School City of East Chicago

BLOCK

CARDINAL NATION!

Grade 8 Mathematics

Grade 8 Mathematics

Units of Study

Appendices

Standards Breakdown

Green: Priority Standards **Pink:** Supporting Standards

UNITS

STANDARDS		1	2	3	6	5	4	7	8	9
Computation	1	Green								
	2	Pink								
Number Sense	1	Green								
	2	Green								
	3	Pink								
	4	Pink								
Algebra and Functions	1		Green							
	2		Green							
	3			Pink						
	4			Pink						
	5			Green						
	6			Green						
	7			Pink						
	8					Green				
Geometry	1							Pink		
	2							Green		
	3				Pink					
	4				Pink					
	5				Green					
	6				Pink					
	7						Pink			
	8						Green			
	9						Pink			
Data Analysis, Statistics, and Probability	1								Pink	
	2								Pink	
	3								Green	
	4									Pink
	5									Pink
	6									Pink

General Description of the Unit

The heart of this unit is rational and irrational numbers and operations. In 7th grade students explored fraction operations on both positive and negative numbers. Now students will expand this from performing two operations (as they did in 7th grade) to performing multiple operations with rational numbers. Additionally, they will convert between decimal and rational forms. Irrational numbers were also introduced in the 7th grade; now students will explore irrational numbers at a deeper level. This includes comparing their decimal approximation to the decimal equivalent of a rational number, plotting irrational numbers on the number line, and finding rational approximations of irrational numbers. The final topic in this unit is exponent notation. In the 7th grade, simple exponent notation and square roots were taught. Now students will simplify number expressions involving exponents and will solve simple quadratic equations ($x^2 = p$). Working with scientific notation in real-world settings is a topic that is rarely tested on iLearn but should still be covered in this unit. This unit serves as an important foundation to the quadratics work students will do in Algebra 1.

Priority Standards	Supporting Standards
• **8.C.1:** Solve real-world problems with rational numbers by using multiple operations. • **8.NS.1:** Give examples of rational and irrational numbers and explain the difference between them. Understand that every number has a decimal equivalent. For rational numbers, show that the decimal equivalent terminates or repeats, and convert a repeating decimal into a rational number. • **8.NS.2:** Use rational approximations of irrational numbers to compare the size of irrational numbers, plot them approximately on a number line, and estimate the value of expressions involving irrational numbers	• **8.C.2:** Solve real-world and other mathematical problems involving numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Interpret scientific notation that has been generated by technology, such as a scientific calculator, graphing calculator, or excel spreadsheet. • **8.NS.3:** Given a numeric expression with common rational number bases and integer exponents, apply the properties of exponents to generate equivalent expressions. • **8.NS.4:** Use square root symbols to represent solutions to equations of the form $x^2 = p$, where p is a positive rational number.
Enduring Understandings	**Essential Questions**
• A rational approximation of an irrational number helps us understand the number in order to compare it with another number or plot it on a number line. • Both rational and irrational numbers are real numbers with a decimal expansion. However, rational numbers can be expressed as a fraction, and their decimals are either terminating or repeating. Irrational numbers cannot be expressed as fractions, and their decimal expansion will go on forever. • The properties of exponents are used to simplify a numeric expression, resulting in an expression that is simpler to compute. • Square roots help solve a quadratic equation; the solution may be rational, irrational, or nonexistent. • Scientific notation makes it easier to work with very large or very small numbers.	• Why is it important to be able to work comfortably with operations on rational numbers? • Why do we approximate irrational numbers? • How are rational and irrational numbers related? • How do the properties of exponents assist in computation? • What features of an equation of the form $x^2 = p$ will result in an irrational solution? • What types of real-world quantities might be expressed in scientific notation?

