North Gibson School Corporation

Grade 7 Mathematics
SY 2022/2023

Grade 7 Mathematics

Units of Study			
Unit 1A:	Proportional Relationships	18 days	1st semester
Unit 1B:	Slope	5 days	1st semester
Unit 2:	Solve Percent Problems	17 days	1st semester
Unit 3:	Operations with Integers	9 days	1st semester
Unit 4:	Operations with Rational Numbers	15 days	1st semester
Unit 5:	Simplify Algebraic Expressions	15 days	1st semester
Unit 6:	Write and Solve Equations	13 days	2nd semester
Unit 7:	Write and Solve Inequalities	13 days	2nd semester
Unit 8:	Geometric Figures	11 days	2nd semester
Unit 9:	Measure Figures	15 days	2nd semester
Unit 10:	Probability	13 days	2nd semester
Unit 11:	Sampling and Statistics	13 days	2nd semester

Appendices

Appendix A: Proficiency Scale Template

Appendix B: Curriculum Refinement Form

Appendix C: North Gibson Priority Standards Vertical Articulation Document

Grade 7 Priority Standards

Priority Standards	**7.AF.2**	Solve equations of the form px + q = r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems.
	7.AF.3	Solve inequalities of the form px + q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real-world problems using inequalities of these forms and solve such problems. Graph the solution set of the inequality and interpret it in the context of the problem.
	7.AF.4	Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.
	7.AF.7	Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships.
	7.AF.9	Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line.
	7.C.6	Use proportional relationships to solve ratio and percent problems with multiple operations (e.g. simple interest, tax, markups, markdowns, gratuities, conversions within and across measurement systems, and percent increase and decrease).
	7.C.8	Solve real-world problems with rational numbers by using one or two operations.
	7.DSP.3	Find, use, and interpret measures of center (mean and median) and measures of spread (range, interquartile range, and mean absolute deviation) for numerical data from random samples to draw comparative inferences about two populations.
	7.DSP.5	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Understand that a probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. Understand that a probability of 1 indicates an event certain to occur and a probability of 0 indicates an event impossible to occur. Identify probabilities of events as impossible, unlikely, equally likely, likely, or certain.
	7.GM.3	Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning.
	7.GM.5	Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.
	7.NS.3	Know there are rational and irrational numbers. Identify, compare, and order rational and irrational numbers (e.g. √2, √3, √5, ∏) and plot them on a number line.

Standards Breakdown

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

STANDARDS		UNITS											
		1A	1B	2	3	4	5	6	7	8	9	10	11
Number Sense	1						—						
	2						●						
	3						★						
Computation	1				●	●							
	2				●	●							
	3				●	●							
	4				●	●							
	5	●											
	6	★		★									
	7				●	●							
	8				★	★							
Algebra and Functions	1						●						
	2							★					
	3								★				
	4		★										
	5		●										
	6	●											
	7	★											
	8	—											
	9	★											
Geometry	1									●			
	2									●			
	3									★			
	4									●			
	5										★		
	6										●		
	7										●		
Data Analysis, Statistics, and Probability	1												●
	2												●
	3												★
	4												●
	5											★	
	6											●	
	7											●	

General Description of the Unit

This unit focuses on graphing proportional relationships in the coordinate plane. This builds upon work done in the 6th grade, when students plotted points and briefly explored proportional relationships in the coordinate plane. Now students will explore this relationship at a much deeper level. This involves representing and analyzing proportional relationships in different representations, including graphs, equations, tables, and verbal descriptions. The culmination of this unit is modeling proportional relationships in real-world and mathematical situations with different representations. Note that operations on negative numbers has not yet been taught, so all problems will involve only positive fractions.

Note that 7.C.5 is a highly assessed standard on ILEARN according to the blueprints, even though it is listed as a supporting standard in this map.

Priority Standards

- **7.AF.7:** Identify the unit rate or constant of proportionality in tables, graphs, equations, and verbal descriptions of proportional relationships.
- **7.AF.9:** Represent real-world and other mathematical situations that involve proportional relationships. Write equations and draw graphs to represent these proportional relationships. Recognize that these situations are described by a linear function in the form y = mx, where the unit rate, m, is the slope of the line.
- **7.C.6:** Use proportional relationships to solve **ratio** and percent problems with multiple operations (e.g. simple interest, tax, markups, markdowns, gratuities, conversions within and across measurement systems, and percent increase and decrease).

Supporting Standards

- **7.AF.6:** Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).
- **7.C.5:** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Additional Standards

- **7.AF.8:** Explain what the coordinates of a point on the graph of a proportional relationship mean in terms of the situation, with special attention to the points (0, 0) and (1,r), where r is the unit rate.

Enduring Understandings

- A proportional relationship can be expressed in a table, verbal description, graph, or equation. Each representation highlights different aspects of the relationship.
- You can use a graph, table, or equation to identify if two quantities have a proportional relationship. If a proportional relationship exists, the graph of the values in a coordinate plane would form a straight line through the origin.
- In a proportional relationship, the graph of the values in a coordinate plane forms a straight line through the origin.

Essential Questions

- Why is it useful to have various representations of a proportional relationship?
- What is a real-world situation that involves a unit rate?
- How can you distinguish relationships that are proportional from relationships that are not proportional??

