interpret the values in a table as coordinates to be plotted on the coordinate plane. (6.AF.9) • I can plot the pairs of values from a table. (6.AF.9) • I can interpret ratios as relative size between two quantities. (6.NS.8) • I can model and use ratios to show relative sizes of two quantities. (6.NS.8) • I can describe how a ratio show the relationship between two quantities. (6.NS.8) • I can represent ratios using the following notations: a/b, a to b, and a:b. (6.NS.8) • I can use conversion factors to convert between English and metric measurement systems. (6.GM.1) • Given conversion factors, I can convert between measurement systems to solve real-world problems. (6.GM.1) • I can demonstrate understanding of unit rates. (6.NS.9) • I can use terms related to rate in the context of a ratio relationship. (6.NS.9)	• Conversion factor • Coordinate plane • Dependent variable • Double number line • Equivalent • Imperial System of Measurement • Independent variable • Metric System • Proportional relationship • Rate • Ratio • Tape diagram • Unit rate • Variable

Mathematical Processes

- PS.2 Reason abstractly and quantitatively.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales

- 6.NS.10

Digital

- IDOE Examples/Tasks 6.NS.10
- IDOE Examples/Tasks 6.AF.10
- IDOE Examples/Tasks 6.AF.9
- IDOE Examples/Tasks 6.NS.8
- IDOE Examples/Tasks 6.GM.1
- IDOE Examples/Tasks 6.NS.9

Manipulatives

- Bar Model Tool
- Desmos Online Graphing Calculator
- Function Calculator Puzzles
- Tape Diagram Models

School Resources

Textbook

Textbook: Indiana Reveal by McGraw-Hill

Module 1: Ratios and Rates
1.1 Understand Ratios: 6.NS.8
1.2 Tables of Equivalent Ratios: 6.NS.10, 6.AF.9
1.3 Graphs of Equivalent Ratios: 6.NS.10, 6.AF.9
1.4 Compare Ratio Relationships: 6.NS.8, 6.NS.10, 6.AF.9
1.5 Solve Ratio Problems: 6.NS.10
1.6 Convert Customary Measurement Units: (SKIP)
Supplement: Converting between Measurement Systems
1.7 Understand Rates and Unit Rates: 6.NS.9, 6.NS.10
1.8 Solve Rate Problems: 6.NS.9, 6.NS.10

Supplemental Sections:
Module 7: Relationships between Two Variables
7.1 Relationships between Two Variables: 6.AF.10
7.2 Write Equations to Represent Relationships Represented in Tables: 6.AF.10
7.3 Graphs of Relationships: 6.AF.10
7.4 Multiple Representations: 6.AF.10

Formative Assessments

General Description of the Unit

In this unit, students convert between fractions, decimals, and percents without the use of a calculator. Only commonly used fractions need to be taught; the textbook have examples that go beyond this and can be skipped. Section 2.3 will need to be supplemented or modified to meet 6.NS.5.

Priority Standards

- **6.NS.5:** Know commonly used fractions (halves, thirds, fourths, fifths, eighths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.
- **6.NS.10:** Use reasoning involving rates and ratios to model real-world and other mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).

Supporting Standards

- N/A

Enduring Understandings

- Fractions, decimals, and percents can be converted between using algorithms to simplify comparisons and computations.
- Ratios, unit rates, and proportions can all be represented in multiple ways, including: tables, tape diagrams, double number lines, and equations. Determining the relationship between numbers in a model can help to find missing numbers.

Essential Questions

- When converting between fractions, decimals, and percents, which conversion is easiest? Hardest? Which conversion do you find the most useful?
- Do you prefer to work with a decimal, percent, or fraction form of a number? Why?

Key Concepts

- I can use reasoning to model real-world problems involving rates. (6.NS.10)
- I can use reasoning to model real-world problems involving ratios. (6.NS.10)
- I can represent real world and other mathematical problems with rates and ratios. (6.NS.10)
- I can give examples of commonly used fractions. (6.NS.5)
- I can translate between commonly used fractions and their decimal and percent equivalents. (6.NS.5)
- Without using a calculator, I can convert between fractions, decimals and percents of positive rational numbers. (6.NS.5)

Related Concepts

- N/A

Vocabulary

- Double number line
- Equivalent
- Rate
- Ratio
- Tape diagram

Mathematical Processes

- PS.2 Reason abstractly and quantitatively.
- PS.3 Construct convincing arguments and critique the reasoning of others.