Key Concepts	Related Concepts	Vocabulary
• I can solve real-world problems by adding, subtracting, multiplying, and dividing rational numbers. (8.C.1) • I can classify rational and irrational numbers. (8.NS.1) • I can show that every number has a decimal equivalent. (8.NS.1)	• I can write an estimation of a large quantity by expressing it as the product of a single-digit number and a positive power of ten. (8.C.2) • I can write an estimation of a very small quantity by expressing it as the product of a single-digit number and a negative power of ten. (8.C.2)	• Equivalent expressions • Integer • Inverse operation • Irrational number • Negative Exponent Rule • Non-perfect square • Perfect square • Power of a Power • Principal root • Product of Powers

• I can show that the decimal equivalent eventually repeats for rational numbers. (8.NS.1) • I can change every repeating decimal into a rational number. (8.NS.1) • I can estimate irrational numbers with rational approximations. (8.NS.2) • I can use estimate values to compare two or more irrational numbers. (8.NS.2) • I can plot irrational numbers on a number line using rational approximations. (8.NS.2) • I can estimate the value of expressions that use irrational numbers. (8.NS.2) • I can estimate the square root of non-perfect squares. (8.NS.2)	• I can compare quantities written in scientific notation. (8.C.2) • I can compute with two numbers expressed in scientific notation. (8.C.2) • I can interpret scientific notation that has been generated by technology. (8.C.2) • I can apply the product of powers property to simplify expressions with integer exponents. (8.NS.3) • I can apply the power of a product property to simplify expressions with integer exponents. (8.NS.3) • I can apply the power to a power rule to simplify expressions with integer exponents. (8.NS.3) • I can apply the quotient of powers to simplify expressions with integer exponents. (8.NS.3) • I can apply the negative exponent rule to simplify expressions with integer exponents. (8.NS.3) • I can apply the zero-exponent rule to simplify expressions with integer exponents. (8.NS.3) • I can use the properties of integer exponents to simplify expressions. (8.NS.3) • I can identify equivalent expressions. (8.NS.3) • I can generate equivalent expressions using the properties of exponents. (8.NS.3) • I can use square root symbols to represent the solutions to quadratic equations. (8.NS.4) • I can represent solutions to equations of the form x^2 = p as both positive and negative. (8.NS.4) • I can determine which solution (positive, negative, both) is appropriate in a given situation. (8.NS.4)	• Properties of Exponents • Quotient of Powers • Rational number • Repeating • Scientific notation • Square root • Terminating • Zero Exponent Rule

Mathematical Processes

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

Resources

Proficiency Scales	Digital	Manipulatives
• 8.NS.1	• IDOE Examples/Tasks 8.C.1 • IDOE Examples/Tasks 8.NS.1 • IDOE Examples/Tasks 8.NS.2 • IDOE Examples/Tasks 8.C.2 • IDOE Examples/Tasks 8.NS.3 • IDOE Examples/Tasks 8.NS.4	• Graph Paper • Multiplication Chart • Scientific Calculator • Virtual Coordinate Plane • Virtual Number Line

School Resources	
Textbook **Lessons:** Lesson 0: Lessons for the First Five Days Lesson 1: Properties of Integer Exponents Lesson 2: Square Roots Lesson 3A: Understand Rational and Irrational Numbers Lesson 3B: Solve Problems with Rational Numbers Lesson 4: Scientific Notation Lesson 5: Operations and Scientific Notation	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

Now students will work with linear equations and inequalities. In the 7th grade students solved simple linear equations and inequalities. Now students will work with multi-step equations and inequalities, including problems that involve combining like terms. Students should also model and solve real-world situations with these equations and inequalities. Additionally, students will write equations that have a given number of solutions (0, 1, or infinite) and will justify their equation. A spiral review of equations and inequalities from the 6th and 7th grades can also be included in this unit.

Priority Standards

- **8.AF.1:** Solve linear equations and inequalities with rational number coefficients fluently, including those whose solutions require expanding expressions using the distributive property and collecting like terms. Represent real-world problems using linear equations and inequalities in one variable and solve such problems.
- **8.AF.2:** Generate linear equations in one variable with one solution, infinitely many solutions, or no solutions. Justify the classification given.

Supporting Standards

- None

Enduring Understandings

- Real-world situations can be modeled with equations and inequalities. When a relationship needs to be exactly the same, an equation is usually used. Inequalities are typically used when a minimum or maximum value is needed.
- When solving a linear inequality, the direction of the inequality changes if both sides are multiplied or divided by a negative number.
- Linear equations will either have one solution, no solution, or infinitely many solutions.