Key Concepts

- I can compute a unit rate. (7.AF.7)
- I can define the constant of proportionality as a unit rate. (7.AF.7)
- I can analyze tables, graphs, equations and verbal descriptions to identify the unit rate. (7.AF.7)
- I can identify real-world situations that involve proportional relationships. (7.AF.9)
- I can represent proportional relationships by writing equations. (7.AF.9)
- I can draw graphs that represent proportional relationships. (7.AF.9)

Related Concepts

- I can recognize a proportional relationship given a table by testing for equivalent ratios. (7.AF.6)
- I can recognize a proportional relationship given a graph. (7.AF.6)
- I can identify equivalent proportional relationships across representations. (7.AF.6)
- I can compute a unit rate for a given ratio from information within a situational context or mathematical problem. (7.C.5)
- I can form a unit rate with fractions. (7.C.5)

Vocabulary

- Constant of proportionality
- Coordinates
- Equivalent ratios
- Linear function
- Measurement system
- Origin
- Percent error
- Percent increase/decrease
- Proportional relationship
- Ratio
- Simple interest
- Slope
- Unit rate

• I can explain how the graph of a proportional relationship relates to the linear function y = mx. (7.AF.9) • Given an equation or graph, I can solve real-world problems involving proportional relationships. (7.AF.9) • I can see the relationship between the unit rate and the slope, m. (7.AF.9) • I can apply proportional reasoning to solve multistep ratio and percent problems. (7.C.6) • I can calculate the percent increase or decrease in a given context. (7.C.6) • I can convert within and across measurement systems using proportional relationships. (7.C.6) • I can calculate markups and markdown using proportional relationships. (7.C.6) • I can calculate simple interest in a given problem. (7.C.6) • I can solve problems involving tax and gratuities. (7.C.6)	• I can compute a unit rate with quantities measured in unlike units. (7.C.5) • I can explain what the points on a graph of a proportional relationship mean in terms of a specific situation. (7.AF.8) • I can recognize that (1, r) on a graph represents the unit rate, r. (7.AF.8) • I can explain the significance of the point (0, 0) on the graph of proportional relationship. (7.AF.8)	

Mathematical Processes

- PS.4 Model with mathematics.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales	Digital	Manipulatives
• 7.AF.7 • 7.AF.9 • 7.C.6	• IDOE Examples/Tasks 7.AF.7 • IDOE Examples/Tasks 7.AF.9 • IDOE Examples/Tasks 7.C.6 • IDOE Examples/Tasks 7.AF.6 • IDOE Examples/Tasks 7.C.5 • IDOE Examples/Tasks 7.AF.8	• Algebra Tiles • Colored Tiles • Coordinate Grid • Fraction Circles • Graph Paper • Graphing Calculator • Pattern Blocks • Quadrant One Grid • Scientific Calculator • Virtual Graph Paper

School Resources	
Textbook Textbook: Indiana Reveal by McGraw-Hill Module 1: Proportional Relationships 1-1 Unit Rates Involving Ratios of Fractions 1-2 Understand Proportional Relationships 1-3 Tables of Proportional Relationships 1-4 Graphs of Proportional Relationships 1-5 Equations of Proportional Relationships 1-6 Solve Problems Involving Proportional Relationships	**Formative Assessments**

Unit 1B: Slope (5 days, 1st semester)

General Description of the Unit

In this unit, slope is explored through proportional relationships. Slope will be defined as a rate of change and will be used to distinguish between linear and non-linear relationships. Supplemental resources will be needed for this unit, and Module 12 can be used as a guide.

Note that 7.AF.5 is a highly assessed standard on ILEARN according to the blueprints, even though it is listed as a supporting standard in this map.

Priority Standards

- **7.AF.4:** Define slope as vertical change for each unit of horizontal change and recognize that a constant rate of change or constant slope describes a linear function. Identify and describe situations with constant or varying rates of change.

Supporting Standards

- **7.AF.5:** Graph a line given its slope and a point on the line. Find the slope of a line given its graph.

Enduring Understandings

- The slope represents the rate of change between two quantities. Because a proportional relationship has constant slope, the slope can be calculated between any two points from a graph or table.
- A rate of change can be constant or varying; when two quantities have a constant rate of change, their graph will be a straight line.
- A line with negative slope will go down from left to right; a line with positive slope will go up from left to right; a line with no (0) slope will remain flat (horizontal).

Essential Questions

- What is a situation between two variables that would likely result in a constant rate of change?
- What is a situation between two variables that would likely result in a non-constant rate of change?

Key Concepts

- I can express slope as vertical change per unit of horizontal change. (7.AF.4)
- I can classify situations as having a constant rate of change (being linear) or as having a varying rate of change (being non-linear). (7.AF.4)
- I can explain the vertical change and the horizontal change in a real-world context. (7.AF.4)
- I can describe situations that would have a constant rate of change. (7.AF.4)
- I can describe situations that would have a varying rate of change. (7.AF.4)

Related Concepts

- I can find the slope of a line given a graph. (7.AF.5)
- I can graph a line given its slope and one other point on the line. (7.AF.5)

Vocabulary

- Constant rate of change
- Horizontal change
- Linear function
- Slope
- Varying rate of change
- Vertical change
- x-axis
- y-axis

Mathematical Processes

- PS.4 Model with mathematics.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales

- 7.AF.4

Digital

- IDOE Examples/Tasks 7.AF.4
- IDOE Examples/Tasks 7.AF.5

Manipulatives

- Coordinate Grid
- Graph Paper
- Graphing Calculator
- Quadrant One Grid
- Scientific Calculator
- Virtual Graph Paper

School Resources	
Textbook Use as Supplemental Resource: Module 12: Linear Relationships 12-1 Proportional Relationships and Slope (Review of 1.4 and 1.5; Brief) 12-2 Slope of a Line 12-3 Similar Triangles and Slope 12-4 Direct Variation (SKIP) 12-5 Slope-Intercept Form (SKIP) 12-6 Graph Linear Equations (SKIP)	**Formative Assessments**

General Description of the Unit

In this unit, students will work with other proportional relationships involving ratios and percentages. This includes tax, percent markdowns, and conversions across measurement systems

Priority Standards

- **7.C.6:** Use proportional relationships to solve ratio and **percent** problems with multiple operations (e.g. simple interest, tax, markups, markdowns, gratuities, conversions within and across measurement systems, and percent increase and decrease).