Resources		
Proficiency Scales • 6.NS.10 • 6.NS.5	**Digital** • IDOE Examples/Tasks 6.NS.10 • IDOE Examples/Tasks 6.NS.5	**Manipulatives** • Bar Model Tool • Desmos Online Graphing Calculator • Fractions, Decimals, and Percents Model • Function Calculator Puzzles • Tape Diagram Models

School Resources	
Textbook Module 2: Fractions, Decimals, and Percents 2.1 Understand Percents: (SKIP) 2.2 Percents Greater than 100% and Less than 1%: (SKIP) 2.3 Relate Fractions, Decimals, and Percents: 6.NS.5 (Supplement/Modify) 2.4 Find the Percent of a Number: 6.NS.10 2.5 Estimate the Percent of a Number: 6.NS.10 (Optional) 2.6 Find the Whole: 6.NS.10	**Formative Assessments**

General Description of the Unit

In this unit, students will demonstrate mastery and efficiency with their whole number, decimal, and fraction computation skills. Students will divide multi-digit whole numbers using an algorithmic approach and extend whole number computational fluency to utilize a standard algorithm to compute with decimals in real-world situations. Additionally, they fluently compute with positive fractions and solve two-step, real-world problems involving fractions. In 5th grade, students added and subtracted fractions and mixed numbers with unlike denominators, multiplied fractions and mixed numbers using visual fraction models, and divided whole numbers and unit fractions using visual fraction models. In 6th grade, students will extend these understandings and skills to perform computations fluently using a standard algorithmic approach.

Note that supplementation may be needed for additional student practice.

Priority Standards

- **6.C.1:** Divide multi-digit whole numbers fluently using a standard algorithmic approach.
- **6.C.2:** Compute with positive fractions and positive decimals fluently using a standard algorithmic approach.

Supporting Standards

- **6.C.3:** Solve real-world problems with positive fractions and decimals by using one or two operations.
- **6.C.4:** Compute quotients of positive fractions and solve real-world problems involving division of fractions by fractions. Use a visual fraction model and/or equation to represent these calculations.

Enduring Understandings

- There are multiple methods for dividing whole numbers; you should select an efficient method that is appropriate for the problem.
- Algorithms for whole number computations and decimal computations have many similarities.
- Estimation, number sense, and placement of the decimal in the problem can help determine placement of the decimal in solutions.
- Common denominators are needed in fraction computations involving addition and subtraction but are not needed in fraction computations involving multiplication and division.
- Fraction computations can be represented visually and using numerical computations.

Essential Questions

- What real-world situation can you think of that would require you to divide a 5-digit number by a 2-digit number?
- How are whole numbers and decimal computations similar? How are they different?
- How are computations with fractions similar between operations? How are they different? Which is easiest? Which is most difficult? Why?
- What are real-world examples of when you may need to add or subtract decimals? Multiply or divide decimals?

Key Concepts

- I can use a standard algorithm to fluently divide multi-digit whole numbers. (6.C.1)
- I can compute with positive fractions fluently using a standard algorithm. (6.C.2)
- I can compute with positive decimals fluently using a standard algorithm. (6.C.2)

Related Concepts

- I can solve real-world problems that involve positive fractions using up to two operations. (6.C.3)
- I can solve real-world problems with positive decimals using up to two operations. (6.C.3)
- I can divide two positive fractions. (6.C.4)
- I can solve real-world problems involving division of fractions by fractions. (6.C.4)
- I can use fraction models to represent dividing positive fractions by fractions. (6.C.4)
- I can use equations to divide positive fractions by fractions. (6.C.4)

Vocabulary

- Algorithm
- Division algorithm
- Quotient
- Reciprocal

Mathematical Processes

- PS.1 Make sense of problems and persevere in solving them.
- PS.2 Reason abstractly and quantitatively.

Resources		
Proficiency Scales • 6.C.1 • 6.C.2	**Digital** • IDOE Examples/Tasks 6.C.1 • IDOE Examples/Tasks 6.C.2 • IDOE Examples/Tasks 6.C.4	**Manipulatives** • Bar Model Tool • Fraction Strips • Fractions, Decimals, and Percents Model • Multiplication Table

School Resources	
Textbook Module 3: Compute with Multi-Digit Numbers and Fractions 3.1 Divide Multi-Digit Whole Numbers: 6.C.1 3.2 Compute with Multi-Digit Decimals: 6.C.2, 6.C.3 3.3 Divide Whole Numbers by Fractions: 6.C.2, 6.C.3 3.4 Divide Fractions by Fractions: 6.C.2, 6.C.3, 6.C.4 3.5 Divide with Whole and Mixed Numbers: 6.C.2, 6.C.3, 6.C.4	**Formative Assessments**