Essential Questions

- What are the similarities/differences in solving and expressing the solutions to equations and inequalities?
- What phrases in a word problem indicate that an equation would be the best model? What phrases indicate an inequality?
- What are some key properties of a linear equation with infinitely many solutions? What about those with no solution?

Key Concepts

- I can solve linear equations and inequalities with one variable. (8.AF.1)
- I can solve a linear equation and inequalities by using the distributive property and combining like terms. (8.AF.1)
- I can write and solve equations and inequalities in one variable to represent real-world problems. (8.AF.1)
- I can simplify a linear equation to determine whether it has one solution, no solutions, or infinitely many solutions. (8.AF.2)
- I can give examples of linear equations with one solution, no solutions, or infinitely many solutions. (8.AF.2)

Related Concepts

- N/A

Vocabulary

- Coefficient
- Collecting (combining) like terms
- Distributive Property
- Equivalent equation
- Infinitely many solutions
- Linear equation
- Linear inequality
- Rational number

Mathematical Processes

- PS.1: Make sense of problems and persevere in solving them.
- PS.8 Look for and express regularity in repeated reasoning.

Resources		
Proficiency Scales • 8.AF.1 • 8.AF.2	**Digital** • IDOE Examples/Tasks 8.AF.1 • IDOE Examples/Tasks 8.AF.2	**Manipulatives** • Algebra Tiles • Graph Paper • Virtual Coordinate Plane • Multiplication Chart • Scientific Calculator • Virtual Number Line

School Resources	
Textbook **Lessons:** Lesson 13: Solve Linear Equations with Rational Exponents Lesson 14: Solutions of Linear Equations **Optional Spiral Review Lessons:** 7th Grade Unit 3 Lesson 16: Solve Problems with Equations 7th Grade Lesson 17: Solving Problems with Inequalities 6th Grade Unit 3 Lesson 19: Solve Equations 6th Grade Lesson 20: Solving Inequalities	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

In this unit, students are introduced to the concept of a function for the first time. After developing a definition for a function, students will extend this definition to linear relationships. In the 7th grade, students worked with simple proportional relationships of the form $y = mx$. Now students are ready to work with equations of the form $y = mx + b$ by understanding them as linear functions where m is the slope and b the y-intercept. They will also compare linear and non-linear functions in different forms. Students will translate between the graph, verbal description, key features, table of values, and equation of a linear function. They will also compare two functions that are given in different forms, both with and without a real-world context.

Priority Standards

- **8.AF.5:** Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. Describe similarities and differences between linear and nonlinear functions from tables, graphs, verbal descriptions, and equations.
- **8.AF.6:** Construct a function to model a linear relationship between two quantities given a verbal description, table of values, or graph. Recognize in $y = mx + b$ that m is the slope (rate of change) and b is the y-intercept of the graph, and describe the meaning of each in the context of a problem.

Supporting Standards

- **8.AF.3:** Understand that a function assigns to each x-value (independent variable) exactly one y-value (dependent variable), and that the graph of a function is the set of ordered pairs (x, y).
- **8.AF.4:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear, has a maximum or minimum value). Sketch a graph that exhibits the qualitative features of a function that has been verbally described.
- **8.AF.7:** Compare properties of two linear functions given in different forms, such as a table of values, equation, verbal description, and graph (e.g., compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed).

Enduring Understandings

- Functions with a constant rate of change will have the equation $y = mx + b$ and will form a straight line. Not all functions are linear and will instead have a varying rate of change.
- Linear functions represent situations involving a constant rate of change.
- The y-intercept is the point $(0, y)$ on a table or graph; it is the b in the equation $y = mx + b$; in a verbal description, it is usually the starting value.
- The slope of a function is the rise over run between two points from a table or graph; it is the m in the equation $y = mx + b$; in a verbal description, it is the rate of change between the two quantities.
- All functions have one output for every input. The relationship of the ordered pairs of inputs and outputs can be expressed both graphically and algebraically.
- Functions can be represented in a table, algebraically, graphically, and verbally. Key information about the function is revealed in each representation, though some representations may make certain features more or less visible.

