



Park Hill School District

Building Successful Futures • Each Student • Every Day

8th Grade SPED Resource Mathematics Curriculum

Course Description: In 8th Grade Math, students deepen their mathematical understanding by connecting algebra, functions, and geometry to real-world situations. Instruction focuses on three critical areas:

- (1) developing and analyzing linear relationships by writing, solving, and interpreting equations and systems of equations, and modeling patterns in bivariate data;
- (2) building a strong understanding of functions, including how to represent, interpret, and compare functions across graphs, tables, equations, and verbal descriptions; and
- (3) exploring geometric relationships in two- and three-dimensional figures, including transformations, similarity, and the application of the Pythagorean Theorem to solve problems involving distance and shape.

Throughout the course, students reason mathematically, communicate their thinking, and apply problem-solving strategies to both abstract and real-world contexts. Emphasis is placed on making connections between concepts, using multiple representations, and developing persistence in tackling challenging tasks.

Curriculum Standards: Missouri Department of Elementary and Secondary Education (DESE)

**This document contains the entire 8th Grade Mathematics curriculum that is taught in a general education setting. Items that are highlighted in yellow have been designated as priority information that should be taught in the 8th Grade SPED Mathematics course. Accommodations and Modifications that are recommended to consider have been noted in red text.*

Scope and Sequence: (With Noted Suggested Timing for Resource Setting)

Timeframe	Unit	Instructional Topics
11 blocks	<u>1: Transformations</u>	<u>Topic 1: Transformations</u>
17 blocks 18 blocks	<u>2: Equations & Inequalities</u>	<u>Topic 1: Equations</u> <u>Topic 2: Inequalities</u>
24 blocks 23 blocks	<u>3: Functions & Linear Relationships</u>	<u>Topic 1: Functions & Linear Equations</u> <u>Topic 2: Scatterplots & Lines of Best Fit</u> <u>Topic 3: Systems of Linear Equations</u>
17 blocks 15 blocks	<u>4: Application of Exponential Properties</u>	<u>Topic 1: Exponents & Scientific Notation</u> <u>Topic 2: Real Numbers & The Pythagorean Theorem</u>
8 blocks 10 blocks	<u>5: Geometry</u>	<u>Topic 1: Angles & Triangles: <i>Parallel Lines & Transversals</i></u> <u>Topic 2: Volume & Similar Solids</u>
3 blocks	<u>6: Two-Way Tables</u>	<u>Topic 1: Data Analysis & Displays: <i>Two-Way Tables</i></u>

Unit 1: Transformations

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Transformations

Length of Unit: 11 blocks

Overview of Unit: Students explore how figures move and change in the coordinate plane through translations, rotations, reflections, and dilations. They investigate how transformations affect size, shape, and orientation, and build an understanding of congruence and similarity by analyzing sequences of transformations and applying them to real-world and geometric contexts.

Priority Standards for unit:

- 8.GM.A.3 Describe the effect of dilations, translations, rotations and reflections on two-dimensional figures using coordinates.

Supporting Standards for unit:

- 8.GM.A.1.a Verify experimentally the congruence properties of rigid transformations. Verify that angle measure, betweenness, collinearity and distance are preserved under rigid transformations.
- 8.GM.A.1.b Verify experimentally the congruence properties of rigid transformations. Investigate if orientation is preserved under rigid transformations.
- 8.GM.A.2.a Understand that two-dimensional figures are congruent if a series of rigid transformations can be performed to map the pre-image to the image. Describe a possible sequence of rigid transformations between two congruent figures.
- 8.GM.A.4.a Understand that two-dimensional figures are similar if a series of transformations (rotations, reflections, translations and dilations) can be performed to map the pre-image to the image. Describe a possible sequence of transformations between two similar figures.

Essential Questions:

1. How can we describe how a figure moves on a coordinate plane?
2. What stays the same and what changes during a transformation?
3. Which transformations create figures that are congruent or similar?
4. How can we describe a sequence of transformations?
5. How can similarity be used to solve real world problems?

Enduring Understanding/Big Ideas:

1. Figures can be described using transformations (translations, reflections, rotations, and dilations) which follow specific rules that map every point from the original figure to a new location.
2. Some transformations preserve distance and angle measure (rigid transformations - translations, rotations, reflections), while others change size but keep side lengths proportionate and angle measures congruent (similarity transformations - dilations).

3. Translations, rotations, and reflections create congruent figures, while dilations create similar figures.

4. A sequence of transformations describes the order of changes made to a figure on the coordinate plane to move it from its original position (the preimage) to a new position (the image).

5. Similarity allows us to use scale factors and proportional reasoning to find unknown measurements in real-world situations, such as maps, models, and indirect measurement.

Unit Engaging Scenario

Engaging Scenario 1 block

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

This engaging scenario is an adaptation of the Performance Task in Chapter 2 of Big Ideas. In this task students pretend they are a puppeteer. They track transformations algebraically as the puppet moves in the show and students are encouraged to write their own story about the puppet at the end of the scenario. It may be helpful to use a flashlight and make shadow puppets move closer and farther away from the light to launch this scenario. While students are encouraged to complete the scenario individually, they may want to collaborate on their “story” and perform their “puppet show” to culminate the scenario.

[Engaging Scenario Unit 1 Transformations](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Transformations

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
x-axis y-axis coordinate plane scale factor		angle of rotation center of dilation center of rotation clockwise congruent counterclockwise dilation enlargement image line of reflection	orientation preimage reduction reflection rigid transformation rotation similar figures similarity transformation transformation translation
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.GM.A.1.a 8.GM.A.1.b 8.GM.A.3	The student will translate figures in the coordinate plane.	• I can identify a translation. • I can find the coordinates of a translated figure. • I can use coordinates to translate a figure. ○ Using numbered coordinate plan	2.1 Translations
8.GM.A.1.a 8.GM.A.1.b 8.GM.A.3	The student will reflect figures in the coordinate plane.	• I can identify a reflection. • I can find the coordinates of a figure reflected in an axis. • I can use coordinates to reflect a figure in the x- or y-axis. ○ Using numbered coordinate plan	2.2 Reflections
8.GM.A.1.a 8.GM.A.1.b 8.GM.A.3	The student will rotate figures in the coordinate plane.	• I can identify a rotation. • I can find the coordinates of a figure rotated about the origin. • I can use coordinates to rotate a figure about the origin. ○ Using numbered coordinate plan	2.3 Rotations
8.GM.A.2.a	The student will	• I can identify congruent figures.	2.4 Congruent

	understand the concept of congruent figures.	I can describe a sequence of rigid transformations between two congruent figures	Figures
8.GM.A.3	The student will dilate figures in the coordinate plane.	- I can identify a dilation. - I can find the coordinates of a figure dilated with respect to the origin. - I can use coordinates to dilate a figure with respect to the origin. - Using numbered coordinate plan	2.5 Dilations
<i>8.GM.A.4.a</i>	The student will understand the concept of similar figures.	- I can identify similar figures. - I can describe a similarity transformation between two similar figures.	2.6 Similar Figures
<i>8.GM.A.2.a</i>	The student will describe a sequence of transformations.	I can describe a sequence of transformations.	2.2-2.6

Engaging Experience 1

Title: Transformation Logo Card Sort		Blocks: ¼
Learning Target(s): The student will describe a sequence of transformations.		Success Criteria: I can describe a sequence of transformations.
Rich Task: In this activity, students use their existing understanding of translations, reflections, and rotations to sort cards with different logos into different categories based on the transformation the logo displays. There is more than one correct answer to each card.		Instructional Suggestions: - This is a great unit opener. - Highlight different combinations of possible transformations (e.g. two 90 degree clockwise rotations vs one reflection and then a translation). - Have students try and come up with different possibilities for one card. - Have students do multiple rounds of sorting. Start off with congruent vs similar and then sort by different transformations. - Be sure to encourage students to use mathematics vocabulary when discussing this activity.

Student Math Practices:

●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8

Resources:

- [Transformation Logo Card Sort](#)

Engaging Experience 2

Title: Two Truths and a Lie		Blocks: $\frac{1}{4}$
Learning Target(s): The student will describe a sequence of transformations	Success Criteria: I can describe a sequence of transformations.	
Rich Task: Each group/partner will read all three statements, then discuss which statement they believe is the lie. They will explain their reasoning using math vocabulary. After the discussion, reveal the lie and explain why it is incorrect.		Instructional Suggestions: - Highlight misconceptions in the “lies” and highlight the most efficient combination of transformations. - Be sure to encourage students to use mathematics vocabulary when discussing this activity.
Student Math Practices: ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: Two-Truths and a Lie - Which is the best description - Multiple Transformations		
Modified Version: Do Experience together as a whole class activity.		

Engaging Experience 3

Title: Transformations Golf		Blocks: $\frac{1}{2}$
Learning Target(s): - The student will translate figures in the coordinate plane - The student will rotate figures in the coordinate plane - The student will reflect figures in the coordinate plane	Success Criteria: I can use various transformations to move a starting figure (pre-image) to a destination (image) in the coordinate plane.	
Rich Task: In this activity, students use their existing understanding of translations, reflections, and rotations to complete a round of transformation golf. For each challenge, their task is the same: Use one or more transformations to transform the pre-image onto the image. It is recommended you solve the challenges	Instructional Suggestions: - Highlight the variety of different solutions that students come up with. - Provide unique challenges for particular problems (e.g. “Can you solve it only using reflections?”) - Have students predict the result of their transformation before allowing	

yourself before assigning this activity.	them to proceed. ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8	
Resources: ● Desmos Transformations Golf	

Summary of Unit 1 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
1: Transformations	Translations	Big Ideas: 2.1 Translations Engaging Experiences: 1: Translations Logo Card Sort IXL Additional Resources: - Lesson: Translations - Skill: XUS - 8th Translations: graph the image	1 block
	Reflections	Big Ideas: 2.2 Reflections IXL Additional Resources: - Lesson: Reflection - Skill: NBM - 8th Reflections: graph the image	1 block
	Rotations	Big Ideas: 2.3 Rotations Engaging Experiences: 2: Two Truths and a Lie (modified version has been provided) IXL Additional Resources: - Lesson: Rotation - Skill: 5EQ - 7th Rotations: graph the image - Skill: HHS - 8th Rotations: find the coordinates - Skill: 7MB - 7th Identify reflections, rotations, and translations - Skill: UYL - 8th - Identify reflections, rotations, and translations	2 blocks 3 blocks

	Congruent Figures	Big Ideas: 2.4 Congruent Figures Engaging Experiences: 3: Transformation Mini Golf IXL Additional Resources: - Lesson: Congruence - Skill: LPP- 8th Congruence statements and corresponding parts	1 block
	Dilations	Big Ideas: 2.5 Dilations IXL Additional Resources: - Lesson: Dilations - Skill: 9T4 - 8th Dilations: graph the image	1 block
	Similar Figures	Big Ideas: 2.6 Similar Figures	1 block
	Sequence of Transformations	Big Ideas: 2.1 Translations 2.2 Reflections 2.3 Rotations 2.4 Congruent Figures 2.5 Dilations 2.6 Similar Figures IXL Additional Resources: - Lesson: Transformations - Skill: XPK - 8th Describe a sequence of transformations	2 blocks
		Review/Flex Days	1 block
		Test Day	1 block
Engaging Scenario: Transformations Use an end-of-unit exam as a summative assessment to assess unit skills.			1 block

Unit 2: Equations & Inequalities

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Equations & Inequalities

Length of Unit: 17 blocks

Overview of Unit: Students develop fluency in solving linear equations and inequalities, including multi-step equations and those with variables on both sides. They interpret solutions in context and represent inequalities on number lines. Emphasis is placed on reasoning about why procedures work and modeling real-world situations with equations and inequalities.