Unit 4: Integers, Rational Numbers, and the Coordinate Plane (17 days, 1st semester)

General Description of the Unit

In this unit, students will expand their knowledge of the number system. Students will be introduced to integers and explore understandings of positive and negative numbers, the role of zero, and how these relate to real-world contexts. Students will apply these concepts to find opposites of numbers and work with absolute value. They will use these skills to compare and order rational numbers on a number line. Additionally, students will expand their 5th grade use of the coordinate plane and coordinates in the first quadrant, to graphing positive and negative ordered pairs in all four quadrants. They will identify patterns for each quadrant, use absolute value to find distances between points, and solve real-world and mathematical problems by graphing points in any quadrant.

Note that section 4.3 will require extra practice.

Priority Standards

- **6.NS.1:** Understand that positive and negative numbers are used 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 and compare quantities in real-world contexts, explaining the meaning of 0 in each situation.
- **6.NS.3:** Compare and order rational numbers and plot them on a number line. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- **6.AF.8:** Solve real-world and other mathematical problems by graphing points with rational number coordinates on a coordinate plane. Include the use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Supporting Standards

- **6.NS.2:** 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.4:** Understand that the absolute value of a number is the distance from zero on a number line. Find the absolute value of real numbers and know that the distance between two numbers on the number line is the absolute value of their difference. Interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
- **6.AF.7:** Understand that signs of numbers in ordered pairs indicate the quadrant containing the point. Identify rules or patterns in the signs as they relate to the quadrants. Graph points with rational number coordinates on a coordinate plane.

Enduring Understandings

- There are positive and negative numbers. These values represent real-world contexts, with zero creating a baseline in each context.
- Absolute value represents the distance from zero on a number line and is represented by two parallel, vertical lines on each side of a number.
- The coordinate plane is divided into four quadrants. There are patterns in ordered pairs that indicate which quadrant a point will lie in.
- Distances between points can be found on the coordinate plane and also by computing with the coordinates.

Essential Questions

- What are real-world examples of negative integers?
- Why is it important to be able to compare rational numbers?
- What patterns can you describe about the coordinate plane?
- How would you teach someone to graph something on a coordinate plane?

Key Concepts

- I can solve real-world and other problems by graphing points with rational number coordinates on a coordinate plane. (6.AF.8)
- I can find the distance between points with the same first coordinate or the same second coordinate. (6.AF.8)
- I can show on a number line that a negative number lies in the opposite direction as a positive number. (6.NS.1)

Related Concepts

- I can accurately identify the four quadrants of a coordinate plane. (6.AF.7)
- I can demonstrate understanding that the signs of the numbers in ordered pairs indicate which quadrant a point lies. (6.AF.7)
- I can identify rules or patterns in the signs as they relate to quadrants. (6.AF.7)

Vocabulary

- Absolute value
- Axes
- Coordinate plane
- Coordinates
- Integer
- Magnitude
- Negative
- Opposite
- Order
- Ordered pair
- Positive

• I can show that positive and negative numbers have opposite values. (6.NS.1) • I can use positive and negative numbers to represent and compare quantities in a variety of real-world contexts. (6.NS.1) • I can explain the meaning of 0 in real world contexts. (6.NS.1) • I can plot rational numbers on a number line. (6.NS.3) • I can compare and order rational numbers. (6.NS.3) • I can write statements of order for rational numbers in real-world problems. (6.NS.3) • I can interpret and explain statements of order for rational numbers in real-world problems. (6.NS.3)	• I can graph points with rational number coordinates on a coordinate plane. (6.AF.7) • I can demonstrate understanding of integers. (6.NS.2) • I can show that numbers with opposite signs are located on opposite sides of zero on the number line. (6.NS.2) • I can explain that the opposite of the opposite of a number is actually the number itself. (6.NS.2) • I can explain that 0 is its own opposite. (6.NS.2) • I can use a number line to explain that absolute value is the distance a number is away from zero. (6.NS.4) • I can find the absolute value of real numbers. (6.NS.4) • I can show the distance between two numbers on the number line is the absolute value of their difference. (6.NS.4) • I can relate absolute value to magnitude for a positive or negative quantity in a real-world situation. (6.NS.4)	• Quadrant • Rational number • Real numbers • Reflection

