CARNEGIE LEARNING

1 Transforming Geometric Objects

MATHia Unit	MATHia Workspace	Overview	SC Standard	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1: Rigid Motion Transformations															
Rigid Motions on the Coordinate Plane	Experimenting with Rigid Motions	Students use an interactive Explore Tool to perform translations, reflections, and rotations. Students also identify vertical and horizontal symmetry and describe sequences of rigid motions that map one figure onto a congruent figure. Students observe that, after rigid motions, parallel lines remain parallel and angle measures and line segments do not change their measure.	8.GM.1 8.GM.1a 8.GM.1b 8.GM.1c	✔				•							
	Translating Plane Figures	Students will select translations that match a pre-image to a target image figure, given a reference point.	8.GM.2c 8.GM.2e		✔				•						
	Reflecting Plane Figures	Students will select reflections over lines that match a pre-image to target image figure, given a reference point.	8.GM.2b 8.GM.2e		✔				•						
	Rotating Plane Figures	Students will select rotations that match a pre-image to a target image figure, given a reference point.	8.GM.2a 8.GM.2e		✔				•						
	Describing Rigid Motions Using Coordinates	Students watch an animation showing how rigid motions--translations, reflections, and rotations--are defined on the coordinate plane using algebraic notation. Students identify and produce rigid motions of shapes using coordinates and the coordinate plane.	8.GM.3a	✔		•									

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Topic 2: Similarity															
Dilating Figures on the Coordinate Plane	Defining Similarity	Students watch an animation showing how similar figures can be created by drawing and measuring lines from a point of dilation. Students distinguish between enlargement and reduction dilations and use the corresponding side length ratios to determine the scale factors of dilations. Students learn that shapes created by dilations are similar figures, which have congruent corresponding angle measures and proportional corresponding side lengths.	8.GM.4b	✔		•					•				
	Dilating Plane Figures	Students will select dilations that match a pre-image to target image figures, given a reference point.	8.GM.2e 8.GM.4a 8.GM.4b 8.GM.4c		✔				•						
Mapping Similar Figures Using Transformations	Performing One Transformation	Students will select a translation, rotation, reflection, or dilation that matches a pre-image to a target image figure, given a reference point.	8.GM.2 8.GM.2a 8.GM.2b 8.GM.2c 8.GM.2d 8.GM.2e 8.GM.4a 8.GM.4b 8.GM.4c		✔				•						
	Performing Multiple Transformations	Students will select multiple transformations from translation, rotation, reflection, and dilation to match a pre-image to a target image figure, given a reference point.	8.GM.2 8.GM.2a 8.GM.2b 8.GM.2c 8.GM.2d 8.GM.2e 8.GM.4a 8.GM.4b 8.GM.4c		✔				•						

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Mapping Similar Figures Using Transformations (continued)	Describing Transformations Using Coordinates	Students watch a brief animation showing how dilations are defined on the coordinate plane using algebraic notation. They compare and contrast shapes and their dilations on the coordinate plane and then define a similar figure as one which is obtained from an original figure by a sequence of dilations and rigid motions. Students also define a congruent figure as one which is obtained from an original figure by a sequence of rigid motions. Finally, students identify sequences of rigid motions or rigid motions and dilations which produce a transformed figure and differentiate between transformations that produce congruent figures and those that produce similar figures that are not congruent.	8.GM.3a	✔		•					•				
Topic 3: Line and Angle Relationships															
Triangle Sum and Exterior Angle Theorems	Introduction to Triangle Sum and Exterior Angle Theorems	Students are informally introduced to the Triangle Sum Theorem. They derive the Exterior Angle Theorem using the Triangle Sum Theorem and substitution.	8.GM.5a 8.GM.5b	✔											•
	Solving Problems Using Triangle Sum and Exterior Angles	Students determine the remote interior angles of a triangle given an exterior angle. They use the Triangle Sum and Exterior Angle Theorems to calculate unknown angle measures in diagrams.	8.GM.5b		✔					•				•	
Angle Relationships Formed by Lines Intersected by a Transversal	Classifying Angles Formed by Transversals	Students follow worked examples and complete sorting activities as they learn to identify angles and angle pairs formed by lines cut by a transversal.	8.GM.5c	✔		•	•								
	Reasoning about Angles Formed by Transversals	Students solve reasoning problems involving angle measures formed by lines cut by a transversal.	8.GM.5c	✔											•
	Calculating Angle Measures Formed by Transversals	Calculate the measure of the sought angle by using angle relationships formed by two lines cut by a single transversal.	8.GM.5c		✔					•					