Priority Standards for unit:

- 8.EE1.C.7.a Solve linear equations and inequalities in one variable. Create and identify linear equations with one solution, infinitely many solutions or no solutions.
- 8.EE1.C.7.b Solve linear equations and inequalities in one variable. Solve linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and combining like terms.

Supporting Standards for unit:

- 8.GM.A.5.a Explore angle relationships and establish informal arguments. Derive the sum of the interior angles of a triangle.
- 8.GM.A.5.b Explore angle relationships and establish informal arguments. Explore the relationship between the interior and exterior angles of a triangle.
- 8.GM.A.5.d Explore angle relationships and establish informal arguments. Use the properties of similar figures to solve problems.

Essential Questions:

1. How do we solve multi-step equations and inequalities, including those with variables on both sides?
2. How do we determine the number of solutions to an equation or inequality?
3. How can we use algebraic processes to help solve real-world problems using equations and inequalities?
4. How do we use equations to find unknown angles or sides of a triangle?

Enduring Understanding/Big Ideas:

1. Multi-step equations and inequalities can be solved by simplifying each side using distribution and combining like terms, then using inverse operations and properties of equality to isolate the variable.
2. The number of solutions is determined by simplifying the equation: it may result in one solution, no solution (a false statement), or infinitely many solutions (a true statement).

3. Real-world situations can be translated into equations or inequalities, which can be solved algebraically, and the solution can be interpreted.
4. Use known relationships, such as the Triangle Sum Theorem, Exterior Angle Theorem, and proportional relationships of sides to write and solve equations that represent the missing values.

Unit Engaging Scenario

Engaging Scenario 1 block

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

In this scenario, students are presented with “puzzles” that represent equations with one variable. Students are tasked with building these equations based on description, solving them, and explaining why a magician’s algebra based magic trick works using the concepts of solving equations, inverse operations, and the concept of infinitely many solutions.

[Engaging Scenario 2 - Puzzle Problems as Applications of Solving Equations](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Equations and Inequalities

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
addition property of equality division property of equality no solution infinitely many solutions adjacent supplementary multiplication property of equality subtraction property of equality		distributive property inverse operations expression like terms variable solve evaluate simplify solution substitute	
		exterior angle interior angle similar figures remote interior remote exterior interior angles exterior angles	
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.EE1.C.7.b	The student will write and solve one-step equations.	- I can apply properties of equality to produce equivalent equations. - I can solve equations using addition, subtraction, multiplication, or division.	1.1 Solving Simple Equations
8.EE1.C.7.b	The student will write and solve multi-step equations.	- I can apply properties to produce equivalent equations. - I can solve multi-step equations. - I can use multi-step equations to model and solve real-life problems.	1.2 Solving Multi-Step Equations
8.EE1.C.7.a 8.EE1.C.7.b	The student will write and solve equations with variables on both sides with different kinds of solutions.	- I can apply properties to produce equivalent equations. - I can solve multi-step equations. - I can use multi-step equations to model and solve real-life problems. - I can identify equations with one solution, no solution, and infinitely many solutions.	1.3 Solving Equations with Variables on Both Sides
8.EE1.C.7.a 8.EE1.C.7.b	The student will write and solve inequalities	- I can apply properties to produce equivalent inequalities. - I can solve multi-step	Algebra 1 AGA 2022 Big Ideas

	with variables on both side	inequalities. • I can use multi-step inequalities to model and solve real-life problems. • I can identify inequalities with no solutions or infinitely many solutions.	Resource 2.1-2.4
8.GM.A.5.a 8.GM.A.5.b	The student will understand properties of interior and exterior angles of triangles.	• I can use equations to find missing angle measures of triangles. • I can use interior and exterior angles of a triangle to solve real-life problems.	3.2 Angles of Triangles
8.GM.A.5.d	The student will use similar triangles to find missing measures.	• I can use angle measures to determine whether triangles are similar. • I can use similar triangles to solve real-life problems.	3.4 Using Similar Triangles

Engaging Experience 1

Title: Discovering Equations		Blocks: ¼
Learning Target(s): ● The student will write and solve equations with variables on both sides with different kinds of solutions.	Success Criteria: ● I can apply properties to produce equivalent equations. ● I can solve multi-step equations. ● I can use multi-step equations to model and solve real-life problems	
Rich Task: ● Students will use properties of equality and models of coins and pouches to understand the concept of variables, equations, and inverse operations.	Instructional Suggestions: ● Have students determine how many coins are in each pouch. ● Then, have kids identify how the pouches represent the variable and the coins represent the constant. ● Have kids explain how and why we use inverse operations to identify the unknown quantity in the pouches. ● Complete one as a class, then have students work in groups to complete the activity. ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u>		
●MP1	●MP2	●MP3
●MP4	●MP5	●MP6
●MP7	●MP8	

Resources:

- [Engaging Experience #1 Discovering Equations \(bags and coins\).pdf](#)

Engaging Experience 2

Title: Determining the Number of Solutions to an Equation		Blocks: 1
Learning Target(s): • The student will write and solve equations with variables on both sides with different kinds of solutions		Success Criteria: • I can identify equations with one solution, no solution, and infinitely many solutions.
Rich Task: • Kids will solve the equations directly on the equation card and then place it in the column depending on if it has one solution, no solution or infinitely many solutions.		Instructional Suggestions: • Discuss WHY an equation has only one solution. • Discuss WHY an equation has no solution. • Discuss WHY an equation has infinitely many solutions. • Highlight common misconceptions. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.
Student Math Practices: •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8		
Resources: • Types of Solutions Card Sort.pdf		
Modified Version: Do Experience together in pairs or as a whole class. Number of Solutions Card Sort Modified.pdf		

Engaging Experience 3

Title: The Story of X		Blocks: ½
Learning Target(s): ● The student will write and solve equations with variables on both sides with different kinds of solutions	Success Criteria: ● I can apply properties to produce equivalent equations. ● I can solve multi-step equations.	
Rich Task: ● Students will use verbal descriptions to first write an equation. They will then use the verbal descriptions to work backward to “undo” the operations applied to x to find the solution.	Instructional Suggestions: ● Start by having kids write the equation based on the verbal description. ● Then, students match the verbal description to the equation cards. ● Lastly, students use the verbal description cards to work backwards to isolate or solve for x. ● Emphasize the use of inverse operations and solving by doing the verbal statements “backwards.” ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: ● Engaging Experience #2 Story of x.pdf		

Engaging Experience 4

Title: Inequality in Real Life		Blocks: ¼
Learning Target(s): • The student will write and solve inequalities with variables on both side	Success Criteria: • I can solve multi-step inequalities. • I can use multi-step inequalities to model and solve real-life problems.	
Rich Task: • Pose the question: You have recently opened a frozen yogurt shop right next to your school. You have decided that you are going to charge \$0.25 for a bowl and then \$0.40 per ounce for any yogurt and toppings. If a student comes in with \$5 and they want to buy a bowl of FroYo, how many ounces can they get?	Instructional Suggestions: • Pose the question and give students time to work through it. • Discuss what would happen if they don't want to buy the max amount of frozen yogurt. Is that ok? What does this mean? • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: • Inequality Problem		

Summary of Unit 2 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
	Solving Simple Equations	Big Ideas: 1.1 Solving Simple Equations IXL Additional Resources: - Lesson: Solving Equations - Skill: WLR - 6th Solve one-step equations with whole numbers - Skill: 7JV - 6th Solve one-step equations involving integers - Skill: WKM - 7th Solve one-step equations - Skill: 5J4 - 8th Solve one-step equations	1 block
1: Equations and Inequalities	Write and Solve Multi-Step Equations	Big Ideas: 1.2 Solving Multi-Step Equations Engaging Experiences: 1: Discovering Equations IXL Additional Resources: - Lesson: Multi-Step Equations - Skill: JXD - 8th Solve two-step equations - Skill: NSH - 7th - Solve two-step equations - Skill: Q2B - 8th Solve equations involving like terms - Skill: 55K - 8th Solve multi-step equations	4 blocks
	Write and Solve Multi-Step Equations with Variables on Both Sides	Big Ideas: 1.3 Solving Equations with Variables on Both Sides Engaging Experiences: 2: Determining the Solution to an Equation (modified version has been provided) 3: The Story of X	6 blocks

		IXL Additional Resources: - Lesson: Variables on Both Sides - Skill: ZYL - 8th Solve equations with variables on both sides	
	Solving Multi-Step Inequalities with Variables on Both Sides	Big Ideas: (Algebra Book) 2.2 Solving Inequalities Using Addition and Subtraction (Algebra Book) 2.3 Solving Inequalities Using Multiplication and Division (Algebra Book) 2.4 Solving Multi-Step Inequalities Engaging Experiences: 4: Inequalities in Real Life IXL Additional Resources: - Lesson: Inequalities - Skill: QWH - 7th Solve one-step inequalities - Skill: XGQ - 7th Solve two-step inequalities - Skill: 6AZ - 8th Solve multi-step inequalities	3 blocks
	Triangle Interior and Exterior Angles	Big Ideas: 3.2 Angles of Triangles IXL Additional Resources: - Lesson: Interior Angles of Triangles - Lesson: Exterior Angles of Triangles - Skill: JFJ - 8th Find missing angles in triangles - Skill: FMP - 8th Exterior Angle Theorem	1 block
	Similar Triangles	Big Ideas: 3.4 Using Similar Triangles IXL Additional Resources: - Lesson: Similar Triangles - Skill: TYZ - 8th Angle-angle criterion for similar triangles	1 block