Mathematical Processes

- PS.7 Look for and make use of structure.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales	Digital	Manipulatives
• 6.NS.1 • 6.NS.3 • 6.AF.8	• IDOE Examples/Tasks 6.AF.8 • IDOE Examples/Tasks 6.NS.1 • IDOE Examples/Tasks 6.NS.3 • IDOE Examples/Tasks 6.AF.7 • IDOE Examples/Tasks 6.NS.2 • IDOE Examples/Tasks 6.NS.4	• Coordinates Game • Desmos Online Graphing Calculator • Digital Number Line

School Resources

Textbook

Module 4: Integers, Rational Numbers, and the Coordinate Plane
4.1 Represent Integers: 6.NS.1
4.2 Opposite and Absolute Value: 6.NS.2, 6.NS.4
4.3 Compare and Order Integers: 6.NS.3
4.4 Rational Numbers: 6.NS.3
4.5 The Coordinate Plane: 6.AF.7, 6.AF.8
4.6 Graph Reflections of Points: (SKIP)
4.7 Absolute Value and Distance: 6.AF.8

Formative Assessments

Unit 5: Numerical and Algebraic Expressions (20 days, 2nd semester)

General Description of the Unit

In this unit, students will develop an understanding of variables and their uses. While students are exposed to variables in earlier grade levels through formulas and unofficial uses, this will be their first focus on the meaning and use of variables across math. Students will evaluate expressions for specific values of their variables, then define and use multiple variables when writing expressions for real-world situations. Students will also apply the properties of operations to create equivalent linear expressions. Additionally, students will practice their computation skills as they work the order of operations and the properties of operations to evaluate numerical expressions. In previous grades, students have explored the identity, inverse, commutative, associative, and distributive properties, as well as the use of grouping symbols; however, the formal order of operations will be a new topic to students. While exploring order of operations, students will also be introduced to exponents and their use. Finally, this unit will conclude with explorations of prime and composite numbers and least common multiple and greatest common factors and their uses.

Note that 6.C.5 is rarely assessed on ILEARN, even though it is a supporting standard in this map. Supplementation will be needed for 6.NS.6 (prime and composite terminology) when teaching 5.5 and 5.6

Priority Standards

- **6.AF.1:** Evaluate expressions for specific values of their variables, including expressions with whole-number exponents and those that arise from formulas used in geometry and other real-world problems.
- **6.AF.3:** Define and use multiple variables when writing expressions to represent real-world and other mathematical problems, and evaluate them for given values.
- **6.C.6:** Apply the order of operations and properties of operations (identity, inverse, commutative properties of addition and multiplication, associative properties of addition and multiplication, and distributive property) to evaluate numerical expressions with nonnegative rational numbers, including those using grouping symbols, such as parentheses, and involving whole number exponents.

Supporting Standards

- **6.AF.2:** Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions and to justify whether two linear expressions are equivalent when the two expressions name the same number regardless of which value is substituted into them.
- **6.C.5:** Evaluate positive rational numbers with whole number exponents.

Additional Standards

- **6.NS.6:** Identify and explain prime and composite numbers.
- **6.NS.7:** 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 from 1 to 100, with a common factor as a multiple of a sum of two whole numbers with no common factor.

Enduring Understandings

- Variables are used to represent an unknown numerical value. More than one variable can be used in mathematical expressions and equations.
- Just like there are standard rules for reading a book, there are rules for the order in which math problems are solved. Problems are not always solved left to right, but rather using an order of operations.
- Exponents indicate repeated multiplication: 2^3 is 2 x 2 x 2, not 2 x 3.

Essential Questions

- How is thinking algebraically similar to thinking numerically? How is it different?
- Why is it important to have an order of operations?
- What are common mistakes with exponents that you want to remember to avoid?
- How can you figure out if a number is prime or composite? Why might it be important to determine this information?