Essential Questions

- What types of real-world situations can be represented with a graph? What might the graph reveal about the situation?
- What makes a relationship linear?
- What types of real-world situations can be modeled with a linear function? What would the slope and y-intercept mean in the situation?
- How can you check if an ordered pair will lie on the graph of the function?
- Which representation of a function do you prefer to work with? Why?

Key Concepts

- I can explain that an equation in the form of y = mx + b represents the graph of a linear relationship. (8.AF.5)

Related Concepts

- I can define a function as a rule, where for each input there is exactly one output. (8.AF.3)
- I can identify the independent and dependent variables. (8.AF.3)

Vocabulary

- Decreasing
- Dependent variable
- Distance-time graph
- Function
- Increasing

• I can give examples of relationships and create a table of values that can be defined as non-linear. (8.AF.5) • I can compare and contrast linear and nonlinear functions from tables, graphs, equations, and verbal descriptions. (8.AF.5) • I can write a linear equation given a table of values. (8.AF.6) • I can write a linear equation given a graph. (8.AF.6) • I can write a linear equation given a verbal description. (8.AF.6) • I can explain why the equation y = mx + b represents a linear function. (8.AF.6) • I can find the slope and y-intercept in a linear function. (8.AF.6) • Given an equation in slope-intercept form, I can interpret the slope and y-intercept in context. (8.AF.6)	• Given a graph or table, I can determine whether the relation is a function. (8.AF.3) • I can show the relationship between inputs and outputs of a function by graphing them as ordered pairs on a coordinate grid. (8.AF.3) • I can identify where a graph is increasing or decreasing. (8.AF.4) • I can classify a graph as linear or nonlinear. (8.AF.4) • I can locate maximum and minimum values on a graph, when present. (8.AF.4) • I can match the graph of a function to a given situation. (8.AF.4) • I can sketch a graph that exhibits the qualitative features of a function that has been described verbally. (8.AF.4) • I can compare the properties of two linear functions that are represented differently (as equations, tables, graphs, or verbal). (8.AF.7) • I can interpret and analyze distance-time graphs and equations. (8.AF.7)	• Independent variable • Linear • Linear function • Linear relationship • Maximum value • Minimum value • Nonlinear • Nonlinear function • Ordered pair • Qualitative • Rate of change • Relation • Slope • y-intercept

Mathematical Processes

- PS.1: Make sense of problems and persevere in solving them.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales	Digital	Manipulatives
• 8.AF.5 • 8.AF.6	• IDOE Examples/Tasks 8.AF.5 • IDOE Examples/Tasks 8.AF.6 • IDOE Examples/Tasks 8.AF.3 • IDOE Examples/Tasks 8.AF.4 • IDOE Examples/Tasks 8.AF.7	• Coordinate Grid • Graphing Calculator • Quadrant One Grid • Scientific Calculator • Virtual Coordinate Plane

School Resources

Textbook	Formative Assessments

Lessons: Lesson 6: Understand Functions Lesson 7: Compare Functions Lesson 8: Understand Linear Functions Lesson 9: Analyze Linear Functions Lesson 10: Graphs of Functional Relationships Lesson 11: Represent Proportional Relationships Lesson 12: Understand the Slope-Intercept Equation for a Line	
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

This unit serves as an introduction to transformations, a concept that will be new to students. Students will work with rotations, reflections, translations, and dilations. They will verify many properties of the transformations and will work with the transformations on the coordinate plane. Then students will use these transformations to define the concepts of congruency and similarity. They will informally show that two figures are congruent or similar by describing a sequence of the appropriate transformations (i.e., dilations are only used for similarity) that map one figure onto the other. While no individual standard from this unit is priority on iLearn, taken together these standards compose a relatively significant portion of the test (up to 8 questions).