		Review/Flex Days	1 block
		Test Day	1 block
Engaging Scenario: Puzzle Problems as Applications of Solving Equations Use an end-of-unit exam as a summative assessment to assess unit skills.			1 block

Unit 3: Functions & Linear Relationships

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Functions & Linear Relationships

Length of Unit: 24 blocks

Overview of Unit: Students develop a deep understanding of functions as relationships that assign each input exactly one output. They analyze and represent linear relationships using graphs, tables, equations, and verbal descriptions, interpreting key features such as slope and intercept in context. Students explore systems of linear equations as a way to compare two relationships and determine where they intersect, both graphically and algebraically. They also investigate bivariate data using scatter plots, describe patterns of association, and construct and interpret lines of best fit to model real-world situations. ***Note:** In order to make sure that this unit is built for student conceptual understanding, the sections and chapters from Big Ideas have been reordered. Please see the “Aligned Sections from Course Resource” column in each topic to find Big Ideas alignment.*

Priority Standards for unit:

- 8.F.A.1.b Explore the concept of functions. (The use of function notation is not required.) Determine if a relation is a function.
- 8.F.A.2 Compare characteristics of two functions each represented in a different way.
- 8.F.B.4.a Use functions to model linear relationships between quantities. Explain the parameters of a linear function based on the context of a problem.
- 8.EE1.B.6.a Apply concepts of slope and y-intercept to graphs, equations and proportional relationships. Explain why the slope (m) is the same between any two distinct points on a non-vertical line in the Cartesian coordinate plane.
- 8.EE1.B.6.b Apply concepts of slope and y-intercept to graphs, equations and proportional relationships. Derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b .
- 8.EE1.C.8.a Analyze and solve systems of linear equations. Graph systems of linear equations and recognize the intersection as the solution to the system.
- 8.EE1.C.8.b Analyze and solve systems of linear equations. Explain why solution(s) to a system of two linear equations in two variables correspond to point(s) of intersection of the graphs.
- 8.EE1.C.8.c Analyze and solve systems of linear equations. Explain why systems of linear equations can have one solution, no solution or infinitely many solutions.
- 8.EE1.C.8.d Analyze and solve systems of linear equations. Solve systems of two linear equations.
- 8.F.B.5 Describe the functional relationship between two quantities from a graph or a verbal description.

- 8.DSP.A.3 Interpret the parameters of a linear model of bivariate measurement data to solve problems.

Supporting Standards for unit:

- 8.F.A.1.a Explore the concept of functions. (The use of function notation is not required.) Understand that a function assigns to each input exactly one output.
- 8.F.A.1.c Explore the concept of functions. (The use of function notation is not required.) Graph a function.
- 8.F.A.3.a Investigate the differences between linear and nonlinear functions. Interpret the equation $y = mx + b$ as defining a linear function, whose parameters are the slope (m) and the y-intercept (b).
- 8.F.A.3.b Investigate the differences between linear and nonlinear functions. Recognize that the graph of a linear function has a constant rate of change
- 8.F.A.3.c Investigate the differences between linear and nonlinear functions. Give examples of nonlinear functions.
- 8.F.B.4.b Use functions to model linear relationships between quantities. Determine the parameters of a linear function.
- 8.F.B.4.c Use functions to model linear relationships between quantities. Determine the x-intercept of a linear function.
- 8.EE1.B.5.a Graph proportional relationships. Interpret the unit rate as the slope of the graph.
- 8.EE1.B.5.b Graph proportional relationships. Compare two different proportional relationships.
- 8.DSP.A.1 Construct and interpret scatter plots of bivariate measurement data to investigate patterns of association between two quantities.
- 8.DSP.A.2 Generate and use a trend line for bivariate data, and informally assess the fit of the line.

Essential Questions:

1. What makes a relation a function, and how can we represent it in different ways?
2. What makes a function linear, and how can we represent it in different ways?
3. How do we graph linear relationships?
4. How do we write a linear equation?
5. How can we use linear relationships to model real-world situations?
6. How can we determine if a relationship is linear or nonlinear?
7. How can we compare functions represented in different ways?
8. How can we determine the point of intersection of a system of linear equations, and what does it represent?
9. How can we determine the number of solutions to a system of linear equations?
10. How do we use a system of linear equations to model real-world situations?
11. How can we use scatter plots and lines of best fit to model patterns in data?
12. How can we use a line of best fit to make predictions?

Enduring Understanding/Big Ideas:

1. A relation is a function if each input has exactly one output, and functions can be represented using tables, graphs, equations, mapping diagrams, ordered pairs, and verbal descriptions.
2. A function is linear if it has a constant rate of change and it can be represented as a graph with a straight line, a table with a constant rate of change, or an equation.
3. Use slope and y-intercept or ordered pairs/a table of values to plot points that form a straight line.
4. Determine the rate of change (slope) and initial value (y-intercept) from a situation, table, graph, or two points, and express them in the form $y = mx + b$.
5. Linear relationships model real-world situations by using constant rates of change, allowing the prediction of outcomes and interpretation of slope, y-intercept, and or x-intercept in context.
6. A relationship is linear if it has a constant rate of change; if the rate of change varies, the relationship is nonlinear.
7. Functions can be compared by analyzing and translating between graphs, tables, equations, and verbal descriptions to determine key features like rate of change (slope) and initial value (y-intercept), increasing, decreasing, constant, discrete, and continuous.
8. The point of intersection is the solution to a system and represents the value(s) where both linear relationships are equal in context. The solution is found by graphing both equations or using the substitution or elimination methods.
9. A system can have one solution (intersecting lines, different slopes), no solution (parallel lines or same slope with different y-intercepts), or infinitely many solutions (the same line, same slopes, same y-intercept).
10. Write a system of linear equations to model the situation and use the intersection to find and interpret the solution.
11. Scatter plots show relationships between two variables, and lines of best fit model the overall trend to help describe and analyze the association.
12. A line of best fit can be used to estimate unknown values and make predictions by extending the trend of the data within a reasonable range.

Unit Engaging Scenario

Engaging Scenario 1 block

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

In this engaging scenario, students are assessed on the following topics: Functions, Linear equations (writing and graphing), systems of linear equations, scatter plots, and lines of best fit.

[Engaging Scenario: Functions and Linear Relationships](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Functions & Linear Equations

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
table ordered pairs x-coordinate y-coordinate Coordinate Plane		function function rule input independent dependent linear function	mapping diagram nonlinear function output relation
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.F.A.1.a 8.F.A.1.b 8.F.A.1.c	The student will understand the concept of a function.	● I can represent a relation as a set of ordered pairs. ● I can determine whether a relation is a function. ● I can use functions to solve real-life problems.	7.1 Relations and Functions
8.F.A.1.c 8.F.A.2 8.F.B.4..a	The student will represent functions in a variety of ways.	● I can write a function rule that describes a relationship. ● I can evaluate functions for given inputs. ● I can represent functions using tables and graphs.	7.2 Representations of Functions
8.EE1.B.6.a 8.F.B.4.a 8.F.A.1.c	The student will graph linear equations.	● I can create a table of values and write ordered pairs given a linear equation. ● I can plot ordered pairs to create a graph of a linear equation. ● I can use a graph of a linear equation to solve a real-life problem. (Engaging Experience)	4.1 Graphing Linear Equations
8.EE1.B.5.a 8.EE1.B.6.a 8.EE1.B.6.b 8.F.B.4.a	The student will find and interpret the slope of a line.	● I can explain the meaning of slope. ● I can find the slope of a line. ● I can interpret the slope of a line in a real-life problem.	4.2 Slope of a Line
8.EE1.B.5.a 8.EE1.B.5.b	The student will graph proportional	● I can graph an equation that represents a proportional	4.3 Graphing Proportional

8.EE1.B.6.a 8.F.B.4.a	relationships.	relationship. • I can write an equation that represents a proportional relationship. • I can use graphs to compare proportional relationships.	Relationships
8.EE1.B.6.b 8.F.B.4.a <i>8.F.B.4.b</i>	The student will graph linear equations in slope-intercept form.	• I can identify the slope and y-intercept of a line given an equation. • I can rewrite a linear equation in slope-intercept form. • I can use the slope and y-intercept to graph linear equations.	4.4 Graphing Linear Equations in Slope-Intercept Form
8.EE1.B.6.b <i>8.F.B.4.b</i> <i>8.F.B.4.c</i>	The student will graph linear equations in standard form.	• I can rewrite the standard form of a linear equation in slope-intercept form. • I can find intercepts of linear equations written in standard form. • I can use intercepts to graph linear equations.	4.5 Graphing Linear Equations in Standard Form
8.EE1.B.6.b 8.F.B.4.a <i>8.F.B.4.b</i>	The student will write equations of lines in slope-intercept form.	• I can find the slope and the y-intercept of a line. • I can use the slope and the y-intercept to write an equation of a line. • I can write equations in slope-intercept form to solve real-life problems.	4.6 Writing Equations in Slope-Intercept Form
<i>8.F.B.4.b</i> 8.EE1.B.6.b	The student will write equations of lines given two points.	• I can use a point on a line and the slope to write an equation of the line. • I can use any two points to write an equation of a line. • I can write equations in point-slope form to solve real-life problems.	4.7 Writing Equations in Point-Slope Form
8.F.A.2 <i>8.F.A.3.a</i> <i>8.F.A.3.b</i> 8.F.B.4.a <i>8.F.B.4.b</i> <i>8.F.B.4.c</i>	The student will use functions to model linear relationships.	• I can write linear functions to model relationships. • I can interpret linear functions in real-life situations.	7.3 Linear Functions

8.F.A.3.a 8.F.A.3.b 8.F.A.3.c 8.F.A.2 8.F.B.5	The student will understand differences between linear and nonlinear functions.	● I can recognize linear functions represented as tables, equations, and graphs. ● I can compare linear and nonlinear functions.	7.4 Comparing Linear and Nonlinear Functions
8.F.B.5	The student will use graphs of functions to describe relationships between quantities.	● I can describe relationships between quantities in graphs. ● I can sketch graphs given verbal descriptions of relationships.	7.5 Analyzing and Sketching Graphs

Engaging Experience 1

Title: Guess My Rule!		Blocks: ½					
Learning Target(s): ● The student will understand the concept of a function. ● The student will represent functions in a variety of ways.		Success Criteria: ● I can write a function rule that describes a relationship.					
Rich Task: ● Students will be given a scenario involving Ana and Ray. They are given a table and students have to guess the rule.		Instructional Suggestions: ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.					
<u>Student Math Practices:</u>							
●MP1	●MP2	●MP3	●MP4	●MP5	●MP6	●MP7	●MP8
Resources: ● task_81guess_my_rule-230503-164754.pdf							

Engaging Experience 2

Title: Comparing the Snowfall in Different Cities		Blocks: ½
Learning Target(s): • The student will graph linear equations.	Success Criteria: • I can create a table of values and write ordered pairs given a linear equation. • I can plot ordered pairs to create a graph of a linear equation. • I can use a graph of a linear equation to solve a real-life problem.	
Rich Task: • Students will create a table of ordered pairs based on information given on the snowfall rates of different cities. They will then graph the snowfall of 4 cities on one graph. They will compare the snowfall of each city.	Instructional Suggestions: • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
Student Math Practices: ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: • Graphing Linear Equations Exploration-retyped pdf.pdf		
Modified Version: Do Experience together as a whole class activity.		