Key Concepts

- I can evaluate variable expressions by substituting specific values in for the variables. (6.AF.1)
- I can evaluate variable expressions with whole number exponents by substituting specific values in for the variables. (6.AF.1)

Related Concepts

- I can use the properties of operations to create equivalent linear expressions. (6.AF.2)
- I can use the identity and inverse properties of addition and multiplication to create equivalent linear expressions. (6.AF.2)

Vocabulary

- Associative Property of Addition
- Associative Property of Multiplication
- Commutative Property of Addition
- Commutative Property of Multiplication
- Composite numbers

- I can evaluate variable expressions that arise from formulas used in geometry and real-world problems by substituting specific values in for the variables. (6.AF.1)
- I can write expressions using multiple variables to represent real-world problems. (6.AF.3)
- I can define variables within expressions given in the context of a problem. (6.AF.3)
- I can evaluate expressions that include multiple variables in real-world problems for given values. (6.AF.3)
- I can apply the order of operations to evaluate numerical expressions with nonnegative rational numbers. (6.C.6)
- I can use the identity and inverse properties of addition and multiplication when evaluating numerical expressions with nonnegative rational numbers. (6.C.6)
- I can use the commutative properties of addition and multiplication when evaluating expressions with nonnegative rational numbers. (6.C.6)
- I can evaluate expressions that have grouping symbols and whole number exponents. (6.C.6)
- I can use the identity and inverse properties of addition and multiplication to justify whether two linear expressions are equivalent when the same number is generated regardless of which value of substituted in to it. (6.AF.2)
- I can use the commutative properties of addition and multiplication to create equivalent linear expressions. (6.AF.2)
- I can use the commutative properties of addition and multiplication to justify whether two linear expressions are equivalent when the same number is generated regardless of which value of substituted in to it. (6.AF.2)
- I can evaluate expressions that have grouping symbols and whole number exponents. (6.AF.2)
- I can use the distributive property to create equivalent linear expressions. (6.AF.2)
- I can use the distributive property to justify whether two linear expressions are equivalent when the same number is generated regardless of which value of substituted in to it. (6.AF.2)
- I can determine whether two expressions are equivalent. (6.AF.2)
- I can evaluate positive rational numbers with whole number exponents. (6.C.5)
- I can identify prime numbers. (6.NS.6)
- I can identify composite numbers. (6.NS.6)
- I can explain how to determine if numbers are prime or composite. (6.NS.6)
- I can find the greatest common factor (GCF) between two numbers less than or equal to 100. (6.NS.7)
- I can find the least common multiple (LCM) between two whole numbers less than or equal to 12. (6.NS.7)
- I can determine whether two whole numbers from 1 to 100 have a common factor. (6.NS.7)
- I can use the distributive property to express a sum of two whole numbers between 1 and 100 with a common factor as a multiple of a sum of two whole numbers without a common factor. (6.NS.7)
- Distributive Property
- Distributive Property of Multiplication
- Evaluate
- Exponent
- Expression
- Greatest common factor
- Identity Property of Addition
- Identity Property of Multiplication
- Integer
- Inverse Property of Addition
- Inverse Property of Multiplication
- Least common multiple
- Linear expression
- Numerical expression
- Prime numbers
- Rational number
- Variable
- Whole number

Mathematical Processes

- PS.1 Make sense of problems and persevere in solving them.
- PS.2 Reason abstractly and quantitatively.

Resources

Proficiency Scales	Digital	Manipulatives
• 6.AF.1 • 6.AF.3 • 6.C.6	• IDOE Examples/Tasks 6.AF.1 • IDOE Examples/Tasks 6.AF.3 • IDOE Examples/Tasks 6.C.6 • IDOE Examples/Tasks 6.AF.2 • IDOE Examples/Tasks 6.C.5 • IDOE Examples/Tasks 6.NS.6 • IDOE Examples/Tasks 6.NS.7	• Algebra Mobile Puzzles • Divisibility Rules • Order of Operations Calculator • Scientific Calculator • Sieve of Eratosthenes

School Resources

Textbook

Module 5: Numerical and Algebraic Expressions
5.1 Powers and Exponents: 6.C.5
5.2 Numerical Expressions: 6.C.5, 6.C.6
5.3 Write Algebraic Expressions: 6.AF.3
5.4 Evaluate Algebraic Expressions: 6.AF.1, 6.AF.3
5.5 Factors and Multiples: 6.NS.6, 6.NS.7
5.6 Use the Distributive Property: 6.AF.2, 6.C.6, 6.NS.7
5.7 Equivalent Algebraic Expressions: 6.AF.2

Supplement 6.NS.6 in 5.5 and 5.6

Formative Assessments

General Description of the Unit

In this unit, students will extend their use of variables to solve one-step equations and inequalities. This will be students' introduction to these concepts and will be skills they use for many future math courses. Students will first understand that solving an equation or inequality is the process of determining which values make equations and inequalities true by substituting values. They will use their understanding of inverse operations to then explore one-step equations with non-negative rational numbers. Finally, they will learn about inequalities and solve one-step inequalities including graphing solutions on a number line and interpreting solutions in real-world situations.