Supporting Standards

- N/A

Enduring Understandings

- Proportional relationships express how quantities change in relation to each other.
- Fractions and decimals can be represented as a percentage. Percentages are frequently used in the real-world and understanding how to convert fractions and decimals to percentages (and the other way around) can make calculations in the real-world more convenient.

Essential Questions

- How can you figure out the price of an item on sale?
- What is a real-life situation where something would have a percent of increase?

Key Concepts

- I can apply proportional reasoning to solve multistep ratio and percent problems. (7.C.6)
- I can calculate the percent increase or decrease in a given context. (7.C.6)
- I can convert within and across measurement systems using proportional relationships. (7.C.6)
- I can calculate markups and markdown using proportional relationships. (7.C.6)
- I can calculate simple interest in a given problem. (7.C.6)
- I can solve problems involving tax and gratuities. (7.C.6)

Related Concepts

- N/A

Vocabulary

- Measurement system
- Percent error
- Percent increase/decrease
- Proportional relationship
- Ratio
- Simple interest

Mathematical Processes

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

Resources

Proficiency Scales

- 7.C.6

Digital

- IDOE Examples/Tasks 7.C.6

Manipulatives

- Algebra Tiles
- Colored Tiles
- Fraction Circles
- Pattern Blocks
- Scientific Calculator

School Resources	
Textbook Module 2: Solve Percent Problems 2-1 Percent of Change 2-2 Tax 2-3 Tips and Markups 2-4 Discounts 2-5 Interest 2-6 Commission and Fees 2-7 Percent Error	**Formative Assessments**

Unit 3: Operations with Integers (9 days, 1st semester)

General Description of the Unit

In this unit students continue to develop fluency with numeric operations by extending the operations to integers. While negative numbers were introduced in 6th grade, students did not perform any operations with them. This will include exploring subtraction as adding the additive inverse $(p - q = p + (-q))$ and understanding that $(-1)(-1) = 1$ and $-\left(\frac{p}{q}\right) = \frac{-p}{q} = \frac{q}{-p}$. In the next unit, students will apply these rules to all rational numbers instead of just integers.

Priority Standards

- **7.C.8:** Solve real-world problems with rational numbers by using one or two operations.

Supporting Standards

- **7.C.1:** Understand p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Show on a number line that a number and its opposite have a sum of 0 (are additive inverses). Find and interpret sums of rational numbers in real-world contexts.
- **7.C.2:** Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- **7.C.3:** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers.
- **7.C.4:** Understand that integers can be divided, provided that the divisor is not zero. Understand that if p and q are integers, then –(p/q) = (–p)/q = p/(–q).
- **7.C.7:** Compute fluently with rational numbers using an algorithmic approach.

Enduring Understandings

- A number and its opposite are additive inverses and have a sum of 0.
- When adding integers, if both signs are the same, the integers are added together. If the signs of two integers are different, then the difference between their absolute values is found.
- Subtracting integers is the same as adding the additive inverse.
- When multiplying integers, if the sign on both factors is the same, the product will be positive. If the sign on both factors is different, then the product will be negative.
- When dividing integers, if the dividend and divisor have the same sign, the quotient will be positive. If the sign on the dividend and divisor are different, then the quotient will be negative.

Essential Questions

- How are adding positive and negative integers similar to adding just positive integers? How are they different?
- How can number lines be used to find the difference between two integers?
- What is a real-world situation that would require multiplication of positive and negative numbers?
- How are multiplying and dividing integers similar to multiplying and dividing positive numbers? How are they different?

Key Concepts

- I can solve real-world problems by adding, subtracting, multiplying, and dividing rational numbers. (7.C.8)

Related Concepts

- I can show addition of integers on a number line. (7.C.1)
- I can explain how p + q is the number located from p, in the positive or negative direction. (7.C.1)

Vocabulary

- Absolute value
- Additive inverse
- Algorithmic approach
- Distributive Property
- Dividend
- Divisor
- Integer
- Opposite

	• I can describe situations where opposite quantities combine to make zero. (7.C.1) • I can represent and explain how a number and its opposite have a sum of zero and are additive inverses. (7.C.1) • I can show subtraction of integers on a number line. (7.C.2) • I can explain that subtraction is equivalent to adding the additive inverse. (7.C.2) • I can represent how the distance between two rational numbers on a number line is the absolute value of their difference. (7.C.2) • I can subtract rational numbers in the context of a real-world problem. (7.C.2) • I can recognize and describe the rules when multiplying signed numbers. (7.C.3) • I can apply the distributive property to multiply rational numbers. (7.C.3) • I can explain the concept of dividing integers. (7.C.4) • I can explain why integers cannot be divided when the divisor is zero. (7.C.4) • I can recognize and describe the rules when dividing signed numbers. (7.C.4) • I can add, subtract, multiply and divide with rational numbers. (7.C.7)	• Product • Properties of operations • Quotient • Rational 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
• 7.C.8	• IDOE Examples/Tasks 7.C.8 • IDOE Examples/Tasks 7.C.1 • IDOE Examples/Tasks 7.C.2 • IDOE Examples/Tasks 7.C.3 • IDOE Examples/Tasks 7.C.4 • IDOE Examples/Tasks 7.C.7	• Virtual Multiplication Chart • Virtual Number Line

School Resources	
Textbook Module 3: Operations with Integers 3-1 Add Integers 3-2 Subtract Integers 3-3 Multiply Integers 3-4 Divide Integers 3-5 Apply Integer Operations	**Formative Assessments**

General Description of the Unit

Now students extend operations with negative numbers to all rational numbers. All fraction operations (addition, subtraction, multiplication, and division) have been taught in previous grades, but now students will perform these operations on the entire rational number system (positive and negative fractions). The final goal is to be able to compute fluently with rational numbers and to solve real-world problems with two operations involving rational numbers.