Priority Standards	Supporting Standards
• **8.GM.5:** Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations. Describe a sequence that exhibits the similarity between two given similar figures.	• **8.GM.3:** Verify experimentally the properties of rotations, reflections, and translations, including: lines are mapped to lines, and line segments to line segments of the same length; angles are mapped to angles of the same measure; and parallel lines are mapped to parallel lines. • **8.GM.4:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations. Describe a sequence that exhibits the congruence between two given congruent figures. • **8.GM.6:** Explore dilations, translations, rotations, and reflections on two-dimensional figures in the coordinate plane.
Enduring Understandings	**Essential Questions**
• Translation, rotation, and reflection are transformations that maintain key properties of an object, including length and angle measure. • Two figures are congruent if a series of transformations without a dilation can map one shape onto the other. • Two figures are similar if a series of transformations, possibly with a dilation, can map one shape onto the other. • When performing transformations on a shape in the coordinate plane, apply the transformations to the vertices.	• How are congruence and similarity alike? How are they different? • What objects in the real world have congruency? Similarity? • When performing a transformation on a figure in the coordinate plane, can the transformed shape be a different shape than the original image? Why or why not?

Key Concepts	Related Concepts	Vocabulary
• I can explain how transformations can be used to prove that two figures are similar. (8.GM.5) • I can describe a sequence of transformations that either prove or disprove that two figures are similar. (8.GM.5) • I can describe attributes of similar figures. (8.GM.5)	• I can verify the properties of rotated, reflected or translated geometric figures by measuring and comparing lengths of segments and measures of angles. (8.GM.3) • I can prove that lines and line segments remain the same length following a rotation, reflection, or translation. (8.GM.3) • I can confirm that angles have the same measure following a rotation, reflection, or translation. (8.GM.3) • I can verify that parallel lines remain parallel following a rotation, reflection, or translation. (8.GM.3) • I can explain that a two-dimensional figure is congruent to another after performing a series of	• Congruent • Coordinate • Coordinate notation • Dilation • Mapped • Parallel lines • Reflection • Rotation • Similar • Translation • Two-dimensional figure • Vector notation

	rotations, reflections and translations. (8.GM.4) • I can describe a sequence of transformations that shows the congruence between two figures. (8.GM.4) • I can describe the changes to the size and shape of a figure after a dilation in the coordinate plane. (8.GM.6) • I can explore translations in the coordinate plane. (8.GM.6) • I can use coordinate notation to describe a translation. (8.GM.6) • I can use vector notation to describe a translation. (8.GM.6) • I can explore a reflection across the x-axis, y-axis or the lines y = x or y = -x in the coordinate plane. (8.GM.6) • I can explore a rotation about the origin in the coordinate plane. (8.GM.6)	

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

Resources

Proficiency Scales	Digital	Manipulatives
• 8.GM.5	• IDOE Examples/Tasks 8.GM.5 • IDOE Examples/Tasks 8.GM.3 • IDOE Examples/Tasks 8.GM.4 • IDOE Examples/Tasks 8.GM.6	• Coordinate Grid • Desmos Geometry • Geogebra: Transformations Stations • Protractor • Scientific Calculator • Straightedge • Virtual Coordinate Plane

School Resources

Textbook	Formative Assessments
Lessons: Lesson 18: Understand Properties of Transformations Lesson 19: Transformations and Congruence Lesson 20: Transformations and Similarity	

STEM Resources	Cross-Curricular Resources

General Description of the Unit

This unit extends students' understanding of linear functions to a system of linear equations. This is the first time that students are introduced to the concept of a system of equations. Students will not do any algebraic manipulation of a system (which is saved for Algebra 1); instead, they interpret the solution to a system as the point of intersection between the two lines and approximate the solution by graphing. This unit can also serve as a place to spiral review much of the work they did last semester with equations and functions.

Priority Standards	Supporting Standards
• **8.AF.8:** Understand that solutions to a system of two linear equations correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously. Approximate the solution of a system of equations by graphing and interpreting the reasonableness of the approximation.	• None
Enduring Understandings	**Essential Questions**
• A linear system of equations is made up of two or more linear functions. A solution is an ordered pair that satisfies all equations in the system.	• Why is the solution to a linear system of equations an ordered pair and not just a single number?

Key Concepts	Related Concepts	Vocabulary
• I can explain the solution to a system of two linear equations in two variables as the point of intersection of their graph. (8.AF.8) • I can describe the point of intersection between two lines as the point that satisfies both equations at the same time. (8.AF.8) • I can estimate the solution to a system of linear equations and assess the reasonableness of my approximation. (8.AF.8)	• None	• Linear relationship • Point of intersection • Simultaneous • System of two linear equations

Mathematical Processes

- PS.1: Make sense of problems and persevere in solving them.
- PS.8 Look for and express regularity in repeated reasoning.