Note that section 6.6 may require supplementing for additional practice.

Priority Standards

- **6.AF.5:** Solve equations of the form $x + p = q$, $x – p = q$, $px = q$, and $x/p = q$ fluently for cases in which p, q and x are all nonnegative rational numbers. Represent real world problems using equations of these forms and solve such problems.

Supporting Standards

- **6.AF.4:** Understand that solving an equation or inequality is the process of answering the following 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.AF.6:** Write an inequality of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$, where c is a rational number, to represent a constraint or condition in a real-world or other mathematical problem. Recognize inequalities have infinitely many solutions and represent solutions on a number line diagram.

Enduring Understandings

- Equations and inequalities with variables can be solved with an understanding of inverse operations.
- Equations have specific solutions and inequalities may have more than one solution/a range of solutions.
- Inequality solutions can be represented using number line diagrams.

Essential Questions

- When might you need to solve for a variable in a real-life situation?
- How is the operation important when evaluating equations or inequalities?
- What types of real-life situations are represented by inequalities?

Key Concepts

- I can identify the operation and its inverse operation in order to solve one step linear equations. (6.AF.5)
- I can solve linear equations using one of four operations when working with nonnegative rational numbers. (6.AF.5)
- I can represent real-world problems using one step linear equations. (6.AF.5)
- I can solve real-world problems involving one step linear equations. (6.AF.5)

Related Concepts

- I can use substitution to determine whether a number in a set makes an equation or an inequality true. (6.AF.4)
- I can explain what the solution to an equation or inequality represents. (6.AF.4)
- I can write inequalities of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$ to represent real-world problems. (6.AF.6)
- I can write inequalities of the form $x > c$, $x \geq c$, $x < c$, or $x \leq c$ to represent a given visual representation. (6.AF.6)
- I can demonstrate understanding that inequalities have infinite solutions. (6.AF.6)
- I can graph solutions to inequalities on a number line. (6.AF.6)

Vocabulary

- Constraint
- Equation
- Inequality
- Infinitely many solutions
- Inverse operation
- Rational number
- Substitute

Mathematical Processes

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

Resources

Proficiency Scales	Digital	Manipulatives
• 6.AF.5	• IDOE Examples/Tasks 6.AF.5 • IDOE Examples/Tasks 6.AF.4 • IDOE Examples/Tasks 6.AF.6	• Algebra Mobile Puzzles • Model Algebra Equations

School Resources

Textbook	Formative Assessments
Module 6: Equations and Inequalities 6.1 Use substitution to Solve One-Step Equations: 6.AF.4 6.2 One-Step Addition Equations: 6.AF.5 6.3 One-Step Subtraction Equations: 6.AF.5 6.4 One-Step Multiplication Equations: 6.AF.5 6.5 One-Step Division Equations: 6.AF.5 6.6 Inequalities: 6.AF.6	

Unit 8: Area, Volume, and Surface Area (22 days, 2nd semester)

General Description of the Unit

This unit will introduce the concept of interior angle sums for triangles and quadrilaterals, and students will use this information to solve real-world and other mathematical problems. Then, students will continue to find the area of 2D complex shapes. In 4th grade, students explore area of complex shapes made up of rectangles, and in 5th grade students learn to find area of triangles, trapezoids, and parallelograms. They will use these skills to find the area of complex shapes by composing or decomposing the object into simple shapes. Finally, students will graph polygons in the coordinate plane and solve problems related to polygons on the coordinate plane.

For 3-diminisional objects, students will review the concept of volume that was introduced in 5th grade and find volume of rectangular prisms with fractional edge lengths. Finally, students will be introduced to the concept of surface area and explore nets to solve real-world problems involving surface area.

Priority Standards

- **6.GM.4:** Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems.

Supporting Standards

- **6.GM.2:** Know that the sum of the interior angles of any triangle is 180º and that the sum of the interior angles of any quadrilateral is 360º. Use this information to solve real-world and mathematical problems.
- **6.GM.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 to solve real-world and other mathematical problems.
- **6.GM.5:** Find the volume of a right rectangular prism with fractional edge lengths using unit cubes of the appropriate unit fraction edge lengths (e.g., using technology or concrete materials), 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 to solve real-world and other mathematical problems.
- **6.GM.6:** Construct right rectangular prisms from nets and use the nets to compute the surface area of prisms; apply this technique to solve real-world and other mathematical problems.

