Grade 7 Mathematics

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Modules of Study

Mod 3:	Operations with Integers	17 days	Semester 1
Mod 4:	Operations with Rational Numbers	17 days	Semester 1
Mod 1:	Proportional Relationships	12 days	Semester 1
Mod 2:	Percents	14 days	Semester 1
Mod 5:	Simplify Algebraic Expressions	14 days	Semester 2
Mod 6/ 7:	Write and Solve Equations and Inequalities	32 days	Semester 2
Mod 12:	Linear Relationships and Slope	14 days	Semester 2
Mod 8:	Geometric Figures	10 days	Semester 2
Mod 9:	Measure Figures	20 days	Semester 2
Mod 11:	Sampling and Statistics	10 days	Semester 2
Mod 10:	Probability	9 days	Semester 2

Appendices

Appendix A: Proficiency Scale Template

Appendix B: PLC Form

Standards Breakdown

Green: Priority Standards **Pink:** Supporting Standards **Gray:** Additional Standards

UNITS

Domain	Standard	3	4	1	2	5	6/7	8	9	10	11
Computation	1	Pink	Pink								
	2	Pink	Pink								
	3	Pink	Pink								
	4	Pink	Pink								
	5			Green				Green			
	6				Green						
	7	Pink	Pink								
	8	Green	Green								
Number Sense	1	Gray									
	2	Pink									
	3		Green								
Algebra and Functions	1					Pink					
	2						Green	Green			
	3						Pink				
	4				Green						
	5				Green						
	6			Pink							
	7			Green							
	8			Gray							
	9			Green	Green						
Geometry	1							Pink			
	2							Pink			
	3							Pink			
	4							Pink			
	5								Green		
	6								Pink		
	7								Gray		
Data Analysis, Statistics, and Probability	1									Pink	
	2									Pink	
	3									Green	
	4									Pink	
	5										Green
	6										Pink
	7										Pink

STA
NDA
RDS

General Description of the Unit

This unit begins with a five-day Lesson 0 that reviews important content. Then students will work with integer operations by extending the operations to negative numbers. 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 $(-1)(-1) = 1$. 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; this goal culminates in Unit 1B. Square roots and prime factorization are also included.

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 $-\left(\frac{p}{q}\right) = \frac{-p}{q} = \frac{p}{-q}$.
- **7.C.7:** Compute fluently with rational numbers using an algorithmic approach.
- **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

- 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 rational integers is the same as adding the additive inverse.
- Number lines can be used to subtract rational integers by finding the absolute difference between the two integers.
- 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.

Essential Questions

- What are real-world examples of when you may need to compute with negative numbers? Can you give an example for each operation and explain how your solution makes sense in the context?
- 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 rational 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?

• 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. • Composite numbers can be written as a product of the prime factors, which can be useful in finding the GCF or LCM.	

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) • 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)	• Absolute value • Additive inverse • Algorithmic approach • Composite number • Distributive Property • Dividend • Divisor • Factor tree • Integer • Inverse relationship • Opposite • Perfect square • Prime factorization • Prime number • Principal square root • Product • Properties of operations • Quotient • Rational number • Square root

	• 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)	

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 • IDOE Examples/Tasks 7.NS.2 • IDOE Examples/Tasks 7.NS.1	• Multiplication Chart • Scientific Calculator • Virtual Multiplication Chart • Virtual Number Line

School Resources

Textbook	Formative Assessments
Lesson 0: Lessons for the First Five Days Lesson 1: Understand Addition of Positive and Negative Integers Lesson 2: Understand Subtraction of Positive and Negative Integers Lesson 3: Add and Subtract Positive and Negative Integers Lesson 4A: Multiply and Divide Positive and Negative Integers Lesson 4B: Multiply and Divide Positive and Negative Integers	

STEM Resources	Cross-Curricular Resources

General Description of the Unit

In this unit, students extend the computational work they did with negative numbers to 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 and whole numbers). Additionally, students will explore irrational numbers for the first time. They will classify numbers as rational or irrational, as well as plotting both rational and irrational numbers on a number line. This work prepares students for the 8th grade, where they work with rational and decimal approximations of irrational numbers.