Resources

Proficiency Scales	Digital	Manipulatives
• 8.AF.	• IDOE Examples/Tasks 8.AF.8 • IDOE Examples/Tasks 8.DSP.3	• Coordinate Grid • Graphing Calculator • Quadrant One Grid • Scientific Calculator • Virtual Coordinate Plane

School Resources	
Textbook **Lessons:** Lesson 15: Understand Systems of Equations Lesson 16: Solve Systems of Equations Algebraically Lesson 17: Solve Problems Using Systems of Equations	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

This unit focuses entirely on the Pythagorean Theorem. Students should be able to explain the Pythagorean relationship with inductive reasoning (as opposed to a formal proof). After establishing the theorem, students will use the theorem in two ways. First, they will solve for an unknown side length in a right triangle; this should be both in mathematical settings and real-world settings. Second, they will apply the theorem to solve for the distance between two points in the coordinate plane. This does not need to develop into the distance formula, which is saved for the high school Geometry course. Note that 8.GM.9 is priority in iLearn even though it is a supporting standard in this map.

Priority Standards

- **8.GM.8:** Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.

Supporting Standards

- **8.GM.7:** Use inductive reasoning to explain the Pythagorean relationship.
- **8.GM.9:** Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.

Enduring Understandings

- The Pythagorean Theorem states the square of the hypotenuse length is equal to the sum of the squares of the lengths of the legs in a right triangle.
- The Pythagorean Theorem can be used to find the distance between two points on a coordinate grid.

Essential Questions

- What is a verbal or visual explanation for the relationship between the sides of a right triangle described in the Pythagorean Theorem?
- How can the Pythagorean Theorem be applied in a real-world situation?
- How does the Pythagorean Theorem relate to the distance between two points?

Key Concepts

- I can draw a diagram and use the Pythagorean Theorem to solve real world problems involving right triangles. (8.GM.8)
- I can apply the Pythagorean Theorem to find an unknown side length of a right triangle. (8.GM.8)

Related Concepts

- I can understand how to use inductive reasoning to make conjectures. (8.GM.7)
- I can use inductive reasoning to explain the Pythagorean Theorem. (8.GM.7)
- I can create a right triangle given two points on a coordinate grid. (8.GM.9)
- I can apply the Pythagorean Theorem to find the distance between two points in a coordinate system. (8.GM.9)

Vocabulary

- Inductive reasoning
- Pythagorean relationship
- Pythagorean Theorem
- Right triangle

Mathematical Processes

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

Resources

Proficiency Scales

- 8.GM.8

Digital

- IDOE Examples/Tasks 8.GM.8
- IDOE Examples/Tasks 8.GM.7
- IDOE Examples/Tasks 8.GM.9

Manipulatives

- Coordinate Grid
- Desmos Geometry
- Scientific Calculator

School Resources	
Textbook **Lessons:** Lesson 21: Understand Angle Relationships Lesson 22: Understand Angle Relationships in Triangles Lesson 23: Understand the Pythagorean Theorem Lesson 24: Solve Problems Using the Pythagorean Theorem Lesson 25: Distance in the Coordinate Plane	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

In this unit students continue to build their knowledge of three-dimensional shapes, a concept they've explored for several years at this point. Students should have already been exposed to the volume formulas for right rectangular prisms, cylinders, and objects composed of multiple right rectangular prisms. Now students are ready to add the volume of cones, spheres, and pyramids to the list; additionally, they will find the surface area of a sphere. In addition to working with volume, students will explore the attributes of these three-dimensional objects. Part of this exploration will be exploring slices of the three-dimensional objects.

Priority Standards	**Supporting Standards**
• **8.GM.2:** Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.	• **8.GM.1:** Identify, define, and describe attributes of three-dimensional geometric objects (right rectangular prisms, cylinders, cones, spheres, and pyramids). Explore the effects of slicing these objects using appropriate technology and describe the two-dimensional figure that results.
Enduring Understandings	**Essential Questions**
• There are three-dimensional figures all around us. Thus, we can use surface area and volume to find information such as the amount of paint needed to paint a bedroom, the amount of space a gift box can hold, or how much frosting can fill a pastry bag. • Different representations of a three-dimensional object, such as horizontal slices, can help us understand the shape's properties.	• How can surface area and volume be used to find answers to real-world problems? • What is one or more three-dimensional objects that could have a square cross section?