Enduring Understandings

- Area represents the square units within a two-dimensional object, and complex shapes can be divided into simple shapes to compute the area more easily.
- The interior angles of a triangle sum to 180º; the interior angles of a quadrilateral sum to 360º.
- Volume represents the unit cubes that fit within a three-dimensional object. Volume can be found visually with unit cubes, or by computing with the side lengths of the object.
- Surface area represents the outside area of a three-dimensional object and can be found by adding the area of the different faces of the three-dimensional object.

Essential Questions

- What is a real-world situation where you would need to find the area of a complex shape?
- How is the sum of the interior angles of a triangle related to the sum of the interior angles of a quadrilateral?
- How can you describe the size of this amazon box (or other 3D object) to someone that couldn't see it? How can you use measurement to make your description more precise?
- How are area, volume, and surface area related? How are they different?
- What are real-world examples of when you might need to find area? Volume? Surface area?

Key Concepts	Related Concepts	Vocabulary

• I can decompose or compose complex shapes composed of polygons. (6.GM.4) • I can find the area of shapes composed of polygons. (6.GM.4) • I can solve real-world problems where finding the area of complex shapes is required. (6.GM.4)	• I can show that the sum of the interior angles of all triangles is 180º. (6.GM.2) • I can show that the sum of all interior angles of any quadrilateral is 360º. (6.GM.2) • I can solve real-world problems involving missing angles of triangles and quadrilaterals. (6.GM.2) • I can solve problems involving missing angles of triangles and quadrilaterals. (6.GM.2) • Given coordinates for their vertices, I can draw polygons in the coordinate plane. (6.GM.3) • I can use coordinates with the same first or second coordinate to find side lengths of polygons. (6.GM.3) • I can solve real-world problems involving missing length by using the coordinates of polygons. (6.GM.3) • I can use unit cubes (using technology or concrete materials) to find the volume of right rectangular prisms with fractional edge lengths. (6.GM.5) • I can use unit cubes (using technology or concrete materials) to show the volume of a right rectangular prism with fractional edge lengths. (6.GM.5) • I can show that finding the volume of a right rectangular prism using unit cubes is the same as finding the volume by multiplying the edge lengths of the prism. (6.GM.5) • I can apply the volume formulas V=lwh and V=Bh to find the volume of right rectangular prisms with fractional edge lengths. (6.GM.5) • I can solve real-world problems by finding the area of right rectangular prisms with fractional edge lengths. (6.GM.5) • I can construct right rectangular prisms from nets. (6.GM.6) • I can use the net of a right rectangular prism to find the surface area. (6.GM.6) • I can solve real-world problems asking me to find the surface area of right rectangular prisms by using nets. (6.GM.6)	• Complex shape • Composing • Coordinate plane • Coordinates • Decomposing • Interior angle • Net • Polygon • Quadrilateral • Rectangular prism • Sum • Surface area • Unit Cubes • Vertex • Volume
Mathematical Processes • PS.4 Model with mathematics.		

- PS.5 Use tools appropriately.

Resources		
Proficiency Scales	**Digital**	**Manipulatives**
• 6.GM.4 • 6.GM.6	• IDOE Examples/Tasks 6.GM.2 • IDOE Examples/Tasks 6.GM.3 • IDOE Examples/Tasks 6.GM.4 • IDOE Examples/Tasks 6.GM.5 • IDOE Examples/Tasks 6.GM.6	• Geogebra • Mathigon • Rectangular Prisms

School Resources	
Textbook	**Formative Assessments**
Module 8: Area 8.1 Area of Parallelograms (Review) 8.2 Area of Triangles (Review) 8.3 Area of Trapezoids (Review) 8.4 Area of Regular Polygons: 6.GM.4 (SKIP) 8.5 Polygons in the Coordinate Plane: 6.GM.3 8.6 Area of Composite Figures: 6.GM.4 IN Lesson: Angles of Triangles: 6.GM.2 Supplement: Angles of Quadrilaterals 6.GM.2 IN Lesson: Polygons and Angles: 6.GM.2 (SKIP) Module 9: Volume and Surface Area 9.1 Volume of Rectangular Prisms: 6.GM.5 9.2 Surface Area of Rectangular Prisms: 6.GM.6 9.3 Surface Area of Triangular Prisms 9.4 Surface Area of Pyramids (6.GM.6 item spec)	

General Description of the Unit

In 5th grade, students are introduced to the concept of mean, median, and mode. In 6th grade, students will use these skills, and learn about range and interquartile range to describe center and spread of data sets. They will review line plots and be introduced to histograms and box plots. Students will use all of these skills to formulate statistical questions and represent and analyze data in meaningful ways.