Priority Standards	Supporting Standards
• **7.C.8:** Solve real-world problems with rational numbers by using one or two operations. • **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.	• **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 $-\left(\frac{p}{q}\right) = \frac{-p}{q} = \frac{p}{-q}$. • **7.C.7:** Compute fluently with rational numbers using an algorithmic approach.

Enduring Understandings	Essential Questions
• The most appropriate operation should be chosen based on the context provided. • Number lines can pair with number sense to solve for an unknown measure in a real-world situation. • Rational approximations of irrational numbers can be used to compare the size of irrational numbers with rational numbers and other irrational numbers. • Computational fluency refers to efficiency, accuracy, and flexibility with computational strategies.	• What are real-world examples of when you may need to compute with negative numbers? Can you give an example for each operation and explain how your solution makes sense in the context? • Why do we approximate irrational numbers? • What is a real-world situation that would require addition of positive and negative numbers? • How are multiplying and dividing integers similar to multiplying and dividing positive numbers? How are they different? • Which integer operation do you think is the easiest, why? Which integer operation do you think is hardest, why?

Key Concepts	Related Concepts	Vocabulary
• I can solve real-world problems by adding, subtracting, multiplying, and dividing rational numbers. (7.C.8) • 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)	• 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 • Irrational number • Opposite • Product • Properties of operations • Quotient • Rational number

Mathematical Processes

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

Resources

Proficiency Scales	Digital	Manipulatives
• 7.C.8 • 7.NS.3	• IDOE Examples/Tasks 7.C.8 • IDOE Examples/Tasks 7.NS.3 • 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	• Scientific Calculator • Virtual Multiplication Chart • Virtual Number Line

School Resources

Textbook	Formative Assessments
Lesson 5: Terminating and Repeating Decimals Lesson 6: Multiply and Divide Rational Numbers Lesson 7: Add and Subtract Rational Numbers Lesson 8: Solve Problems with Rational Numbers	
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

In this unit students will focus on the unit rate, a concept they began working with in 6th grade. Students will apply the fraction operations they developed in earlier units to calculate a unit rate involving a ratio of two fractions. Students will also identify unit rates from tables, verbal descriptions, graphs, and equations; additionally, they will determine if a relationship is proportional from these different representations.

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.5:** Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

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).

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

- Unit rates are helpful for comparing two different rates and for finding larger equivalent rates.
- 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.
- (1, r) on a graph represents the unit rate, r in a proportional relationship.
- In a proportional relationship, the graph of the values in a coordinate plane forms a straight line through the origin.

Essential Questions

- What form of a proportional relationship do you prefer to look at to find the slope? Why?
- How does comparing quantities describe the relationship between them?
- How can you distinguish relationships that are proportional from relationships that are not proportional?
- When might it be more useful to look at the relationship between values on a graph instead of in a table or equation?

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)
- 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)

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 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)

Vocabulary

- Constant of proportionality
- Coordinates
- Equivalent ratios
- Linear function
- Origin
- Proportional relationship
- Ratio
- Slope
- Unit rate

• I can see the relationship between the unit rate and the slope, m. (7.AF.9) • 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) • I can compute a unit rate with quantities measured in unlike units. (7.C.5)		

Mathematical Processes

- PS.1 Make sense of problems and persevere in solving them.
- PS.2 Reason abstractly and quantitatively.
- 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.5	• IDOE Examples/Tasks 7.AF.7 • IDOE Examples/Tasks 7.AF.9 • IDOE Examples/Tasks 7.C.5 • IDOE Examples/Tasks 7.AF.6 • 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

School Resources

Textbook	Formative Assessments
Lesson 9: Ratios Involving Complex Fractions Lesson 10: Understand Proportional Relationships Lesson 11: Equations for Proportional Relationships	

STEM Resources	Cross-Curricular Resources

General Description of the Unit

After exploring the unit rate in the previous unit, students are ready to apply this concept to graph proportional relationships in the coordinate plane. This builds off 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. Slope will be defined as a rate of change and will be used to distinguish between linear and non-linear relationships. Students will apply the skills from this unit and the last one to solve real-world problems involving proportional relationships. This work prepares students for exploring all linear relationships in the 8th grade.