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1	Transforming Geometric Objects					Strategies									
MATHia Unit	**MATHia Workspace**	**Overview**	**SC Standard**	**Concept Builder**	**Mastery**	Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
The Angle-Angle Similarity Theorem	Introduction to the Angle-Angle Similarity Theorem		8.GM.5d	✔											
	Identifying Similar Triangles	Students construct informal arguments to establish facts about the congruence between pairs of angles. Then they use the angle-angle criterion to decide if two triangles are similar (or not).	8.GM.5d		✔										

2 Developing Functional Foundations

MATHia Unit	MATHia Workspace	Overview	SC Standard	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1: From Proportions to Linear Relationships															
Representations of Proportional Relationships	Representing Proportional Relationships Algebraically	Students identify a constant of proportionality from a scenario. They use the constant of proportionality to select an equation that models a proportional relationship in a scenario. Students use an equation modeling a proportional relationship to determine a value for an independent variable when the value for the dependent variable is given.	8.F.4	✔									•		•
	Modeling the Constant of Proportionality	Given a scenario, students complete a table of values, write a direct variation equation, plot values from the table, and draw the line representing the direct variation equation.	8.F.4c		✔				•		•		•	•	
	Comparing Proportional Relationships in Different Forms		8.EEI.5c		✔										
Using Similar Triangles to Describe the Steepness of a Line	Understanding the Slopes of Lines	Students watch an animation which shows that the unit rate and constant of proportionality for a situation are both equivalent to the slope of a line representing the situation. Students answer questions, demonstrating with similar triangles that the slope of a straight line is the same between any two points on the line. They interpret the slopes of lines representing different real-world scenarios. Finally, students use an interactive Explore Tool, which helps students to build the linear equation representing a straight line on a coordinate plane.	8.EEI.6a 8.EEI.6b	✔		•									

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2 Developing Functional Foundations

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Using Similar Triangles to Describe the Steepness of a Line (continued)	Writing Equations for Lines	Students use slope triangles to determine the slopes of lines graphed on the coordinate plane. They then use the slope of the line, including slopes of 0, to write the equation for the line. Students then translate the line and write the equation for the translated line. Students learn that equations of the form y = mx represent straight lines graphed through the origin and equations of the form y = mx + b represent translations of those lines.	8.EE.6c		✔					•					
Exploring Slopes	Graphing Linear Relationships	Students will graph proportional and non-proportional linear relationships. They will examine and compare unit rates.	8.EEI.5b 8.F.3a 8.F.3b	✔					•						
	Comparing Proportional and Non-Proportional Relationships		8.EE.6c		✔										
Topic 2: Linear Relationships															
Using Tables, Graphs, and Equations	Multiple Representations of Linear Equations	Students represent scenarios with linear expressions. They compare multiple representations of linear functions and determine whether a table, graph, or equation match a given scenario. Students match graphed lines and equations to given scenarios.	8.F.1c	✔			•						•		
	Modeling Linear Relationships Using Multiple Representations	Students model problems using expressions, tables, and graphs. Students use number properties to evaluate and solve one-step and two-step equations.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔				•		•		•	•	
Linear Relationships in Tables	Calculating Slopes	Students are given a relation and a choice as to which method to use to graph it. Students are then given information about the line appropriate to the chosen method.	8.F.4a 8.F.4b		✔				•		•		•		

2 Developing Functional Foundations

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Slope-Intercept Form of a Line	Connecting Slope-Intercept and Point-Slope Forms	Students watch an animation showing a situation involving a California roller coaster whose initial drop can be modeled by a linear equation in point-slope form. Students then write linear equations in point-slope form to describe lines on a coordinate plane given two points. They convert these equations in point-slope form into slope-intercept form to determine the y-intercept of each line.	8.F.4b	✔		•							•		
	Writing Equations Given Slope and a Point	In real-world and mathematical problems, students write the equation of a line in slope-intercept form given the slope and a point on the line.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔				•		•		•	•	
	Writing Equations Given Two Points	In real-world and mathematical problems, students write the equation of a line in slope-intercept form given two points on the line.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔				•		•		•	•	
	Analyzing Models of Linear Relationships	Students analyze scenarios of linear relationships. They are given an equation that models the scenario. Students then match the different expressions in the equation to verbal descriptions of these quantities in the context of the scenario.	8.F.4d		✔		•						•		
Point-Slope Form of a Line	Modeling Linear Relationships Given an Initial Point	Given a scenario describing an initial point and a second point in a linear relationship, students define variables, answer questions, and write an expression to represent the line.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔						•		•	•	
	Modeling Linear Relationships Given Two Points	Given a scenario describing two points in a linear relationship, students define variables, answer questions, and write an expression to represent the line.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔						•		•	•	
Graphing Linear Equations	Graphing Given an Integer Slope and y-Intercept	Students will write the equations of lines given an integer slope and a y-intercept.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔				•		•		•		
	Graphing Given a Decimal Slope and y-Intercept	Students will write the equations of lines given a decimal-value slope and a y-intercept.	8.F.4a 8.F.4b 8.F.4c 8.F.4d		✔				•		•		•		
	Modeling Linear Equations in Standard Form	Students follow worked examples and analyze linear equations in standard form. Students identify components of linear equations and their meaning in terms of problem situations.	8.F.4a	✔			•						•		•