Priority Standards

- **6.DS.4:** Summarize numerical data sets in relation to their context in multiple ways, such as: report the number of observations; describe the nature of the attribute under investigation, including how it was measured and its units of measurement; determine quantitative measures of center (mean and/or median) and spread (range and interquartile range); describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered; relate the choice of measures of center and spread to the shape of the data distribution and the context in which the data were gathered

Supporting Standards

- **6.DS.1:** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for the variability in the answers. 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.DS.2:** Select, create, and interpret graphical representations of numerical data, including line plots, histograms, and box plots.
- **6.DS.3:** Formulate statistical questions; collect and organize the data (e.g., using technology); display and interpret the data with graphical representations (e.g., using technology).

Enduring Understandings

- There are different measures of center, frequency, and distribution that can be used to describe and summarize a data set.
- Different measures of center have different pros and cons, and they must be evaluated for each situation to find the data point that best represents a data set.
- There are several ways to collect, organize, display, and analyze data. You must choose the most appropriate methods for the data you are considering.

Essential Questions

- How are mean, median, and mode similar? How are they different?
- What is the best measure of center, and why?
- How might someone use a certain measure of center over a different measure to persuade or mislead an audience?
- What are different ways you can collect, organize, and display data? Is there a best way; why?

Key Concepts

- I can report the number of observations when summarizing numerical data sets. (6.DS.4)
- I can describe the nature of the attribute under investigation, including how it was measured and the units of measurement, when summarizing data sets. (6.DS.4)
- I can describe overall patterns and deviations from overall patterns with reference to the context in which data was gathered. (6.DS.4)
- I can find the mean, median of data sets. (6.DS.4)
- I can find the range and interquartile range of data sets. (6.DS.4)
- I can communicate my choice of measure of center and spread to the shape of the data distribution and the context in which the data were gathered. (6.DS.4)

Related Concepts

- I can recognize that statistical questions anticipate variability in data related to the question. (6.DS.1)
- I can explain how statistical questions will account for the variability in responses. (6.DS.1)
- I can understand that data collected to answer statistical questions has a distribution and can describe it by its overall shape. (6.DS.1)
- I can describe a data distribution by its center and spread. (6.DS.1)
- I can identify appropriate graphical representations of numerical data including line plots, histograms, and box plots. (6.DS.2)
- I can create and interpret line plots that represent numerical data. (6.DS.2)
- I can create and interpret histograms that represent numerical data. (6.DS.2)
- I can create and interpret box plots that represent numerical data. (6.DS.2)

Vocabulary

- Attribute
- Box plots
- Center
- Distribution
- Graphical representation
- Histograms
- Interquartile range
- Line plots
- Mean
- Measures of center
- Median
- Observation
- Outlier
- Range
- Spread
- Statistical question
- Variability

	• I can create statistical questions. (6.DS.3) • I can collect the data from a statistical question. (6.DS.3) • I can organize (using technology) data based on statistical questions. (6.DS.3) • I can display and interpret data collected from a statistical question with graphical representations (using technology). (6.DS.3)	

Mathematical Processes

- PS.3 Construct convincing arguments and critique the reasoning of others.
- PS.4 Model with mathematics.

Resources

Proficiency Scales	Digital	Manipulatives
• 6.DS.4	• IDOE Examples/Tasks 6.DS.4 • IDOE Examples/Tasks 6.DS.1 • IDOE Examples/Tasks 6.DS.2 • IDOE Examples/Tasks 6.DS.3	• Data Displays • Desmos Box Plot • Dice Roller • Histogram Maker • Statistics Calculator

School Resources

Textbook	Formative Assessments
Module 10: Statistical Measures and Displays 10.1 Statistical Questions: 6.DS.1, 6.DS.3 10.2 Dot Plots and Histograms: 6.DS.1, 6.DS.2, 6.DS.4 10.3 Measures of Center: 6.DS.1, 6.DS.2, 6.DS.4 10.4 Interquartile Range and Box Plots: 6.DS.1, 6.DS.2, 6.DS.4 10.5 MAD (SKIP) 10.6 Outliers: 6.DS.1, 6.DS.2, 6.DS.4 10.7 Interpret Graphical Displays: 6.DS.1, 6.DS.2, 6.DS.4	