Topic 2: Scatterplots & Lines of Best Fit

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
<i>None</i>		line of best fit correlation slope y-intercept	scatter plot outlier gap cluster bivariate
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.DSP.A.1	The student will use scatter plots to describe patterns and relationships between two quantities.	- I can make a scatter plot. - I can identify outliers, gaps, and clusters in a scatter plot. - I can use scatter plots to describe relationships between data.	6.1 Scatter Plots
8.DSP.A.1 8.DSP.A.2 8.DSP.A.3	The student will use lines of fit to model data.	- I can write and interpret an equation of a line of fit. - I can find an equation of a line of best fit. - I can use a line of fit to make predictions.	6.2 Lines of Fit

Engaging Experience 1

Title: Scatterplot Capture		Blocks: ¼
Learning Target(s): The student will use scatter plots to describe patterns and relationships between two quantities.	Success Criteria: - I can make a scatter plot. - I can identify outliers, gaps, and clusters in a scatter plot. - I can use scatter plots to describe relationships between data.	

Rich Task: In this activity, students use observations about scatterplot relationships to make predictions about future points in the plot. In particular, students focus on linear vs nonlinear association, strong vs weak association, and increasing vs decreasing plots.	Instructional Suggestions: - Follow the Teacher Moves posted in Desmos - After this activity, discuss how to use the line of best fit to make predictions and also discuss how accurate predictions outside of your data may or may not be. - Be sure to encourage students to use mathematics vocabulary when discussing this activity.
Student Math Practices: ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8	
Resources: Desmos - Scatterplot Capture	

Engaging Experience 2

Title: The Vitruvian Man		Blocks: ¾
Learning Target(s): • The student will use lines of fit to model data.	Success Criteria: • I can write and interpret an equation of a line of fit. • I can find an equation of a line of best fit. • I can use a line of fit to make predictions.	
Rich Task: • Leonardo DaVinci drew the famous Vitruvian Man based on human body proportions. DaVinci claimed that the human arm span and height are proportionate. With your students, explore this theory.		Instructional Suggestions: • Put students into groups • Be sure to encourage students to use mathematics vocabulary when discussing this activity.
Student Math Practices: •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8		
Resources: • The Vitruvian Man		

Topic 3: Systems of Linear Equations

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
parallel lines intersection substitution		solution of a system of linear equations (in two variables)	system of linear equations standard form Elimination Method Substitution Method
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.EE1.C.8.a 8.EE1.C.8.b	The student will understand how to solve systems of linear equations by graphing.	- I can graph a linear equation. - I can find the point where two lines intersect. - I can solve a system of linear equations by graphing.	5.1 Solving Systems of Linear Equations by Graphing
8.EE1.C.8.b 8.EE1.C.8.d	The student will understand how to solve systems of linear equations by substitution.	- I can solve a linear equation in two variables for either variable. - I can solve a system of linear equations by substitution.	5.2 Solving Systems of Linear Equations by Substitution
8.EE1.C.8.b 8.EE1.C.8.d	The student will understand how to solve systems of linear equations by elimination.	- I can add or subtract equations in a system. - I can use the Multiplication Property of Equality to produce equivalent equations. - I can solve a system of linear equations by elimination.	5.3 Solving Systems of Linear Equations by Elimination
8.EE1.C.8.b 8.EE1.C.8.c 8.EE1.C.8.d	The student will solve systems with different numbers of solutions.	- I can determine the number of solutions of a system. - I can solve a system of linear equations with any number of solutions.	5.4 Solving Special Systems of Linear Equations

Engaging Experience 1

Title: Matching Systems		Blocks: ¼	
Learning Target(s): ● The student will understand how to solve systems of linear equations by graphing.		Success Criteria: ● I can graph a linear equation. ● I can find the point where two lines intersect. ● I can solve a system of linear equations by graphing.	
Rich Task: ● Students will match cards that have equations on them to their corresponding graph card and corresponding solution card		Instructional Suggestions: ● Highlight common mistakes. ● Highlight the point of intersection is the solution to the system. ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8			
Resources: ● task_93sets_of_systems-230503-165101.pdf			

Engaging Experience 2

Title: The Cars and Motorcycles Task		Blocks: $\frac{1}{4}$
Learning Target(s): • The student will understand how to solve systems of linear equations by substitution.	Success Criteria: • I can solve a system of linear equations by substitution.	
Rich Task: • Prompt: Diane looked out the window of her math classroom at the teachers' parking lot and said, "There are 13 motorcycles and cars in the lot." Steve looked out the window and said, "I see 42 wheels." The teacher asked, "How many motorcycles and how many cars are in the parking lot?" Show all your work, and explain your thinking.	Instructional Suggestions: • Prompt students to develop unique ways to demonstrate their thinking: algebraically (setting up equations), graphically (Draw a picture of the cars and motorcycles and their associated wheels), or tabular (make columns representing the relationship between number of cars and wheels and the relationship between number of motorcycles and wheels). • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	

Student Math Practices:

●MP1

●MP2

●MP3

●MP4

●MP5

●MP6

●MP7

●MP8

Engaging Experience 3**Title:** Two Storage Tanks Task**Blocks:** ½**Learning Target(s):**

- The student will understand how to solve systems of linear equations by graphing.
- The student will understand how to solve systems of linear equations by substitution.
- The student will understand how to solve systems of linear equations by elimination.

Success Criteria:

- I can find the point where two lines intersect.
- I can solve a system of linear equations by substitution.
- I can solve a system of linear equations by elimination.

Rich Task:

- Students will utilize their existing knowledge of linear equations and slope-intercept form to construct two linear equations that model the amount of water (y) in each tank after x hours. Through reasoning and analysis, students will conclude that they are trying to find the value of x when the y values of each equation are equal to one another, leading to a potential introduction into the substitution method of solving linear systems.

Instructional Suggestions:

- Have students work in groups and have them interpret the meaning of the linear equations they constructed from the graph with a quick-write.
- Have students utilize their knowledge of properties of equality to lead into the elimination method.
- Have students extend the graphs of the lines to make a graphical prediction about the solution and see how this solution behaves algebraically when the x and y values are substituted into the system.
- Be sure to encourage students to use mathematics vocabulary when discussing this activity.

Student Math Practices:

●MP1

●MP2

●MP3

●MP4

●MP5

●MP6

●MP7

●MP8

Resources:

- [Two Storage Tanks Task](#)

Modified Version:

Do Experience together as a whole class activity.

Summary of Unit 3 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
1: Functions & Linear Equations	Functions, Relations, and Representing Functions	Big Ideas: 7.1 Relations and Functions 7.2 Representations of Functions Engaging Experiences: 1: Guess My Rule! IXL Additional Resources: - Lesson: Relations and Functions - Skill: ELJ - 8th Identify functions - Skill: AEB - 8th Identify functions: graphs	1 ½ blocks 2 blocks
	Graphing Linear Equations Given a Table of Values	Big Ideas: 4.1 Graphing Linear Equations Engaging Experiences: 2: Comparing Snowfall in Different Cities (modified version provided) IXL Additional Resources: - Lesson: Linear Equations	1 block
	Find and Interpret Slope	Big Ideas: 4.2 Slope of a Line IXL Additional Resources: - Lesson: Slope - Skill: D7M 8th Find the slope from a graph - Skill: ZAC - 8th Find the slope from two points - Skill: FSV - 8th Graph a line using slope	2 blocks

	Graphing Proportional Relationships	Big Ideas: 4.3 Graphing Proportional Relationships IXL Additional Resources: - Lesson: Slope Intercept Form - Skill: U55 - 8th Slope-intercept form: find the slope and y-intercept	1 block
	Graphing in Linear Equations in Slope-Intercept Form	Big Ideas: 4.4 Graphing Linear Equations in Slope-Intercept Form IXL Additional Resources: - Lesson: Slope Intercept Form - Skill: W5E - 8th Graph a line from an equation in slope-intercept form	1 block
	Graphing Linear Equations in Standard Form	Big Ideas: 4.5 Graphing Linear Equations in Standard Form	1 block
	Writing Linear Equations in Slope-Intercept Form	Big Ideas: 4.6 Writing Equations in Slope-Intercept Form IXL Additional Resources: - Lesson: Slope Intercept Form - Skill: WHP - 8th Write a linear equation from a slope and y-intercept	1 block
	Writing Linear Equations Given a Point and Slope or Given Two Points	Big Ideas: 4.7 Writing Equations in Point-Slope Form	1 block
	Write and Interpret Linear Functions	Big Ideas: 7.3 Linear Functions IXL Additional Resources: - Lesson: Linear Functions - Skill: AEB - 8th Identify functions: graphs	1 block

	Comparing Linear and Nonlinear Functions	Big Ideas: 7.4 Comparing Linear and Nonlinear Functions IXL Additional Resources: - Lesson: Linear Function - Skill: XB8 - 8th Identify linear and nonlinear functions: graphs and equations	$\frac{1}{2}$ block 1 block
	Describe the Functional Relationships Between Two Quantities from a Graph or Verbal Description	Big Ideas: 7.5 Analyzing and Sketching Graphs	1 block
		Review/Flex Days	$\frac{1}{2}$ block 1 block
		Test Day	1 block
2: Scatterplots & Lines of Best Fit	Using Scatterplots to Describe Relationships	Big Ideas: 6.1 Scatterplots IXL Additional Resources: - Lesson: Scatter Plots - Skill: NDP - 5th Create scatter plots - Skill: AVL - 8th Create scatter plots - Skill: GZE - 8th Identify trends with scatter plots - Skill: RP8 - 8th Outliers in scatter plots - Skill: GYV - 5th Interpret scatter plots	1 block
	Using Scatterplots to Model Data and Make Predictions	Big Ideas: 6.2 Lines of Fit Engaging Experiences: 1: Scatterplot Capture 2: The Vitruvian Man IXL Additional Resources: - Lessons: Lines of Best Fit	1 block