Note that supplementation may be needed throughout the unit, including in section 4.6 for real-world problems and problems with two operations.

Priority Standards

- **7.C.8:** Solve real-world problems with rational numbers by using one or two operations.

Supporting Standards

- **7.C.1:** Understand p + q as the number located a distance |q| from p, in the positive or negative direction, depending on whether q is positive or negative. Show on a number line that a number and its opposite have a sum of 0 (are additive inverses). Find and interpret sums of rational numbers in real-world contexts.
- **7.C.2:** Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
- **7.C.3:** Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers.
- **7.C.4:** Understand that integers can be divided, provided that the divisor is not zero. Understand that if p and q are integers, then –(p/q) = (–p)/q = p/(–q).
- **7.C.7:** Compute fluently with rational numbers using an algorithmic approach.

Enduring Understandings

- Computational fluency refers to efficiency, accuracy, and flexibility with computational strategies.
- When adding rational numbers, if both signs are the same, the integers are added together. If the signs of two numbers are different, then the difference between their absolute values is found.
- Subtracting rational numbers is the same as adding the additive inverse.
- When multiplying rational numbers, if the sign on both factors is the same, the product will be positive. If the sign on both factors is different, then the product will be negative.
- When dividing rational numbers, if the dividend and divisor have the same sign, the quotient will be positive. If the sign on the dividend and divisor are different, then the quotient will be negative.

Essential Questions

- How are adding positive and negative rational numbers similar to adding just positive fractions? How are they different?
- How can number lines be used to find the difference between two rational numbers?
- What is a real-world situation that would require multiplication of a positive and negative rational number?
- How are multiplying and dividing negative rational numbers similar to multiplying and dividing positive numbers? How are they different?

Key Concepts	Related Concepts	Vocabulary
• I can solve real-world problems by adding, subtracting, multiplying, and dividing rational numbers. (7.C.8)	• I can show addition of integers on a number line. (7.C.1) • I can explain how p + q is the number located from p, in the positive or negative direction. (7.C.1) • I can describe situations where opposite quantities combine to make zero. (7.C.1) • I can represent and explain how a number and its opposite have a sum of zero and are additive inverses. (7.C.1) • I can show subtraction of integers on a number line. (7.C.2) • I can explain that subtraction is equivalent to adding the additive inverse. (7.C.2) • I can represent how the distance between two rational numbers on a number line is the absolute value of their difference. (7.C.2) • I can subtract rational numbers in the context of a real-world problem. (7.C.2) • I can recognize and describe the rules when multiplying signed numbers. (7.C.3) • I can apply the distributive property to multiply rational numbers. (7.C.3) • I can explain the concept of dividing integers. (7.C.4) • I can explain why integers cannot be divided when the divisor is zero. (7.C.4) • I can recognize and describe the rules when dividing signed numbers. (7.C.4) • I can add, subtract, multiply and divide with rational numbers. (7.C.7)	• Absolute value • Additive inverse • Algorithmic approach • Distributive Property • Dividend • Divisor • Integer • Opposite • Product • Properties of operations • Quotient • Rational 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
• 7.C.8	• IDOE Examples/Tasks 7.C.8 • IDOE Examples/Tasks 7.C.1 • IDOE Examples/Tasks 7.C.2 • IDOE Examples/Tasks 7.C.3 • IDOE Examples/Tasks 7.C.4 • IDOE Examples/Tasks 7.C.7	• Virtual Multiplication Chart • Virtual Number Line

School Resources	
Textbook Module 4: Operations with Rational Numbers 4-1 Rational Numbers 4-2 Add Rational Numbers 4-3 Subtract Rational Numbers 4-4 Multiply Rational Numbers 4-5 Divide Rational Numbers 4-6 Apply Rational Number Operations	**Formative Assessments**

Unit 5: Simplify Algebraic Expressions (15 days, 1st semester)

General Description of the Unit

In this unit, students create equivalent algebraic expressions and identify the property used. Additionally, students are introduced to irrational numbers for the first time. Students will evaluate the square root of perfect square whole numbers, such as $\sqrt{16}$ and $\sqrt{81}$. This will support the introduction of irrational numbers as students explore decimal approximation of the square root of other (non-perfect square) numbers, such as $\sqrt{3}$ and $\sqrt{10}$. Students will classify numbers as rational or irrational, as well as plotting both rational and irrational numbers on a number line. Students will also express numbers in their prime factorization using exponents; this is an additional standard that is not heavily tested on ILEARN.

Note that 7.AF.1is highly assessed on ILEARN, even though it is a supporting standard in the map. The textbook includes cube roots, which don't need to be taught in 7th grade. A quiz will be given after 5.5.

Priority Standards

- **7.NS.3:** Know there are rational and irrational numbers. Identify, compare, and order rational and irrational numbers (e.g. √2, √3, √5, π) and plot them on a number line.