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2 Developing Functional Foundations

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Graphing Linear Equations (continued)	Graphing Linear Equations using a Given Method	Students graph relations given in standard form by applying an indicated method: the slope-intercept method, two-points method, or two-intercepts method.	8.F.4a 8.F.4b		✔				•						
	Graphing Linear Equations using a Chosen Method	Students are given a relation and a choice as to which method to use to graph it. Students are then given information about the line appropriate to the chosen method.	8.F.4a 8.F.4b		✔				•						
Defining Functional Relationships	Classifying Relations and Functions	Students watch an animation and follow worked examples as they learn how to classify relations as functions or non-functions.	8.F.1a 8.F.1b 8.F.1c 8.F.1d	✔		•							•		•

Topic 3: Introduction to Functions

Using Tables, Graphs, and Equations	Exploring Functions	Students use an interactive function machine to explore mystery functions. Students use the function machine and a table to identify functions. They also use the machine along with sorting activities to identify the domain and range of different functions.	8.F.1a	✔			•	•							
Describing Graphs of Functions	Exploring Graphs of Functions	Students use an interactive function machine and a graph to identify and analyze function equations and graphs. Students identify intercepts of the graphs.	8.F.1a 8.F.1c	✔				•							
	Identifying Key Characteristics of Graphs of Functions	Students will identify key characteristics from the graph of a function, such as the intercepts, minimum and maximum x-values, minimum and maximum y-values, domain, and range.	8.F.4		✔				•						
Comparing Functions Using Different Representations	Comparing Linear Relationships in Different Forms		8.F.2		✔										

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2 Developing Functional Foundations

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Topic 4: Patterns in Bivariate Data															
Analyzing Patterns in Scatter Plots	Estimating Lines of Best Fit	Students describe the patterns of association in scatter plots and select the most appropriate line of best fit for a scatter plot.	8.DSP.1c 8.DSP.2	✔			•	•					•		
	Using Lines of Best Fit	Students practice interpreting the meaning of lines of best fit and using the lines to make predictions.	8.DSP.2 8.DSP.3 8.DSP.3a 8.DSP.3b 8.DSP.3c	✔									•		
Patterns of Association of Two-Way Tables	Building Marginal Frequency Distributions	Students construct a Marginal Frequency Distribution from an input Data Table for a contextual scenario.	8.DSP.4a*		✔						•		•		
	Analyzing Marginal Frequency Distributions	Students analyze a Marginal Frequency Distribution to answer questions about frequencies for interior and total cells, categories with minimum or maximum frequencies for interior and/or total cells, and comparing frequencies in different rows or columns	8.DSP.4c*		✔								•		
	Building Marginal Relative Frequency Distributions	Students construct a Marginal Relative Frequency Distribution from an input Marginal Frequency Distribution for a contextual scenario.	8.DSP.4a* 8.DSP.4b*		✔						•		•		
	Analyzing Marginal Relative Frequency Distributions	Students analyze a Marginal Relative Frequency Distribution to answer questions about relative frequencies for interior and total cells, categories with minimum or maximum relative frequencies for interior and/or total cells, and comparing relative frequencies in different rows or columns.	8.DSP.4b* 8.DSP.4c*		✔								•		