Priority Standards	Supporting 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. • **7.AF.5:** Graph a line given its slope and a point on the line. Find the slope of a line given its graph. • **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).	• None

Enduring Understandings	Essential Questions
• The slope represents the rate of change between two quantities. • 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. • The slope of a line is calculated as rise over run. • 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). • A proportional relationship can be expressed in a table, verbal description, graph, or equation. Each representation highlights different aspects of the relationship. • Fractions and decimals can be represented as a percent. Percents are frequently used in the real-world and understanding how to convert fractions and decimals to percents (and the other way around) can make calculations in the real-world more convenient.	• What is a situation between two variables that would likely result in a non-constant rate of change? • Why is it important to consider slope in problem situations? • Why is it useful to have various representations of proportional relationships? • How does comparing quantities describe the relationship between them?

Key Concepts	Related Concepts	Vocabulary
• 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)	• N/A	• Constant rate of change • Horizontal change • Linear function • Measurement system • Percent error • Percent increase/decrease • Proportional relationship • Ratio

• 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) • 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) • 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) • 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)		• Simple interest • Slope • Unit rate • 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 • 7.AF.5 • 7.AF.9 • 7.C.6	**Digital** • IDOE Examples/Tasks 7.AF.4 • IDOE Examples/Tasks 7.AF.5 • IDOE Examples/Tasks 7.AF.9 • IDOE Examples/Tasks 7.C.6	**Manipulatives** • Algebra Tiles • Colored Tiles • Coordinate Grid • Fraction Circles • Graph Paper • Graphing Calculator • Pattern Blocks • Quadrant One Grid • Scientific Calculator

School Resources	
Textbook Lesson 12: Problem-Solving with Proportional Relationships Lesson 13A: Proportional Relationships Lesson 13B: Slope and Linear Functions Lesson 13C: Graph Linear Functions	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

After working with operations on rational numbers, students are now prepared to apply this skill to expressions, equations, and inequalities. First, students will work with expressions. They will focus on the distributive property and on factoring out a common number to produce equivalent expressions; additionally, they will explain each property used when simplifying an expression. It is important to note that 7.AF.1 is a priority on iLearn, even though it is listed as s supporting standard in this map.

Priority Standards	Supporting Standards
• None	• **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.
Enduring Understandings	**Essential Questions**
• Properties of operations can be used to rewrite an expression in equivalent forms, assisting in reaching a solution to an equation.	• Given an expression, what are some techniques that could be applied to generate equivalent expressions?

Key Concepts	Related Concepts	Vocabulary
• N/A	• 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) • 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)	• Associative Property • Commutative Property • Distributive Property • Equivalent expressions • Identity Property • Inverse Property • Like terms • Linear expressions

Mathematical Processes

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

Resources

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

School Resources	
Textbook Lesson 14: Equivalent Linear Expressions Lesson 15: Writing Linear Expressions	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

Now students will apply their work with expressions to solve equations and inequalities with variables on one side of the equal sign (or inequality). The coefficients can be any rational numbers, including negative fractions, and can include the distributive property. Students should graph the solution to inequalities on a number line. The ultimate goal of this unit is for students to model a real-world situation with an equation or inequality, 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.	• **7.AF.3:** Solve inequalities of the form $px + q$ ($>$ or $\geq$) r or $px + q$ ($<$ or $\leq$) 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.
Enduring Understandings	**Essential Questions**
• Equations can be used to model and solve for a relationship between quantities. • The solution to an inequality is often a set of numbers that can be plotted on a number line. • The context of a problem determines the reasonableness of a solution.	• How can I use equations to solve real-word problems? • What are the similarities and differences in the procedures for solving and expressing the solutions of equations and inequalities? • How do I know when a result is reasonable?

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)	• 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)	• Rational numbers • Solution set

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 • IDOE Examples/Tasks 7.AF.3	• Algebra Tiles • Scientific Calculator • Virtual Number Line

School Resources	
Textbook Lesson 16: Solve Problems with Equations Lesson 17: Solve Problems with Inequalities	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

The course now shifts gears into geometry. This first geometric unit begins by looking at 2-dimensional shapes. Five distinct topics are covered. First, students will explore what groups of sides and angles will form a unique triangle, multiple triangles, or no triangles. Then, students will explore similarity in polygons, including the angle-angle criterion for triangles. This leads into the topic of scale drawings, which builds on earlier work done with unit rates. Next, students will develop and apply facts about angle measurements (vertical, adjacent, complementary, supplementary) to both mathematical and real-world settings.