Supporting Standards

- **7.AF.1:** Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring out a common number (e.g., given 2x - 10, create an equivalent expression 2(x - 5)). Justify each step in the process.
- **7.NS.2:** Understand the inverse relationship between squaring and finding the square root of a perfect square whole number. Find square roots of perfect square whole numbers.

Additional Standards

- **7.NS.1:** Find the prime factorization of whole numbers and write the results using exponents.

Enduring Understandings

- Properties of operations can be used to rewrite an expression in equivalent forms, assisting in reaching a solution to an equation.
- Rational approximations of irrational numbers can be used to compare the size of irrational numbers with rational numbers and other irrational numbers.
- Both rational and irrational numbers are real numbers with a decimal expansion.
- There is an inverse relationship between squaring and finding the square root of a number. Understanding this relationship allows us to make more efficient calculations in problems involving perfect square whole numbers.
- Composite numbers can be written as a product of the prime factors, which can be useful in finding the GCF or LCM.

Essential Questions

- Why do we approximate irrational numbers?
- Why is it useful to know the square root of a perfect square whole number?
- How can I use prime factors to solve a problem?

Key Concepts

- I can classify a number as rational or irrational. (7.NS.3)
- I can use estimate values to compare and order two or more rational and/or irrational numbers. (7.NS.3)
- I can plot rational numbers and estimates of irrational numbers on a number line. (7.NS.3)

Related Concepts

- I can apply properties of operations to add, subtract, factor, and expand linear expressions with rational coefficients. (7.AF.1)
- I can combine like terms to factor and expand linear expressions with rational coefficients using the distributive property. (7.AF.1)
- I can use properties of operations to write equivalent expressions. (7.AF.1)

Vocabulary

- Associative Property
- Commutative Property
- Composite number
- Distributive Property
- Equivalent expressions
- Factor tree
- Identity Property
- Inverse Property
- Inverse relationship
- Irrational number
- Like terms

	• I can rewrite an expression in an equivalent form if needed. (7.AF.1) • I can justify the steps taken to form equivalent expressions. (7.AF.1) • Given a perfect square whole number, I can find the square root. (7.NS.2) • I can explain the relationship between squaring and finding the square root. (7.NS.2) • I can identify when only the principal square root is appropriate to find. (7.NS.2) • I can make and use factor trees to find the prime factorization of numbers. (7.NS.1) • I can write the prime factorization of a composite number using exponents. (7.NS.1)	• Linear expressions • Perfect square • Prime factorization • Prime number • Principal square root • Rational number • Square root

Mathematical Processes

- PS.6 Attend to precision.
- PS.7 Look for and make use of structure.

Resources

Proficiency Scales	Digital	Manipulatives
• 7.NS.3	• IDOE Examples/Tasks 7.NS.3 • IDOE Examples/Tasks 7.AF.1 • IDOE Examples/Tasks 7.NS.2 • IDOE Examples/Tasks 7.NS.1	• Algebra Tiles • Digital Number Line • Scientific Calculator • Virtual Number Line

School Resources

Textbook	Formative Assessments
Module 5: Simplify Algebraic Expressions 5-1 Simplify Algebraic Expressions 5-2 Add Linear Expressions 5-3 Subtract Linear Expressions 5-4 Factor Linear Expressions 5-5 Combine Operations with Linear Expressions IN Lesson: Prime Factorization IN Lesson: Roots IN Lesson: Compare Real Numbers (Modify/Supplement)	

Unit 6: Write and Solve Equations (13 days, 2nd semester)

General Description of the Unit

Now students will solve equations with variables on one side of the equal sign. The coefficients can be any rational numbers, including negative fractions, and can include the distributive property. The ultimate goal of this unit is for students to model a real-world situation with an equation, solve the problem, and check for reasonableness.

Priority Standards	**Supporting Standards**
• **7.AF.2:** Solve equations of the form px + q = r and p(x + q) = r fluently, where p, q, and r are specific rational numbers. Represent real-world problems using equations of these forms and solve such problems.	• N/A
Enduring Understandings	**Essential Questions**
• Equations can be used to model and solve for a relationship between quantities. • Inverse operations can be used to solve equations.	• How can I use equations to solve real-word problems? • How are inverse operations utilized in solving equations?

Key Concepts	**Related Concepts**	**Vocabulary**
• I can solve two-step real-world and mathematical problems using rational numbers. (7.AF.2) • I can use variables to represent numbers in real-world or mathematical problems and make simple equations to solve problems. (7.AF.2)	• N/A	• Rational numbers

Mathematical Processes

- PS.4 Model with mathematics.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales	**Digital**	**Manipulatives**
• 7.AF.2	• IDOE Examples/Tasks 7.AF.2	• Algebra Tiles • Scientific Calculator • Virtual Number Line

School Resources

Textbook	**Formative Assessments**
Module 6: Write and Solve Equations 6-1 Write and Solve One-Step Equations (Review) 6-2 Solve Two-Step Equations px+q=r 6-3 Write and Solve Two-Step Equations px+q=r 6-4 Solve Two-Step Equations p(x+q)=r 6-5 Write and Solve Two-Step Equations p(x+q)=r	

General Description of the Unit

Now students extend their equation work to inequalities. In 6th grade, students graphed inequalities on a number line, but never solved an inequality. Now students will solve inequalities and will graph the solution on a number line. This involves rational number calculations, which should be practiced without a calculator.

Note that the textbook only does one-step inequalities, but the IAS includes two-step inequalities; therefore, the textbook will need to be supplemented.