		• Skill: BG7 - 8th Identify lines of best fit	
		Review/Flex Days	½ block
		Test Day	½ block
3: Systems of Linear Equations	Solving Systems of Linear Equations by Graphing	Big Ideas: • 5.1 Solving Systems of Linear Equations by Graphing Engaging Experiences: • 1: Matching Systems IXL Additional Resources: • Lesson: Linear Equations • Lesson: Systems of Equations • Skill: WV5 - 8th Solve a system of equations by graphing • Skill: ZWP - 8th Graph a horizontal or vertical line	1 block 2 blocks
	Solving Systems of Linear Equations Using Substitution	Big Ideas: • 5.2 Solving Systems of Linear Equations by Substitution Engaging Experiences: • 2: The Cars and Motorcycles Task IXL Additional Resources: • Lesson: Systems of Equations • Skill: J8X - 8th Solve a system of equations using substitution (Use with Jamboard and do together as a class)	2 blocks
	Solving Systems of Linear Equations Using Elimination	Big Ideas: • 5.3 Solving Systems of Linear Equations by Eliminations Engaging Experiences: • 3: Two Storage Tanks Task (modified version provided) IXL Additional Resources: • Lesson: Systems of Equations • Skill: ZQV - 8th Solve a system of equations using elimination	2 blocks

		(Use with Jamboard and do together as a class) • Skill:	
	Solving Systems of Linear Equations with Special Solutions	Big Ideas: 5.4 Solving Special Systems of Linear Equations IXL Additional Resources: - Lesson: Systems of Equations - Skill: UYM - 8th Find the number of solutions to a system of equations	1 block
		Review/Flex Days	$\frac{1}{2}$ block 1 block
		Test Day	1 block
Engaging Scenario: Functions & Linear Relationships Use an end-of-unit exam as a summative assessment to assess unit skills.			1 block

Unit 4: Application of Exponential Properties

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Application of Exponential Properties

Length of Unit: 17 blocks

Overview of Unit: Students apply the properties of integer exponents to generate equivalent expressions and simplify numerical and algebraic expressions. They use scientific notation to represent and operate with very large and very small numbers in real-world contexts. Students will understand that there are numbers which are not rational and approximate their locations on a number line. Students will then work with radicals and integer exponents in applications of the Pythagorean Theorem and its converse.

Priority Standards for unit:

- 8.EE1.A.1 Know and apply the properties of integer exponents to generate equivalent expressions.
- 8.EE1.A.3 Express very large and very small quantities in scientific notation and approximate how many times larger one is than the other.
- 8.GM.B.6 Use models to demonstrate a proof of the Pythagorean Theorem and its converse.

Supporting Standards for unit:

- 8.EE1.A.4.a Use scientific notation to solve problems. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.
- 8.EE1.A.4.b Use scientific notation to solve problems. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.
- 8.EE1.A.2.a Investigate concepts of square and cube roots. Solve equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.
- 8.EE1.A.2.b Investigate concepts of square and cube roots. Evaluate square roots of perfect squares less than or equal to 625 and cube roots of perfect cubes less than or equal to 1000.
- 8.EE1.A.2.c Investigate concepts of square and cube roots. Recognize that square roots of non-perfect squares are irrational.
- 8.NS.A.1.a Explore the real number system. Know the differences between rational and irrational numbers.
- 8.NS.A.1.b Explore the real number system. Understand that all rational numbers have a decimal expansion that terminates or repeats.
- 8.NS.A.1.c Explore the real number system. Convert decimals which repeat into fractions and fractions into repeating decimals.

- 8.NS.A.1.d Explore the real number system. Generate equivalent representations of rational numbers.
- 8.GM.B.7 Use the Pythagorean Theorem to determine unknown side lengths in right triangles in problems in two- and three-dimensional contexts.
- 8.GM.B.8 Use the Pythagorean Theorem to find the distance between points in a Cartesian coordinate system.

Essential Questions:

1. How do we apply exponent properties to simplify expressions?
2. How can we use scientific notation to solve real-world problems?
3. How do we know whether a number is rational or irrational?
4. How can we estimate where irrational numbers belong on a number line and how is this useful in determining the reasonableness of an answer?
5. How does the Pythagorean Theorem help us solve problems involving unknown side lengths and distance in the coordinate plane?
6. How can we use the converse of the Pythagorean Theorem to determine whether a triangle is a right triangle?

Enduring Understanding/Big Ideas:

1. The definition of exponents, product of powers property, quotient of powers property, power of power property, power of a product property, zero and negative exponents properties to simplify expressions involving exponents.
2. Properties of exponents can be applied to simplify problems that involve numbers in scientific notation.
3. Irrational numbers can only be written as nonterminating decimals and nonrepeating decimals. If a number can be written as a terminating decimal or a repeating decimal, or can be expressed as a quotient of integers, it is a rational number.
4. Numbers that are not perfect squares or cubes can be estimated by comparing them to nearby perfect squares and perfect cubes, allowing us to approximate their values and place them accurately on a number line. Knowing nearby perfect squares helps us predict how big an answer should be, so its reasonableness can be evaluated.
5. The Pythagorean Theorem provides a reliable method to find missing side lengths in a right triangle and finding unknown distances in the coordinate plane by relating the side lengths of right triangles.
6. The relationship between the squares of a triangle's side lengths can be used to determine whether a triangle contains a right angle.

Unit Engaging Scenario

Engaging Scenario 1 block

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

Students will use the atomic mass of an element to find the number of atoms in one gram of the element. Students will also determine how much carbon dioxide is in the atmosphere and how much there will be in the future. Students must have knowledge of scientific notation and using powers to evaluate expressions.

[exponents and scientific notation performance task.pdf](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Exponents & Scientific Notation

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
base (of a power) exponent power evaluate simplify solve		power of a power property power of a product property product of powers property quotient of powers property zero exponent property negative exponent property scientific notation	
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.EE1.A.1	The student will use exponents to write and evaluate expressions.	- I can write products using exponents. - I can evaluate expressions involving powers. - I can use exponents to solve real-life problems.	8.1 Exponents
8.EE1.A.1	The student will generate equivalent expressions involving products of powers.	- I can find products of powers that have the same base. - I can find powers of powers. - I can find powers of products.	8.2 Product of Powers Property
8.EE1.A.1	The student will generate equivalent expressions involving quotients of powers.	- I can find quotients of powers that have the same base. - I can simplify expressions using the Quotient of Powers Property. - I can solve real-life problems involving quotients of powers.	8.3 Quotient of Powers Property
8.EE1.A.1	The student will understand the concepts of zero and negative exponents.	- I can explain the meanings of zero and negative exponents. - I can evaluate numerical expressions involving zero and negative exponents. - I can simplify algebraic expressions involving zero and negative exponents.	8.4 Zero and Negative Exponents
8.EE1.A.3 8.EE1.A.4.a	The student will understand the	I can convert between scientific notation and standard form.	8.6 Scientific Notation

8.EE1.A.4.b	concept of scientific notation.	● I can choose appropriate units to represent quantities. ● I can use scientific notation to solve real-life problems.	
8.EE1.A.3 8.EE1.A.4.a 8.EE1.A.4.b	The student will perform operations with numbers written in scientific notation.	● I can explain how to add and subtract numbers in scientific notation. ● I can explain how to multiply and divide numbers in scientific notation. ● I can use operations in scientific notation to solve real-life problems.	8.7 Operations in Scientific Notation

Engaging Experience 1

Title: Applying Properties of Exponents		Blocks: ½
Learning Target(s): ● The student will use exponents to write and evaluate expressions.	Success Criteria: ● I can simplify algebraic expressions involving zero and negative exponents. ● I can simplify expressions using the Quotient of Powers Property. ● I can find products of powers that have the same base. ● I can find powers of powers. ● I can find powers of products.	
Rich Task: ● Students are given cards with expressions on them and cards with just single exponents on them and will have to apply the exponent properties to simplify the expressions to find the matching card with the equivalent exponent on it.	Instructional Suggestions: ● Students will start off by simplifying expressions to match the cards. ● Have students explain why there are several cards that are equivalent. ● Highlight common misconceptions and explicitly explain why certain cards are NOT matches. ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: ● exponents r1.pdf		

Engaging Experience 2

Title: Would you rather...		Blocks: ¼
Learning Target(s): • The student will understand the concept of scientific notation.	Success Criteria: • I can convert between scientific notation and standard form. • I can choose appropriate units to represent quantities. • I can use scientific notation to solve real-life problems.	
Rich Task: • Students compare quantities written in Scientific Notation. For example, would you rather have 3.7×10^3 gold fish crackers or 4.2×10^8 gold fish crackers and why?	Instructional Suggestions: • Be sure students justify their thinking using mathematical reasoning. • Remember that if a student doesn't like ____ (gold fish crackers), they may choose the smaller amount of crackers. This is great as long as they can justify their reasoning. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
Student Math Practices: •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8		
Resources: • Scientific Notation: Would You Rather		
Modified Version: Do Experience together in pairs or as a whole class.		