Key Concepts	**Related Concepts**	**Vocabulary**
• I can state and apply the formulas for the volumes of cones, spheres and pyramids. (8.GM.2) • I can state and apply the formula for surface area of a sphere. (8.GM.2) • I can solve real-world problems involving the volume of cones, spheres, and pyramids. (8.GM.2)	• I can identify three-dimensional figures based on specific attributes. (8.GM.1) • I can define three-dimensional figures based on specific attributes. (8.GM.1) • I can describe three-dimensional figures based on specific attributes. (8.GM.1) • I can make predictions regarding the two-dimensional figure formed when slicing a three-dimensional solid. (8.GM.1)	• Cone • Cylinder • Pyramid • Right rectangular prism • Slice • Sphere • Surface area • Volume

Mathematical Processes

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

Resources

Proficiency Scales	**Digital**	**Manipulatives**
• 8.GM.2	• IDOE Examples/Tasks 8.GM.2 • IDOE Examples/Tasks 8.GM.1	• 3D Geometric Solids • Virtual Prisms • Virtual Cylinders • Virtual Cones • Virtual Pyramids • Desmos Geometry • Scientific Calculator

School Resources	
Textbook **Lessons:** Lesson 26A: Describe Three-Dimensional Objects Lesson 26B: Understand Volume of Cylinders, Cones, and Spheres Lesson 27: Solve Problems with Cylinders, Cones, and Spheres	**Formative Assessments**
STEM Resources	**Cross-Curricular Resources**

General Description of the Unit

The lessons learned about linear functions are now ready to be applied to bivariate data analysis. Students will explore scatterplots by creating a scatterplot and describing any patterns in the data. Then students will work on fitting a linear model to the data, should a linear model be a good fit. Finally, students will use these models to make predictions and will interpret the meaning of the slope and y-intercept. \ This is the first time that students will work with bivariate data; in previous grades students only worked with univariate data. Even though 8.DSP.1 is listed as a supporting standard in this map, it is priority in iLearn.

Priority Standards

- **8.DSP.3:** Write and use equations that model linear relationships to make predictions, including interpolation and extrapolation, in real-world situations involving bivariate measurement data. Interpret the slope and y-intercept in context.

Supporting Standards

- **8.DSP.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantitative variables. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
- **8.DSP.2:** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and describe the model fit by judging the closeness of the data points to the line.

Enduring Understandings

- When a linear equation is the model of a data set, the slope and y-intercept reveal key information about the context; the equation can also be used to make predictions about additional data points.
- Scatter plots create a visual of bivariate data that helps reveal key features, such as associations and outliers.
- Outliers do not follow the pattern among their data set and can alter the accuracy of the prediction being made.
- Straight lines can be used as a model of a data set; a good model is one where the points are close to the line with a similar number of points below and above the line.

Essential Questions

- What is the potential impact of making a prediction from data that contains one or more outliers?
- How is representing bivariate data as a scatter plot an effective way to represent data?
- Is a straight line always a good model for a data set? Why or why not?

Key Concepts

- I can determine the equation of a trend line that approximates the linear relationships between the plotted points of two data sets. (8.DSP.3)
- I can interpret the y-intercept and slope of an equation based on collected data. (8.DSP.3)
- I can use the equation of a trend line to make predictions about additional data points. (8.DSP.3)

Related Concepts

- I can plot ordered pairs on a coordinate grid representing the relationship between two data sets. (8.DSP.1)
- I can identify an appropriate scale for each measurement data when constructing scatter plots. (8.DSP.1)
- I can accurately label the axes when constructing a scatter plot. (8.DSP.1)
- I can describe patterns such as clustering, positive or negative association and linear or nonlinear association. (8.DSP.1)
- I can identify outliers. (8.DSP.1)
- I can recognize if the data plotted on a scatter plot has a linear association or a nonlinear association. (8.DSP.2)