Priority Standards

- **7.AF.3:** Solve inequalities of the form px + q (> or ≥) r or px + q (< or ≤) r, where p, q, and r are specific rational numbers. Represent real-world problems using inequalities of these forms and solve such problems. Graph the solution set of the inequality and interpret it in the context of the problem.

Supporting Standards

- N/A

Enduring Understandings

- The solution to an inequality is often a set of numbers that can be plotted on a number line.
- An inequality is another way to represent a relationship between expressions. Instead of the two expressions being exactly the same, an inequality shows that one expression is greater than (or greater than or equal to) the other expression.

Essential Questions

- How are the processes for solving equations and inequalities alike? Different?
- What characteristics of a word problem imply an inequality should be used instead of an equation?

Key Concepts

- I can use variables to represent numbers in real-world or mathematical problems and make simple inequalities to solve problems. (7.AF.3)
- I can graph and interpret the solution set of an inequality in the context of a problem. (7.AF.3)
- I can solve an inequality for an unknown value, without context. (7.AF.3)

Related Concepts

- N/A

Vocabulary

- Rational numbers
- Solution set

Mathematical Processes

- PS.4 Model with mathematics.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales

- 7.AF.3

Digital

- IDOE Examples/Tasks 7.AF.3

Manipulatives

- Algebra Tiles
- Scientific Calculator
- Virtual Number Line

School Resources	
Textbook Module 7: Write and Solve Inequalities 7-1 Solve One-Step Addition and Subtraction Inequalities 7-2 Wrote and Solve One-Step Addition and Subtraction Inequalities 7-3 Solve One-Step Multiplication and Division Inequalities with Positive Coefficients 7-4 Solve One-Step Multiplication and Division Inequalities with Negative Coefficients 7-5 Write and Solve One-Step Multiplication and Division Inequalities Supplement: Two-Step Inequalities	**Formative Assessments**

General Description of the Unit

The course now shifts gears into geometry. Students will explore the relationships between the sets of sides or angle measures. Students also explore similarity in polygons, including the angle-angle criterion for triangles. This relates with the topic of scale drawings, another topic in this unit and one that is highly assessed on ILEARN. Finally, students develop and apply facts about angle measurements (vertical, adjacent, complementary, supplementary) to both mathematical and real-world settings.

Priority Standards

- **7.GM.3:** Solve real-world and other mathematical problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing. Create a scale drawing by using proportional reasoning.

Supporting Standards

- **7.GM.1:** Explore triangles with given conditions from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- **7.GM.2:** Identify and describe similarity relationships of polygons including the angle-angle criterion for similar triangles, and solve problems involving similarity.
- **7.GM.4:** Solve real-world and other mathematical problems using facts about vertical, adjacent, complementary, and supplementary angles.

Enduring Understandings

- A scale drawing is a two-dimensional figure that is proportional to the dimensions of the figure in which it represents.
- If two or more polygons are similar, a scale factor can be written to represent the ratio of corresponding side lengths. The scale factor can be used with proportional reasoning to find unknown side lengths. In addition, corresponding angle measures in similar polygons are the same.
- Recognizing and applying properties of angles and angle pair relationships can assist in solving real-world problems involving angle measures.

Essential Questions

- What are some jobs or settings that would use scale drawings?
- If given 3 toothpicks of varying sizes, can you always create a triangle? Why or why not?
- How can I use similarity relationships to solve problems involving polygons?
- How can angle relationships be used to solve real-world problems?

Key Concepts

- I can compute actual lengths and areas from a scale drawing. (7.GM.3)
- I can compute the scale factor given the model length and actual length. (7.GM.3)
- I can solve problems with scale drawings of geometric figures. (7.GM.3)
- I can create a scale drawing using proportional reasoning. (7.GM.3)

Related Concepts

- I can recognize triangles with given conditions. (7.GM.1)
- I can recognize a triangle when given three measurements. (7.GM.1)
- I can determine, through exploration, whether three given side lengths (or angle measures) would form a triangle. (7.GM.1)
- I can determine whether two polygons are similar polygons. (7.GM.2)
- I can show two triangles are similar based on their angle measures. (7.GM.2)
- I can solve for missing lengths and/or angles within similar polygons. (7.GM.2)
- I can use properties of supplementary, complementary, vertical, and adjacent angles in multi-step problems. (7.GM.4)
- I can write and solve simple equations for an unknown angle in a figure. (7.GM.4)

Vocabulary

- Adjacent angles
- Angle-angle similarity
- Complementary angles
- Conditions
- Polygons
- Proportional reasoning
- Scale drawings
- Similarity
- Supplementary angles
- Triangle
- Unique
- Vertical angles

	• I can identify types of angles in the context of a real-world problem. (7.GM.4)	

Mathematical Processes
- PS.5 Use tools appropriately.
- PS.6 Attend to precision.

Resources

Proficiency Scales	Digital	Manipulatives
• 7.GM.3	• IDOE Examples/Tasks 7.GM.3 • IDOE Examples/Tasks 7.GM.1 • IDOE Examples/Tasks 7.GM.2 • IDOE Examples/Tasks 7.GM.4	• Algebra Tiles • Colored Tiles • Desmos Geometry • Fraction Circles • Geoboards • Graph Paper • Pattern Blocks • Protractor • Ruler • Scientific Calculator • Straight Edge • Virtual Graph Paper

School Resources

Textbook	Formative Assessments
Module 8: Geometric Figures 8-1 Vertical and Adjacent Angles 8-2 Complementary and Supplementary Angles 8-3 Triangles 8-4 Scale Drawings IN Lesson Similar Triangles and Indirect Measurements	

General Description of the Unit

Students begin the unit by working with circles to develop and apply the area and circumference formulas to both real-world and mathematical problems. After exploring two-dimensional shapes, students now move on to explore 3-dimensional shapes. In the 6th grade, students found the volume of right rectangular prisms. Now students will find the volume of cylinders and composite right rectangular prisms. They will also make nets to represent right rectangular prisms and cylinders; students will then use the nets to aid in calculating the surface area of the figures. Note that several of the textbook lessons on 3-dimensional figures include shapes that are not included in the 7th grade Indiana Academic Standards and do not need to be taught.