Topic 2: Real Numbers & The Pythagorean Theorem

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
square root inverse operations rational number substitution solve evaluate simplify solution set right triangle irrational number		cube root hypotenuse legs perfect cube perfect square index	Pythagorean Theorem Converse of the Pythagorean Theorem radical sign radicand real numbers square root converse
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.EE1.A.2a 8.EE1.A.2b 8.EE1.A.2c	The student will understand the concept of a square root of a number.	- I can find square roots of numbers. - I can evaluate expressions involving square roots. - I can use square roots to solve equations.	9.1 Finding Square Roots
8.EE1.A.2a 8.EE1.A.2b 8.EE1.A.2c	The student will understand the concept of a cube root of a number.	- I can find cube roots of numbers. - I can evaluate expressions involving cube roots. - I can use cube roots to solve equations.	9.3 Finding Cube Roots
8.NS.A.1.a 8.NS.A.1.b 8.NS.A.1.c 8.NS.A.1.d 8.EE1.A.2.c	The student will convert between different forms of rational numbers.	- I can explain the meaning of rational numbers. - I can write fractions and mixed numbers as decimals. - I can write repeating decimals as fractions or mixed numbers.	9.4 Rational Numbers
8.NS.A.1 8.NS.A.2 8.EE1.A.2.c	The student will understand the concept of irrational numbers.	- I can classify real numbers as rational or irrational. - I can approximate irrational numbers. - I can solve real-life problems involving irrational numbers.	9.5 Irrational Numbers

8.GM.B.6 8.GM.B.7 8.GM.B.8	The student will understand the Pythagorean Theorem.	● I can explain the Pythagorean Theorem. ● I can use the Pythagorean Theorem to find unknown side lengths of triangles. ● I can use the Pythagorean Theorem to find distances between points in a coordinate plane.	9.2 The Pythagorean Theorem
8.GM.B.6	The student will understand the converse of the Pythagorean Theorem.	● I can explain the converse of the Pythagorean Theorem. ● I can identify right triangles given three side lengths. ● I can identify right triangles in a coordinate plane.	9.6 The Converse of the Pythagorean Theorem

Engaging Experience 1

Title: Irrational Numbers Exploration		Blocks: ½
Learning Target(s): ● The student will understand the concept of irrational numbers.	Success Criteria: ● I can classify real numbers as rational or irrational. ● I can approximate irrational numbers. ● I can solve real-life problems involving irrational numbers.	
Rich Task: ● Students will explore and demonstrate that irrational numbers cannot be written as a fraction of two integers.		Instructional Suggestions: ● Be sure to encourage students to use mathematics vocabulary when discussing this activity.
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: ● Irrational Numbers Exploration		

Engaging Experience 2

Title: Taco Cart		Blocks: ½
Learning Target(s): • The student will understand the Pythagorean Theorem.	Success Criteria: • I can explain the Pythagorean Theorem. • I can use the Pythagorean Theorem to find unknown side lengths of triangles. • I can use the Pythagorean Theorem to find distances between points in a coordinate plane.	
Rich Task: • Students will compare two people to determine who will reach the taco cart first using both the Pythagorean Theorem and speed.	Instructional Suggestions: • Follow the three act math protocol linked in the resource • Have students grouped to complete this activity and write their thinking on large chart paper or a vertical board. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
Student Math Practices: ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: • Taco Cart 3-Act Math		
Modified Version: Do Experience together as a whole class activity.		

Engaging Experience 3

Title: Pythagorean Theorem Starburst Activity		Blocks: ½
Learning Target(s): The student will understand the converse of the Pythagorean Theorem.	Success Criteria: I can explain the converse of the Pythagorean Theorem.	
Rich Task: Students will use their understanding of Pythagorean Theorem to prove its converse. By constructing squares with areas equivalent to the squares of the side lengths of a right triangle, students will prove that a triangle is a right triangle.	Instructional Suggestions: - Prompt students with three side lengths of a triangle and task them with deciding whether or not it is possible that they form a right triangle. (e.g. 3, 4, 5 or 3, 4, 6) - Encourage students to use mathematics vocabulary when discussing this activity.	

Student Math Practices:

●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8

Resources:

- [Pythagorean Theorem Starburst Activity](#)

Modified Version:

Do Experience together in pairs or as a whole class.

Summary of Unit 4 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
1: Exponents & Scientific Notation	Using the Definition of Exponents	Big Ideas: 8.1 Exponents IXL Additional Resources: - Lesson: Exponents - Skill: VFV 8th Understanding exponents - Skill: EYR - Evaluate powers	1 block
	Product of Powers Property	Big Ideas: 8.2 Product of Powers Property IXL Additional Resources: - Lesson: Properties of Exponents - Skill: EGY- 8th Multiply powers: integer bases - Skill 2CU - 8th Powers of a power: variable bases	1 block
	Quotient of Powers Property	Big Ideas: 8.3 Quotient of Powers Property IXL Additional Resources: - Lesson: Properties of Exponents - Skill: MC2 - 8th Divide powers: integer bases	1 block
	Zero and Negative Exponents	Big Ideas: 8.4 Zero and Negative Exponents - Lesson: Properties of Exponents - Skill: 5MA - 8th Evaluate powers with negative or zero exponents - Skill: WGS - Evaluate powers with negative exponents - Skill: UTY - 8th Evaluate expressions using properties of exponents	1 block

		Engaging Experiences: 1: Applying Properties of Exponents	
	Scientific Notation	Big Ideas: 8.6 Scientific Notations Engaging Experiences: 2: Would You Rather (modified version provided) IXL Additional Resources: - Lesson: Scientific Notation - Skill: H8A - 8th Convert between standard and scientific notation	1 block
	Operations on Scientific Notation	Big Ideas: 8.7 Operations on Scientific Notation	1 block
		Review/Flex Days	1 block
		Test Day	1 block
2: Real Numbers & The Pythagorean Theorem	Squares and Square Roots	Big Ideas: 9.1 Finding Square Roots IXL Additional Resources: - Lesson: Square Roots - Skill: 9RS - 8th Square roots of perfect squares - Skill: 8TF - 8th Positive and negative square roots	1 block
	Cubes and Cube Root	Big Ideas: 9.3 Finding Cube Roots IXL Additional Resources: - Lesson: Cube Roots - Skill: RYG - 8th Cube roots of positive perfect cubes - Skill: J7K - 8th Cube roots of positive and negative perfect cubes	1 block
	Rational Numbers	Big Ideas: 9.4 Rational Numbers	1 block

		IXL Additional Resources: - Lesson: Rational Numbers - Skill: DE8 - 7th Identify rational numbers - Skill: M2D - 7th Convert fractions or mixed numbers to decimals	
	Irrational Numbers	Big Ideas: 9.5 Irrational Numbers Engaging Experiences: 1: Irrational Numbers Exploration (modified version provided) IXL Additional Resources: - Lesson: Irrational Numbers - Skill: NV6 - 8th Identify rational and irrational numbers	1 block
	Pythagorean Theorem	Big Ideas: 9.2 The Pythagorean Theorem Engaging Experiences: 2: Taco Cart (modified version provided) 2: Pythagorean Theorem Starburst Activity (modified version provided) IXL Additional Resources: - Lesson: Pythagorean Theorem - Skill: 7ZL - 8th Pythagorean theorem: find the length of the hypotenuse - Skill: Y9C - 8th Pythagorean theorem: find the missing leg length - Skill: MTM - 8th Pythagorean theorem: find the missing leg or hypotenuse length	1 ½ blocks 2 blocks
	Converse of the Pythagorean Theorem	Big Ideas: 9.6 The Converse of the Pythagorean Theorem	1 ½ blocks
		Review/Flex Days	1 block

		Test Day	1 block
Engaging Scenario: Exponents & Scientific Notation Performance Task Use an end-of-unit exam as a summative assessment to assess unit skills.			1 block

Unit 5: Geometry

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Geometry

Length of Unit: 8 blocks

Overview of Unit: Students investigate angle relationships formed when parallel lines are cut by a transversal, identifying patterns and developing informal arguments to justify why these relationships hold true. As they build reasoning skills, students connect geometric concepts to algebraic problem solving, using equations to represent and solve for unknown angle measures. Building on their understanding of geometric relationships and reasoning, students extend their work to three-dimensional figures. They solve real-world and mathematical problems involving the volume of pyramids, cones, and spheres, as well as the surface area of triangular and rectangular pyramids. Throughout the unit, students apply formulas strategically, interpret and use units appropriately, and make sense of their solutions in context.

Priority Standards for unit:

- 8.GM.C.9.a Solve problems involving surface area and volume. Understand the concept of surface area and find surface area of pyramids.
- 8.GM.C.9.b Solve problems involving surface area and volume. Understand the concepts of volume and find the volume of pyramids, cones and spheres.

Supporting Standards for unit:

- 8.GM.A.5.c Explore angle relationships and establish informal arguments. Construct and explore the angles created when parallel lines are cut by a transversal.

Essential Questions:

1. What angle relationships are created when parallel lines are cut by a transversal?
2. How can we use angle relationships to solve problems and justify reasoning?
3. How is surface area different from volume, and when is each measurement useful?
4. How can we calculate and interpret the volume of pyramids, cones, and spheres in real-world situations?
5. How can we calculate and interpret the surface area of pyramids in real-world situations?

Enduring Understanding/Big Ideas:

1. Identify and name specific angle relationships such as vertical, corresponding, alternate interior and exterior, consecutive (same-side) interior and exterior, and supplementary.
2. Apply these angle relationships to determine missing angle measures and solve problems.
3. Surface area measures the outside covering of a figure, while volume measures the space inside; understanding the difference helps us choose the correct measurement for real-world problems.
4. Volume formulas allow us to measure and compare the amount of space inside three-dimensional objects, helping us solve practical problems involving capacity and storage.

5. Surface area can be calculated by finding the sum of the areas of each face of a pyramid, helping us solve practical problems involving material estimation.

Unit Engaging Scenario

Engaging Scenario 1-2 blocks

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

In this project, students will become city designers and create their own original city while applying their knowledge of angles formed by parallel lines and transversals. Students will design a city map that includes labeled streets and locations placed according to specific geometric angle relationships. The city must include five parallel streets and two transversal streets, all clearly named and labeled. Students will strategically place buildings and locations—such as a school, restaurant, library, and park so that each pair represents a designated angle relationship (alternate interior, corresponding, vertical angles, etc.). The project combines geometry concepts with creativity, allowing students to demonstrate understanding through a visual model. Cities should be neat, colorful, and school appropriate, and students are encouraged to design a unique city inspired by real or fictional places or entirely from their imagination. The goal of this project is to show mastery of angle relationships while practicing mathematical reasoning, organization, and creative design.

City Designer Project

Volume Performance Task - 0.5 block

Students will be given the dimensions of a salsa jar and determine how many can be shipped in a single box, and in a shipment of 12 boxes. Students will determine how much unused space can be filled with packing peanuts. Students will compare and choose which container of packing peanuts should be purchased for one shipment of jars. Students must have knowledge of the formulas for the volume of prisms and cylinders, so extra practice may be needed before this task. This task could also be turned into a larger project comparing the volumes and surface areas of various items from a grocery store.