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. • **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.	• **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.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.4:** Solve real-world and other mathematical problems using facts about vertical, adjacent, complementary, and supplementary angles.

Enduring Understandings	Essential Questions
• Depending on the angle measures and side lengths given, there may exist a unique triangle, multiple triangles, or no triangle with the conditions. • 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. • A scale drawing is a two-dimensional figure that is proportional to the dimensions of the figure in which it represents. • Recognizing and applying properties of angles and angle pair relationships can assist in solving real-world problems involving angle measures.	• 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? • What are some jobs or settings that would use scale drawings? • How can angle relationships be used to solve real-world problems?

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) • 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)	• 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)	• Adjacent angles • Angle-angle similarity • Complementary angles • Conditions • Polygons • Proportional reasoning • Ratio • Rational numbers • Scale drawings • Similarity • Supplementary angles • Triangle • Unique • Unit rate • Vertical angles

• I can compute a unit rate with quantities measured in unlike units. (7.C.5)	• I can solve for missing lengths and/or angles within similar polygons. (7.GM.2) • 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) • 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) • 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.AF.2 • 7.C.5	• IDOE Examples/Tasks 7.AF.2 • IDOE Examples/Tasks 7.C.5 • IDOE Examples/Tasks 7.GM.1 • IDOE Examples/Tasks 7.GM.2 • IDOE Examples/Tasks 7.GM.3 • IDOE Examples/Tasks 7.GM.4	• Algebra Tiles • Colored Tiles • Desmos Geometry • Fraction Circles • Geoboards • Graph Paper • Pattern Blocks • **Protractor** • **Ruler** • Scientific Calculator • Virtual Number Line

School Resources	
Textbook Lesson 18: Problem Solving with Angles Lesson 19A: Understand Conditions for Drawing Triangles Lesson 19B: Similar Figures Lesson 22: Scale Drawings	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

Now students move on to explore the area, surface area, and volume of shapes. First, students will work with the area and circumference of a circle. 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.

Priority Standards	Supporting 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.	• **7.GM.6:** Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms. **Additional Standards** • **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	**Essential Questions**
• The area and circumference of a circle are both directly related to the length of the radius. • Finding the volumes of cylinders and other right three-dimensional objects is done by considering the area of the base and the object's height; partioning complex objects into simpler objects is often a good strategy. • Different representations of a three-dimensional object, such a net, can help us understand the shape's properties and calculate the surface area.	• How are the area and circumference of a circle related? • How can volume be used to find answers to real-world problems? • Can an object have more than one net? Why or why not?

Key Concepts	Related Concepts	Vocabulary
• 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)	• 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)	• 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 ● Desmos Geometry ● Interactive Cylinder ● Interactive Prism ● Interactive Pyramid ● Paper Net Layouts ● Scientific Calculator

School Resources	
Textbook Lesson 20 (not aligned to an IAS standard): Areas of Composed Figures Lesson 21: Area and Circumference of a Circle Lesson 23: Volume of Solids Lesson 24: Surface Area of Solids Lesson 25: Understand Plane Sections of Prisms and Pyramids	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

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, and measures of spread. They will use these analyses to make inferences about the similarities and differences between two different populations.

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 center?
- 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)
- I can explain that inferences about a population can be made by examining a sample. (7.DSP.2)

Vocabulary

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

	• 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)	• 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 Lesson 26: Understand Random Samples Lesson 27: Making Statistical Inferences Lesson 28: Use Mean and Mean Absolute Value Deviation to Compare Data Lesson 29: Use Measures of Center and Variability to Compare Data	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

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	• Deck of Cards • Dice • Virtual Probability Simulators • Scientific Calculator • Spinner

School Resources

Textbook	Formative Assessments
Lesson 30: Understand Probability Concepts Lesson 31: Experimental Probability Lesson 32: Probability Models	
STEM Resources	**Cross-Curricular Resources**