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3 Modeling Linear Equations

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Topic 1: Solving Linear Equations															
Solving Multi-Step Equations	Solving Multi-Step Equations	Students practice solving equations algebraically using a variety of strategies, including using a balance tool.	8.EEI.7a	✔				•							•
	Solving by Combining Like Variable Terms and a Constant with Integers (No Type In)	Students combine like terms and then solve for a variable given an equation with integer coefficients and constants.	8.EEI.7a		✔									•	
	Solving by Combining Like Variable Terms and a Constant with Integers (Type In)	Students combine like terms and then solve for a variable given an equation with integer coefficients and constants.	8.EEI.7a		✔									•	
	Solving by Combining Like Variable Terms and a Constant with Decimals (No Type In)	Students combine like terms and then solve for a variable given an equation with decimal coefficients and constants.	8.EEI.7a		✔									•	
	Solving by Combining Like Variable Terms and a Constant with Decimals (Type In)	Students combine like terms and then solve for a variable given an equation with decimal coefficients and constants.	8.EEI.7a		✔									•	
Analyzing Linear Equations Involving the Distributive Property	Analyzing Models of Linear Relationships Involving the Distributive Property	Students analyze scenarios of one-step linear relationships involving the distributive property. They are given an equation that models the scenario. Students then match the different expressions in the equation to verbal descriptions of these quantities in the context of the scenario.	8.F.4d		✔		•						•		
	Modeling Integer Rates of Change	Students will determine linear expressions with integer coefficients that represent real-world contexts. They will use these expressions to solve problems.	8.F.4a		✔						•		•	•	
	Modeling Fractional Rates of Change	Students will determine linear expressions with fraction or decimal coefficients that represent real-world contexts. They will use these expressions to solve problems.	8.F.4a		✔						•		•	•	

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3 Modeling Linear Equations

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Analyzing Linear Equations Involving the Distributive Property (continued)	Modeling using the Distributive Property over Division	Students will use the Distributive Property over Division to determine and represent expressions for real-world contexts. They will use these expressions to solve problems.	8.EEI.7a 8.F.4a		✔						•		•	•	
Interpreting the Number of Solutions to Equations	Solving Equations with One Solution, Infinite, and No Solutions	Students follow worked examples as they learn to identify equations with one solution, no solutions, and infinite solutions. Students also check the solutions to equations.	8.EEI.7a 8.EEI.7b	✔											•
	Sorting Equations by Number of Solutions	Students complete sorting activities to practice identifying linear equations with one, no, and infinite solutions.	8.EEI.7a 8.EEI.7b	✔			•								
Solving Linear Equations with Variables on Both Sides	Solving with the Distributive Property Over Multiplication	Students will solve equations with variables embedded in distribution expressions.	8.EE.7b		✔									•	
	Solving with the Distributive Property Over Division	Students will solve equations with variables embedded in distribution expressions in fractions.	8.EE.7b		✔									•	
	Solving with Variables on Both Sides with Rationals (No Type In)	Students will solve equations with variables on both sides of the equals sign.	8.EEI.7a		✔									•	
	Solving with Variables on Both Sides with Rationals (Type In)	Students will solve equations with variables on both sides of the equals sign.	8.EEI.7a		✔									•	

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3 Modeling Linear Equations

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Topic 2: Systems of Linear Equations															
Systems of Linear Equations	Introduction to Systems of Linear Equations	Students watch an animation introduces systems of linear equations and demonstrating that linear systems may have one solution, no solutions, or an infinite number of solutions. Students represent systems with one solution graphically and algebraically in order to understand that the solution to such a system is represented by a point of intersection of the graphs of the two linear equations. Students verify solutions to systems and interpret a system in context, making sense of the point of intersection as the break-even point in a cost-income situation.	8.EEI.8b 8.EEI.8d	✔		•			•						
	Modeling Linear Systems Involving Integers	Students will write multiple expressions with integer coefficients and use equations to solve systems and determine break-even points in the context of real-world problems.	8.EEI.8a 8.EEI.8b		✔				•		•		•	•	
	Modeling Linear Systems Involving Decimals	Students will write multiple expressions with decimal coefficients and use equations to solve systems and determine break-even points in the context of real-world problems.	8.EEI.8a 8.EEI.8b		✔				•		•		•	•	
	Solving Linear Systems Using Substitution	Students will solve systems of equations with one solution using substitution in mathematical contexts.	8.EEI.8c		✔				•					•	
	Solving Linear Systems Using Linear Combinations	Students solve systems of linear equations using linear combinations and compare the algebraic and graphical solutions.	8.EEI.8c		✔										
	Solving Linear Systems Using Any Method	Students choose to solve systems of linear equations using substitution or linear combinations.	8.EEI.8c		✔										