[mod_8thgrade_ab-ptt_10.pdf](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Parallel Lines Cut by Transversals

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
parallel lines vertical angles supplementary adjacent angle		congruent transversal alternate interior alternate exterior corresponding	same side interior consecutive interior same side exterior consecutive exterior
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.GM.A.5c	The student will find missing angle measures created by the intersections of lines.	- I can identify congruent angles when a transversal intersects parallel lines. - I can find angle measures when a transversal intersects parallel lines.	3.1 Parallel Lines and Transversals

Engaging Experience 1

Title: Exploring Parallel Lines Cut by a Transversal		Blocks: ¼
Learning Target(s): • The student will find missing angle measures created by the intersections of lines.	Success Criteria: • I can identify congruent angles when a transversal intersects parallel lines. • I can find angle measures when a transversal intersects parallel lines.	
Rich Task: • Each group will have 3 pieces of blue painters tape. First, they will be instructed to create a set of parallel lines with 2 pieces. Second, they will be instructed 2 use the third piece of tape to cut through both parallel lines. You will then tell them which one to label as #1 and based of that they will identify the other angles relationships.	Instructional Suggestions: • After you identify angle relationships, you can tell them the measure of one of the angles and they will have to use their knowledge of the angle relationships to identify the rest of the measures. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8		
Resources: • Tape on walls activity-parallel lines and transversals.pdf		

Engaging Experience 2

Title: Lines, Transversals, and Angles		Blocks: ¼
Learning Target(s): • The student will find missing angle measures created by the intersections of lines.	Success Criteria: • I can identify congruent angles when a transversal intersects parallel lines. • I can find angle measures when a transversal intersects parallel lines.	
Rich Task: • In this activity, students explore the relationship among angles formed by a transversal and a system of two lines. In particular, they consider what happens to angles' measures when the two lines are parallel vs. when they are not.	Instructional Suggestions: • Follow Teacher Moves in Desmos. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.	
<u>Student Math Practices:</u> •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8		
Resources: • Desmos - Lines, Transversals, and Angles		

Topic 2: Volume & Surface Area

<u>Cross-Cutting Terms:</u>		Grade-Specific Terms	
sphere cone pyramid height base volume area surface area		slant height	
Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.GM.C.9.b	The student will find the volume of a cone.	- I can use a formula to find the volume of a cone. - I can use the formula for the volume of a cone to find a missing dimension.	10.2 Volumes of Cones
8.GM.C.9.b	The student will find the volume of a sphere.	- I can use a formula to find the volume of a sphere. - I can use the formula for the volume of a sphere to find the radius. - I can find volumes of composite solids.	10.3 Volumes of Spheres
8.GM.C.9.a 8.GM.C.9.b	The student will find the volume and surface area of a pyramid.	- I can use a formula to find the volume of a pyramid. - I can find the surface area of a sphere.	7th grade 10.2 Surface Area of Pyramids and 10.4 Volume of Pyramids
8.GM.C.9.a 8.GM.C.9.b	The student will compare volumes of cones, spheres and pyramids and compare surface area of pyramids	- I can compare the volumes of cones, spheres and pyramids. - I can compare the surface areas of pyramids	10.2, 10.3 7th grade 10.2 and 10.4

Engaging Experience 1

Title: Meatballs		Blocks: $\frac{1}{2}$
Learning Target(s): • The student will find the volume of a sphere.	Success Criteria: • I can use a formula to find the volume of a sphere. • I can use the formula for the volume of a sphere to find the radius. • I can find volumes of composite solids.	
Rich Task: • Students use volume of cylinders and volume of spheres to predict how many meatballs can fit into a pot before it overflows.		Instructional Suggestions: • Follow the three act math protocol linked in the resource • Have students grouped to complete this activity and write their thinking on large chart paper or a vertical board. • Be sure to encourage students to use mathematics vocabulary when discussing this activity.
<u>Student Math Practices:</u> ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: • Meatballs - 3 Act Math		

Engaging Experience 2

Title: Calculating the Surface Area of a Pyramid Using Nets		Blocks: $\frac{1}{4}$
Learning Target(s): The student will find the volume and surface area of a pyramid.	Success Criteria: I can compare the surface areas of pyramids.	
Rich Task: After reviewing the area equations for squares and triangles, students will utilize a digital model that unfolds a pyramid into its net. Students will construct an equation that relates the length, width, and slant height of a pyramid to its surface area.		Instructional Suggestions: - Have students make a prediction about what individual shapes a pyramid is composed of and how this may affect the equation for the surface area. - Be sure to encourage students to use mathematics vocabulary when discussing this activity.
Student Math Practices: ●MP1 ●MP2 ●MP3 ●MP4 ●MP5 ●MP6 ●MP7 ●MP8		
Resources: Calculating the Surface Area of Pyramids Using Nets - GeoGebra		
Modified Version: Do Experience together as a whole class activity.		

Summary of Unit 5 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
1: Parallel Lines Cut by Transversals	Parallel Lines Cut by Transversals	Big Ideas: 3.1 Parallel Lines and Transversals Engaging Experiences: 1: Exploring Parallel Lines Cut by a Transversal 2: Lines, Transversals, and Angles IXL Additional Resources: - Lesson: Transversals of Parallel Lines - Skill: 8EM - 8th Identify alternate interior and alternate exterior angles - Skill: ZLF - 8th Transversals of parallel lines: name angle pairs - Re-Teach Lesson: Supplementary Angles - Re-Teach Lesson: Vertical Angles - Re-Teach Lesson: Adjacent Angles	2 blocks
		Review/Flex Days	½ block
		Test Day	½ block
2: Volume & Surface Area	Volume of a Cone	Big Ideas: 10.2 Volume of Cones IXL Additional Resources: - Lesson: Volume of Cones - Skill: YYR - 8th Volume of cones - Re-Teacher Lesson: Pi - Re-Teach Skill: YA8 - 7th Area of circles	½ block 1 block
	Volume of a Sphere	Big Ideas: 10.3 Volume of Spheres Engaging Experiences: 1: Meatballs IXL Additional Resources: - Lesson: Volume of Sphere	1 block

		• Skill: QX7 - 8th Volume of spheres	
	Surface Area and Volume of a Pyramid	Big Ideas: • (7th Grade) 10.2 Surface Area of Pyramids • (7th Grade) 10.4 Volume of Pyramids Engaging Experiences: • 2: Calculating the Surface Area of Pyramids Using Nets (modified version provided) IXL Additional Resources: • Lesson: What is Surface Area? • Skill: XSJ - 7th Surface area of pyramids • Skill: 5XW - 6th Surface area of pyramids	1 block 2 blocks
	Comparing Volumes of Cones, Spheres, and Pyramids as well as Surface Area of Pyramids	Big Ideas: • 10.2 Volume of Cones • 10.3 Volume of Spheres • (7th Grade) 10.2 Surface Area of Pyramids • (7th Grade) 10.4 Volume of Pyramids	1 block
		Review/Flex Days	1 block 2 blocks
		Test Day	½ block 1 block
	Engaging Scenarios: City Designer Project and Volume Performance Task Use an end-of-unit exam as a summative assessment to assess unit skills.		1 ½ blocks

Unit 6: Two-Way Tables

Subject: Mathematics

Grade: 8th Grade

Name of Unit: Two-Way Tables

Length of Unit: 3 blocks

Overview of Unit: Students analyze bivariate categorical data using two-way tables. They calculate relative frequencies, identify patterns, and investigate possible associations between variables.

Priority Standards for unit:

- 8.DSP.A.4.a Understand the patterns of association in bivariate categorical data displayed in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.

Supporting Standards for unit:

- 8.DSP.A.4.b Understand the patterns of association in bivariate categorical data displayed in a two-way table. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Essential Questions:

1. How can we organize and analyze relationships between two categorical variables?
2. What do relative frequencies tell us that counts do not?
3. How can data suggest relationships?

Enduring Understanding/Big Ideas:

1. Two-way tables help organize and reveal patterns in categorical data.
2. Relative frequencies indicate the percentage makeup of a particular category in a dataset with respect to the total amount of data.
3. Data can show associations, but it does not necessarily prove cause-and-effect relationships.

Unit Engaging Scenario

Engaging Scenario ½ block

(An Engaging Scenario is a culminating activity that includes the following components: situation, challenge, specific roles, audience, product or performance.)

According to the National Center for Education Statistics, the average salary of a young adult with a bachelor's degree in 2026 is approximately \$60,000 while the average salary for a young adult with a high school diploma is \$44,100. Using a two way table, consider if the cost of college is worth it.

[Is the Cost of College Worth It?](#)

Use an end-of-unit exam as a summative assessment to assess unit skills.

Topic 1: Two-Way Tables

<u>Cross-Cutting Terms:</u>	Grade-Specific Terms
<i>None</i>	joint frequency joint relative frequency marginal relative frequency marginal frequency two-way table bivariate categorical

Priority Standards & Supporting Standards	Learning Targets	Success Criteria	Aligned Sections from Course Resource
8.DSP.A.4a <i>8.DSP.A.4b</i>	The student will use two-way tables to represent data.	- I can read a two-way table. - I can make a two-way table. - I can use a two-way table to describe relationships between data.	6.3 Two-Way Tables

Engaging Experience 1

Title: Testing a New Product		Blocks: 1
Learning Target(s): The student will use two-way tables to represent data.	Success Criteria: - I can read a two-way table. - I can make a two-way table. - I can use a two-way table to describe relationships between data.	
Rich Task: - Judi is starting a new business making deodorants. Before producing the deodorants on a large scale, Judi wants to find out how people are influenced by the fragrance and the packaging. - She makes two fragrances, A and B, and two possible ways to package these deodorants, Bouquet and Hunter. Judi conducts a survey. She asks 40 people to comment on the packaging and sample a small amount of deodorant from four different containers (shown on page 15 of the document).	Instructional Suggestions: - Start off by telling students that Judi wants you to analyze all the data. - Remember that Judi wants to find out how people are influenced by the fragrance and the packaging. - Before you do this, plan your method. - Be sure to encourage students to	

• The people are not told that 'Bouquet A' and 'Hunter A' both contain exactly the same fragrance, A, or that 'Bouquet B' and Hunter B' contain the same fragrance, B. Each person is asked to fill in a card, checking a box to show how he or she feels about each of the four deodorants. For example, the person who filled in the card shown here is male, hates 'Bouquet A', thinks 'Bouquet B' is wonderful, thinks 'Hunter A' is average and thinks 'Hunter B' is quite nice. • Students will make and analyze a two-way table based on this data.	use mathematics vocabulary when discussing this activity. • 1. What questions may be answered by examining and reviewing data collected on the survey cards? • 2. Describe clearly how you will organize, display and analyze the 40 responses in order to answer your questions. It may help if you make up a few results using the blank data sheets provided.
<u>Student Math Practices:</u> •MP1 •MP2 •MP3 •MP4 •MP5 •MP6 •MP7 •MP8	
Resources: • Engaging Experience #1 Two Way Tables.pdf	

Summary of Unit 6 Engaging Learning Experiences

Topic	Section	Experiences	Suggested Length of Time
1: Two-Way Tables	Two-Way Tables	Big Ideas: 6.3 Two-Way Tables Engaging Experiences: 1 Testing a New Product IXL Additional Resources: - Lesson: Two Way Tables - Skill: CRV - 8th Find probabilities using two-way frequency tables (Use with Jamboard and do together as a class)	2 blocks
		Review/Flex Days	½ block
		Test Day	½ block
	Engaging Scenario: Is the Cost of College Worth it?		½ block

Missouri Student Mathematical Practices

According to the Missouri Department of Elementary and Secondary Education (DESE) [guidance on Missouri Student Mathematical Practices](#), “it is important to emphasize not only the content contained in the standards presented but also the importance of mathematical practices for all students at all grade levels. If content standards are not implemented within a view of the mathematical processes/practices that should be developed by students, the ultimate impact on student mathematical power may be minimal. The following Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. They are consistent with the Show-Me process standards and these practices rest on important ‘processes and proficiencies’ with longstanding importance in mathematics education.”