Vocabulary

- Bivariate
- Clustering
- Extrapolation
- Interpolation
- Linear association
- Linear relationship
- Negative association
- Outlier
- Positive association
- Scatter plot

	● I can draw a straight line to approximate the linear relationship between the plotted points of two data sets. (8.DSP.2) ● I can describe the fit of my line by evaluating the closeness of the data points to the line. (8.DSP.2)	

Mathematical Processes

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

Resources

Proficiency Scales	Digital	Manipulatives
● 8.DSP.3	● IDOE Examples/Tasks 8.DSP.3 ● IDOE Examples/Tasks 8.DSP.1 ● IDOE Examples/Tasks 8.DSP.2	● Coordinate Grid ● Graphing Calculator ● Quadrant One Grid ● Scientific Calculator ● Virtual Coordinate Plane

School Resources

Textbook	Formative Assessments
Lessons: Lesson 28: Scatter Plots Lesson 29: Scatter Plots and Linear Models Lesson 30: Solve Problems with Linear Models Lesson 31: Categorical Data in Frequency Tables	

STEM Resources	Cross-Curricular Resources

General Description of the Unit

In this final unit, students will deepen their understanding of probability, a concept that was first introduced in 7th grade. In 7th grade students worked with simple events; now they will explore compound events. Students will define a compound event, along with other associated terms (independent, dependent, complementary, and mutually exclusive). Then they will calculate the probability of compound events using lists, table, and tree diagrams. Finally, students will develop and use the multiplication counting principle. While no single standard in this unit is highly tested in iLearn, together these standards could compose up to 6 questions on the test.

Priority Standards	Supporting Standards
• None	• **8.DSP.4:** Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. Understand and use appropriate terminology to describe independent, dependent, complementary, and mutually exclusive events. • **8.DSP.5:** Represent sample spaces and find probabilities of compound events (independent and dependent) using organized lists, tables, and tree diagrams. • **8.DSP.6:** For events with a large number of outcomes, understand the use of the multiplication counting principle. Develop the multiplication counting principle and apply it to situations with a large number of outcomes.
Enduring Understandings	**Essential Questions**
• When two events are dependent, one event influences the probability of the other and needs to be considered when calculating the probability of both events. • A compound event is made up of two or more events. • When counting the number of outcomes of a compound event, the total can be found by applying the multiplication counting principle.	• How can probabilities be used to analyze and make fair decisions? • Why is it important to know if events are dependent or independent when calculating probabilities? • What are the limitations of the multiplication counting principle?

Key Concepts	Related Concepts	Vocabulary
• N/A	• I can find the sample space for a compound event. (8.DSP.4) • I can find the probability of a compound event. (8.DSP.4) • I can describe events as independent or dependent. (8.DSP.4) • I can identify events as mutually exclusive. (8.DSP.4) • I can identify the complement of an event. (8.DSP.4) • I can represent the sample space of independent and dependent events. (8.DSP.5) • I can create a tree diagram to show the sample space of a compound event. (8.DSP.5) • I can find the probability of a compound event using an organized list. (8.DSP.5) • I can find the probability of a compound event using a table. (8.DSP.5)	• Complementary events • Compound event • Dependent event • Independent event • Multiplication counting principle • Mutually exclusive events • Outcome • Sample space • Simple event • Tree diagram

	• I can find the probability of a compound event using a tree diagram. (8.DSP.5) • I can apply the multiplication counting principle to situations with a large number of outcomes. (8.DSP.6) • I can develop the multiplication counting principle through exploration. (8.DSP.6)	

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

Resources

Proficiency Scales	Digital	Manipulatives
• None	• IDOE Examples/Tasks 8.DSP.4 • IDOE Examples/Tasks 8.DSP.5 • IDOE Examples/Tasks 8.DSP.6	• Virtual Coin Flip • Deck of Cards • Dice • Scientific Calculator

School Resources

Textbook	Formative Assessments
Lessons: Lesson 32: Probability of Compound Events Lesson 33: Probability and Sample Spaces Lesson 34: The Counting Principle	
STEM Resources	**Cross-Curricular Resources**