Priority Standards

- **7.GM.5:** Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.

Supporting Standards

- **7.GM.6:** Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms.
- **7.GM.7:** Construct nets for right rectangular prisms and cylinders and use the nets to compute the surface area; apply this technique to solve real-world and other mathematical problems.

Enduring Understandings

- The area and circumference of a circle are both directly related to the length of the radius.
- Finding the volumes of cylinders and right rectangular prisms is done by multiplying the area of the base by the object's height.
- Different representations of a three-dimensional object, such a net, can help us understand the shape's properties and calculate the surface area.

Essential Questions

- How are the area and circumference of a circle related?
- How would you describe the difference between surface area and volume? What are real-world examples of when you might need to find each?
- Can an object have more than one net? Why or why not?

Key Concepts

- I can identify the formulas for the area and circumference of a circle. (7.GM.5)
- I can use the formulas for circumference and area of a circle to solve problems. (7.GM.5)
- I can explain the relationship between the circumference and the area of a circle. (7.GM.5)

Related Concepts

- I can solve problems involving volume of cylinders. (7.GM.6)
- I can solve problems involving volume of figures composed of right rectangular prisms. (7.GM.6)
- I can apply the volume formulas for cylinders and figures composed of right rectangular prisms to solve real-world problems. (7.GM.6)
- I can use nets to find the surface area of right rectangular prisms and cylinders. (7.GM.7)
- I can solve problems involving surface area of cylinders. (7.GM.7)
- I can solve problems involving surface area of right rectangular prisms. (7.GM.7)

Vocabulary

- Circumference
- Cylinder
- Net
- Rectangular prism
- Right rectangular prism
- Surface area
- Volume

Mathematical Processes

- PS.5 Use tools appropriately.
- PS.6 Attend to precision.

Resources

Proficiency Scales

- 7.GM.5

Digital

- IDOE Examples/Tasks 7.GM.5
- IDOE Examples/Tasks 7.GM.6
- IDOE Examples/Tasks 7.GM.7

Manipulatives

- **3D Geometric Solids**
- Algebra Tiles
- Colored Tiles
- Desmos Geometry
- Fraction Circles

		• Geoboards • Graph Paper • Interactive Cylinder • Interactive Prism • Interactive Pyramid • Paper Net Layouts • Pattern Blocks • Protractor • Ruler • Scientific Calculator • Straight Edge • Virtual Graph Paper

School Resources	
Textbook Module 9: Measure Figures 9-1 Circumference of Circles 9-2 Areas of Circles Supplement: Volume of Cylinders Supplement: Volume of Composite Right Rectangular Prisms Supplement: Surface Area of Cylinders and Nets Supplement: Surface Area of Right Rectangular Prisms and Nets 9-3 Volume (SKIP) 9-4 Surface Area (SKIP) 9-5 Volume and Surface Area of Composite Figures (SKIP)	**Formative Assessments**

General Description of the Unit

In this final unit, students will explore probability for likely the first time; no standards cover probability in the previous grade levels. Students will start by developing an understanding of the meaning of a probability value between 0 and 1. Then they will approximate the probability of an event occurring by collecting data. Finally, they will work with probability models to define the sample space, calculate the probability of each event occurring, and make predictions. They will also compare the probability model with actual observed frequencies.

Priority Standards

- **7.DSP.5:** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Understand that a probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. Understand that a probability of 1 indicates an event certain to occur and a probability of 0 indicates an event impossible to occur. Identify probabilities of events as impossible, unlikely, equally likely, likely, or certain.

Supporting Standards

- **7.DSP.6:** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its relative frequency from a large sample.
- **7.DSP.7:** Develop probability models that include the sample space and probabilities of outcomes to represent simple events with equally likely outcomes. Predict the approximate relative frequency of the event based on the model. Compare probabilities from the model to observed frequencies; evaluate the level of agreement and explain possible sources of discrepancy.

Enduring Understandings

- Numbers from 0 to 1 represent the likelihood of an event occurring, where 0 represents an impossible event and 1 represents an event certain to occur.
- Probability calculations can be applied to solve problems and make decisions.
- Estimations of the probability of an event can be made by running trials and collecting data; it is important to collect a large sample size.
- The expected probability that an event happens and the results from an actual experiment should be close, especially with a large sample. These two probabilities can be compared to find discrepancies in the results.

Essential Questions

- How can knowing the probability of an event impact decisions?
- What types of events could you conduct a trial to estimate its probability?
- Why do the results from an experiment not always match the expected results?