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4 Expanding Number Systems

MATHia Unit	MATHia Workspace	Overview	SC Standard	Concept Builder	Mastery	Strategies: Animations	Classifications	Explore Tools	Graphing Tools	Interactive Diagrams	Interactive Worksheets	Proof	Real-World Scenarios	Solvers	Worked Example
Topic 1: The Real Number System															
The Real Numbers	Introduction to Irrational Numbers	Students determine perfect squares and their square roots. They use rational approximations to determine decimal approximations of square roots of non-perfect squares. Students watch an animation about the real number system and classify real numbers as rational or irrational.	8.NS.1a 8.NS.1c 8.NS.2 8.EEI.2b 8.EEI.2d	✔		•	•				•				•
	Graphing Real Numbers on a Number Line	Students practice plotting various real numbers on a number line. Students approximate, if necessary, and plot decimals, percents, fractions, square roots, and pi.	8.NS.1b 8.NS.2		✔				•						
	Ordering Rational and Irrational Numbers	Students use a number line tool to plot approximate values of real numbers and then compare and order the numbers.	8.NS.1b 8.NS.2	✔					•						
	Solving for Side-Lengths in Area and Volume Problems	Students are given the area or volume of a figure and solve for the side length of a square or cube.	8.EE.2		✔								•	•	
Topic 2: Pythagorean Theorem															
The Pythagorean Theorem	Exploring the Pythagorean Theorem	Students explore a variety of right triangles and answer questions about proofs of the Pythagorean Theorem and its converse.	8.GM.6	✔			•	•							
	Using the Pythagorean Theorem	Students increase their familiarity with using the Pythagorean Theorem by analyzing worked examples.	8.EEI.2a 8.EEI.2d 8.GM.7		✔					•				•	
The Converse of the Pythagorean Theorem	Problem Solving Using the Pythagorean Theorem	Students solve for an unknown side length of a right triangle in real-world problems by using the Pythagorean Theorem.	8.EEI.2a 8.GM.7	✔									•		
Distances in a Coordinate System	Calculating Distances on the Coordinate Plane	Students determine distances on the coordinate plane using the Pythagorean Theorem.	8.EEI.2a 8.GM.8	✔				•							

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5 Applying Powers

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Topic 1: Exponents and Scientific Notation															
Properties of Powers with Integer Exponents	Introduction to the Power Rules	Students analyze worked examples for the power rules, including the Product Rule, Quotient Rule, Power to a Power Rule, Zero Power, and Negative Exponent Rules. They then answer questions and derive a general formula for each rule. Finally, students practice applying the rules.	8.EEI.1	✔							•			•
	Using the Product Rule and the Quotient Rule	Students will simplify mathematical expressions using the Product and Quotient Rules.	8.EEI.1		✔								•	
	Using the Power to a Power Rule	Students will simplify mathematical expressions using the Power to a Power Rule.	8.EEI.1		✔								•	
	Using the Product to a Power Rule and the Quotient to a Power Rule	Students will simplify mathematical expressions using the Product to a Power and the Quotient to a Power Rules.	8.EEI.1		✔								•	
	Using Properties of Exponents with Whole Number Powers	Students will use a variety of strategies, including the Power to a Power Rule, the Product to a Power Rule, and the Quotient to a Power Rule to simplify mathematical expressions with exponents.	8.EE.1		✔								•	
	Rewriting Expressions with Negative and Zero Exponents	Students will simplify mathematical expressions involving negative exponents and exponents of 0.	8.EEI.1		✔								•	
Scientific Notation	Using Scientific Notation	Students write numbers in standard form as numbers in scientific notation and write numbers in scientific notation as numbers in standard form.	8.EEI.3a 8.EEI.3b	✔							•				
	Comparing Numbers using Scientific Notation	Students follow worked examples as they learn how to compare numbers written in scientific notation.	8.EEI.3a 8.EEI.3b	✔											•

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5 Applying Powers

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Topic 2: Volume of Curved Figures															
Volume of a Cylinder	Relating Volumes of Cylinders, Cones, and Spheres	Students analyze a cylinder and its circular bases to understand the volume formulas V = Bh and V = pi * r^2 for the cylinder. They watch an animation which shows filling a cone with liquid and pouring its volume into first a cylinder and then a hemisphere. Students infer the volume formulas for the cone and sphere. Finally, students solve mathematical problems related to the volumes of cylinders, cones, and spheres.	8.GM.9	✔		•									
	Calculating Volume of Cylinders	Students will use mathematical and real-world objects to determine the volume of cylinders.	8.GM.9		✔						•		•	•	
	Using Volume of Cylinders	Students will apply the formula for the volume of a cylinder to solve a variety of different problems.	8.GM.9		✔						•		•	•	
Volume of a Cone	Calculating Volume of Cones	Students will use mathematical and real-world objects to determine the volume of cones.	8.GM.9		✔						•		•	•	
	Using Volume of Cones	Students will apply the formula for the volume of a cone to solve a variety of different problems.	8.GM.9		✔						•		•	•	
Volume of a Sphere	Calculating Volume of Spheres	Students will use mathematical and real-world objects to determine the volume of spheres.	8.GM.9		✔						•		•	•	
	Using Volume of Spheres	Students will apply the formula for the volume of a sphere to solve a variety of different problems.	8.GM.9		✔						•		•	•	