A mathematically literate student can:

Mathematical Practice (MP)	Student Look-For's
Make sense of problems and persevere in solving them.	● Relate a problem to prior knowledge. ● Recognize that there may be multiple entry points to a problem and more than one path to a solution. ● Analyze what is given, what is not given, what is being asked, and what strategies are needed, and make an initial attempt to solve a problem. ● Evaluate the success of an approach to solve a problem and refine it if necessary. ● Evaluate the reasonableness of a solution to a problem.
Reason both contextually and abstractly.	● Make sense of quantities and their relationships in mathematical and real-world situations. ● Describe a given situation using multiple mathematical representations. ● Translate among multiple mathematical representations and compare the meanings each representation conveys about the situation. ● Connect the meaning of mathematical operations to the context of a given situation.

Use critical thinking skills to justify mathematical reasoning and critique the reasoning of others.	● Construct and justify a solution to a problem. ● Compare and discuss the validity of various reasoning strategies. ● Make conjectures and explore their validity. ● Reflect on and provide thoughtful responses to the reasoning of others.
Connect mathematical ideas and real-world situations through modeling.	● Identify relevant quantities and develop a model to describe their relationships. ● Interpret mathematical models in the context of the situation. ● Make assumptions and estimates to simplify complicated situations. ● Evaluate the reasonableness of a model and refine if necessary.
Use a variety of mathematical tools effectively and strategically.	● Select and use appropriate tools when solving a mathematical problem. ● Use technological tools and other external mathematical resources to explore and deepen understanding of concepts.
Communicate mathematically and approach mathematical situations with precision.	● Express numerical answers with the degree of precision appropriate for the context of a situation. ● Represent numbers in an appropriate form according to the context of the situation. ● Use appropriate and precise mathematical language. ● Use appropriate units, scales, and labels.
Identify and utilize structure and patterns.	● Recognize complex mathematical objects as being composed of more than one simple object. ● Recognize mathematical repetition in order to make generalizations. ● Look for structures to interpret meaning and develop solution strategies.
Look for and express regularity in repeated reasoning.	● Notice if calculations are repeated and look for generalizations in methods. ● Maintain oversight of the process while paying attention to the details. ● Draw general results from trying multiple examples.

National Council of Teachers of Mathematics' (NCTM)

Effective Teaching Practices

According to NCTM's *Principles to Actions: Ensuring Mathematical Success for All* (2014), the “eight mathematics teaching practices provide a framework for strengthening the teaching and learning of mathematics. This research-informed framework of teaching and learning...represent[s] a core set of high-leverage practices and essential teaching skills necessary to promote deep learning of mathematics” (p. 9).

Effective Mathematics Teaching Practices
Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.
Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.
Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.
Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments
Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.
Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.
Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.
Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.

Shared Definitions for Cross-Cutting Term

Throughout their middle school mathematics learning experiences, students will encounter many new vocabulary terms to support their conceptual development—some of them are grade-level specific, and some of them are “cross-cutting terms,” or terms that they will encounter instruction on across multiple courses. In order to ensure systemic alignment and clarity of these cross-cutting terms, the following definitions have been provided:

Term	Definition	Location
absolute value	The distance between a number and 0 on a number line; The absolute value of a number a is written as $ a $.	6th Grade: Unit 4, Topic 1 7th Grade: Unit 1, Topic 1
addition property of equality	Adding the same number to each side of an equation, the two sides remain equal.	6th Grade: Unit 3, Topic 2 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1
addition property of inequality	When you add the same number to each side of an inequality, the inequality remains true.	6th Grade: Unit 3, Topic 3 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 2
base (of a power)	The base of a power is the repeated factor.	6th Grade: Unit 1, Topic 1 7th Grade: Unit 6, Topic 1 8th Grade: Unit 4, topic 1
composite figure	A figure made up of triangles, squares, rectangles, and other two-dimensional figures.	6th Grade: Unit 4, Topic 1 7th Grade: Unit 5, Topic 1
division property of equality	When you divide each side of an equation by the same nonzero number, the two sides remain equal.	6th Grade: Unit 3, Topic 2 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1
division property of inequality	When you divide each side of an inequality by the same positive number, the inequality remains true.	6th Grade: Unit 3, Topic 3 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 2
equivalent equations	Equations that have the same solutions.	7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1

equivalent rates	Rates that have the same unit rate.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1
equivalent ratios	Two ratios that describe the same relationship.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1
evaluate	Calculate a numerical result- sometimes by substituting given values	6th Grade: Unit 1, Topic 1 7th Grade: Unit 1, Topic 1 8th Grade: Unit 3, Topic 1
exponent	The exponent indicates the number of times the base is used as a factor.	6th Grade: Unit 1, Topic 1 7th Grade: Unit 2, Topic 1 8th Grade: Unit 4, Topic 1
factoring an expression	Writing a numerical expression or algebraic expression as a product of factors.	6th Grade: Unit 3, Topic 1 7th Grade: Unit 2, Topic 1
graph of an inequality	A graph that shows all the solutions of an inequality on a number line.	6th Grade: Unit 3, Topic 1 7th Grade: Unit 2, Topic 3 8th Grade: Unit 2, Topic 2
integers	The set of whole numbers and their opposites.	6th Grade: Unit 4, Topic 1 7th Grade: Unit 1, Topic 1 8th Grade: Unit 1, Topic 1
like terms	Terms of an algebraic expression that have the same variables raised to the same exponents.	6th Grade: Unit 3, Topic 1 7th Grade: Unit 2, Topic 1 8th Grade: Unit 2, Topic 1
multiplication property of equality	When you multiply each side of an equation by the same nonzero number, the two sides remain equal.	6th Grade: Unit 3, Topic 2 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1
multiplication property of inequality	When you multiply each side of an inequality by the same positive number, the inequality remains true.	6th Grade: Unit 2, Topic 3 7th Grade: Unit 2, Topic 3 8th Grade: Unit 2, Topic 2

power	The result of multiplying a number by itself a certain number of times.	6th Grade: Unit 1, Topic 1 7th Grade: Unit 6, Topic 1 8th Grade: Unit 4, Topic 1
rate	A ratio of two quantities using different units.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1 8th Grade: Unit 3, Topic 1
ratio	A comparison of two quantities; The ratio of a to b can be written as $a : b$.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1
ratio table	A table used to find and organize equivalent ratios.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1 8th Grade: Unit 3, Topic 1
rational number	A number that can be written as $\frac{a}{b}$ where a and b are integers and $b \neq 0$.	6th Grade: Unit 4, Topic 1 7th Grade: Unit 1, Topic 1 8th Grade: Unit 4, Topic 2
simplify	Rewrite an expression in an equivalent, simpler form, with no unnecessary parts.	7th Grade: Unit 1, Topic 1 8th Grade: Unit 2, Topic 1
solution of an inequality	The value of values that makes an inequality true.	6th Grade: Unit 3, Topic 3 7th Grade: Unit 2, Topic 3 8th Grade: Unit 2, Topic 2
solution set	The set of all solutions of an inequality.	6th Grade: Unit 3, Topic 3 7th Grade: Unit 2, Topic 3 8th Grade: Unit 2, Topic 2
solve	Find the value(s) that make an equation or inequality true.	7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1
substitute	Replace a variable with a given value or expression.	6th Grade: Unit 3, Topic 1 7th Grade: Unit 2, Topic 1 8th Grade: Unit 2, Topic 1

subtraction property of equality	When you subtract the same number from each side of an equation, the two sides remain equal.	6th Grade: Unit 3, Topic 2 7th Grade: Unit 2, Topic 2 8th Grade: Unit 2, Topic 1
subtraction property of inequality	When you subtract the same number from each side of an inequality, the inequality remains true.	6th Grade: Unit 3, Topic 3 7th Grade: Unit 2, Topic 3 8th Grade: Unit 2, Topic 2
U.S. customary system	A system of measurement that contains units for length, capacity, and weight.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1
unit rate	A rate that compares a quantity to one unit of another quantity using division.	6th Grade: Unit 2, Topic 1 7th Grade: Unit 3, Topic 1 8th Grade: Unit 3, Topic 1
value of a ratio	The number $\frac{a}{b}$ associated with the ratio a : b. The value of a ratio describes the multiplicative relationship between the quantities in a ratio.	6th Grade: Unit 2, Topic 11. 7th Grade: Unit 3, Topic 1 8th Grade: Unit 4, Topic 2

Unit of Study Terminology

Appendices: All Appendices and supporting material can be found in this course's shell course in the District's Learning Management System.

Assessment Leveling Guide: A tool to use when writing assessments in order to maintain the appropriate level of rigor that matches the standard.

Big Ideas/Enduring Understandings: Foundational understandings teachers want students to be able to discover and state in their own words by the end of the unit of study. These are answers to the essential questions.

Engaging Experience: Each topic is broken into a list of engaging experiences for students. These experiences are aligned to priority and supporting standards, thus stating what students should be able to do. An example of an engaging experience is provided in the description, but a teacher has the autonomy to substitute one of their own that aligns to the level of rigor stated in the standards.

Engaging Scenario: This is a culminating activity in which students are given a role, situation, challenge, audience, and a product or performance is specified. Each unit contains an example of an engaging scenario, but a teacher has the ability to substitute with the same intent in mind.

Essential Questions: Engaging, open-ended questions that teachers can use to engage students in the learning.

Priority Standards: What every student should know and be able to do. These were chosen because of their necessity for success in the next course, the state assessment, and life.

Supporting Standards: Additional standards that support the learning within the unit.

Topic: These are the main teaching points for the unit. Units can have anywhere from one topic to many, depending on the depth of the unit.

Unit of Study: Series of learning experiences/related assessments based on designated priority standards and related supporting standards.

Unit Vocabulary: Words students will encounter within the unit that are essential to understanding. Academic Cross-Curricular words (also called Tier 2 words) are those that can be found in multiple content areas, not just this one. Content/Domain Specific vocabulary words are those found specifically within the content.