Key Concepts

- I can explain how the probability of an event ranges from 0, impossible, to 1, certain, with various levels of likelihood in between. (7.DSP.5)
- I can explain how an event that is equally likely or equally unlikely has a probability of about 0.5 or 1/2. (7.DSP.5)
- I can categorize and order the probabilities of events by their likelihood. (7.DSP.5)
- I can identify probabilities of events using words like impossible, very unlikely, unlikely, equally unlikely/unlikely, very likely, and certain to describe the probabilities of events. (7.DSP.5)

Related Concepts

- I can collect data to approximate probability. (7.DSP.6)
- I can use probability to predict the number of times an event will occur. (7.DSP.6)
- I can identify outcomes based on a possible event. (7.DSP.7)
- I can create a tree diagram to represent the sample space of simple events. (7.DSP.7)
- I can investigate, develop, and use probabilities to help me solve problems. (7.DSP.7)
- I can compare theoretical probabilities to observed frequencies. (7.DSP.7)
- I can develop a probability model and use it to determine the probability of an event occurring. (7.DSP.7)

Vocabulary

- Outcome
- Probability
- Probability model
- Relative frequency
- Sample space
- Simple event
- Theoretical probability

Mathematical Processes

- PS.3 Construct convincing arguments and critique the reasoning of others.
- PS.5 Use tools appropriately.

Resources

Proficiency Scales	Digital	Manipulatives
• 7.DSP.5	• IDOE Examples/Tasks 7.DSP.5 • IDOE Examples/Tasks 7.DSP.6 • IDOE Examples/Tasks 7.DSP.7	• Dice • Experimental Probability Spinner • Scientific Calculator • Spinner

School Resources

Textbook	Formative Assessments
Module 10: Probability 10-1 Find Likelihoods 10-2 Relative Frequency of Simple Events 10-3 Theoretical Probability of Simple Events 10-4 Compare Probabilities of Simple Events 10-5 Simulate Chance Events (Modify - no compound events)	

General Description of the Unit

Now students will shift gears to work with data analysis and statistics. In the 6th grade, students collected, interpreted, and displayed univariate data. Now students will apply all this knowledge to compare two sets of univariate data. Students will start by exploring the characteristics of a valid sample and generating multiple samples. Then students will compare two data sets by analyzing graphical representations, measures of center (including the Mean Absolute Deviation for the first time), and measures of spread. They will use these analyses to make inferences about the similarities and differences between two different populations.

Note that 11.1 needs to include a focus on valid sampling methods; 11.4 will need to be supplemented to introduce the Mean Absolute Deviation for the first time.

Priority Standards

- **7.DSP.3:** Find, use, and interpret measures of center (mean and median) and measures of spread (range, interquartile range, and mean absolute deviation) for numerical data from random samples to draw comparative inferences about two populations.

Supporting Standards

- **7.DSP.1:** Understand that statistics can be used to gain information about a population by examining a sample of the population. Understand that conclusions and generalizations about a population from a sample are valid only if the sample is representative of that population and that random sampling tends to produce representative samples and support valid inferences.
- **7.DSP.2:** Use data from a random sample to draw inferences about a population. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
- **7.DSP.4:** Make observations about the degree of visual overlap of two numerical data distributions represented in line plots or box plots. Describe how data, particularly outliers, added to a data set may affect the mean and/or median.

Enduring Understandings

- Measures of central tendency and spread are statistical summaries that inform us about the results. Each method of central tendency and spread give us slightly different information about the data.
- The results of an unbiased data sample tend to be proportional to the entire population.
- A larger sample size and multiple samples with the same results increase the likelihood the results are accurate.
- Visual displays of data highlight various features of a data set and can help us compare different populations.
- Outliers do not follow the pattern among their data set and can alter the accuracy of the prediction being made.

Essential Questions

- Why is it important to be able to represent data using measures of central tendency?
- How can data be used to inform us about the general population? How can it be used to mislead the general population?
- What are the benefits of performing the same experiment multiple times?
- How do different displays help you interpret data?

Key Concepts

- I can find similarities and differences in two different data sets. (7.DSP.3)
- I can compare and draw conclusions from two populations based off their means, medians and/or range, interquartile range, or mean absolute deviation. (7.DSP.3)
- I can find, use, and interpret various measures of center. (7.DSP.3)
- I can find, use, and interpret various measures of spread. (7.DSP.3)

Related Concepts

- I can explain why generalizations made about a population from a sample are only valid if the sample represents that population. (7.DSP.1)
- I can identify when random sampling has or has not occurred. (7.DSP.1)
- I can verify whether a sample is representative of a given population. (7.DSP.1)

Vocabulary

- Box plot
- Inference
- Interquartile range
- Line plot
- Mean
- Mean absolute deviation
- Measures of center
- Measures of spread
- Median
- Outlier
- Population
- Random sample

	• I can explain that inferences about a population can be made by examining a sample. (7.DSP.2) • I can use data from a random sampling to draw conclusions about a population. (7.DSP.2) • I can generate multiple samples to gauge predictions. (7.DSP.2) • I can compare two data distributions represented by line plots or box plots. (7.DSP.4) • I can compare two sets of data within a single data display such as a line plot or box plot. (7.DSP.4) • I can identify outliers. (7.DSP.4) • I can describe the affect an outlier has on the mean and/or median (7.DSP.4)	• Random sampling • Range • Representative sample • Sample • Statistics • Variation

Mathematical Processes

- PS.3 Construct convincing arguments and critique the reasoning of others.
- PS.5 Use tools appropriately.

Resources

Proficiency Scales	Digital	Manipulatives
• 7.DSP.3	• IDOE Examples/Tasks 7.DSP.3 • IDOE Examples/Tasks 7.DSP.1 • IDOE Examples/Tasks 7.DSP.2 • IDOE Examples/Tasks 7.DSP.4	• Box Plot • Pie Chart • Scientific Calculator

School Resources

Textbook	Formative Assessments
Module 11: Sampling and Statistics 11-1 Biased and Unbiased Statistics 11-2 Make Predictions 11-3 Generate Multiple Samples 11-4 Compare Two Populations (Supplement: MAD) 11-5 Assess Visual Overlap	