Grade 6 Mathematics Curriculum Guide

Grade Level/Course Title: Grade 6	**Quarter** 1	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

Essential Questions for this Unit:
1. How can students understand exponents represent repeated multiplication in order to evaluate power and express whole numbers as powers (find the exponents when given the base)?
2. How can students use the order of operations to simplify numerical expressions?
3. How can students identify properties of numbers and use them to simplify numerical expressions (identify the missing number)?
4. How can students use substitution and order of operations to evaluate algebraic expressions with one or more variables?
5. How can students translate words and situations into numbers, variables and operations?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 1: **(Aug – Sept)** **Order of Operations and Algebraic Expressions** **(14 days)** * standards continued on next page	6.NS.2	Fluently divide multi-digit numbers using the standard algorithm.	Understanding: • Syntax • Exponents • Decomposition • Order of Operations • Properties of Numbers • Evaluating Algebraic Expressions	Course Intro/Book Distribution/Expectations (3 days) Syntax - Expressions, Equations, and Inequalities [GMR] Warm-Up Template (Word) [GMR] Lesson 1.2 Exponents Lesson 1.3 Order of Operations Order of Operations [L] Lesson 1.4 Properties of Numbers *(Distributive Property)* Distributive Property [CP] Lesson 1.5 Evaluating Algebraic Expressions Lesson 1.6 Writing Algebraic Expressions
	6.EE.1	Write and evaluate numerical expressions involving whole-number exponents.		
	6.EE.2	Write, read, and evaluate expressions in which letters stand for numbers. a) Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y* b) Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* c) Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.*		

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Essential Questions for this Unit:

1. How can students understand exponents represent repeated multiplication in order to evaluate power and express whole numbers as powers (find the exponents when given the base)?
2. How can students use the order of operations to simplify numerical expressions?
3. How can students identify properties of numbers and use them to simplify numerical expressions (identify the missing number)?
4. How can students use substitution and order of operations to evaluate algebraic expressions with one or more variables?
5. How can students translate words and situations into numbers, variables and operations?

Unit (Time)	CCSS	Standard Description	Resources
Unit 1: (Aug – Sept) (continued) **Order of Operations and Algebraic Expressions** **(14 days)**	6.EE.3	Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.	
	6.EE.4	Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*	
	6.EE.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.	

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Essential Questions for this Unit:
1. How can students find the area of polygons through decompositions or by making triangles or rectangles?
2. How can students find the area of triangles, quadrilaterals and polygons and relate those areas to other polygons?
3. How can students find the area of irregular shapes (composite shapes, rectangles and triangles together)?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 2: **(Sept)** **Area of Polygons** **(13 days)**	6.G.1	Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	Understanding: • Syntax • Decomposition • Unit Cubes • Students Identify, Write, and Use Correct Formulas to Solve Problems • Draw and Label Diagrams when Appropriate • Include Units when Working with Formulas	Lesson 10.3 Area of Parallelograms Lesson 10.4 Area of Triangles & Trapezoids Lesson 10.6 Area of Irregular and Composite Figures

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Grade Level/Course Title: Grade 6	**Quarter** 1/2	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
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Essential Questions for this Unit:

1. How can students compare and order integers using a number line and <, >, symbols?
2. How can students understand absolute value is the distance for a number from zero, and can determine the absolute value of integers?
3. How can students use integers in real world context, for example, elevation, temperature change, owing/having money?
4. How can students graph points in all four quadrants of a coordinate plane and use coordinate points to solve problems, for example find the distance between 2 points, as well as, draw polygons on the coordinate plane when given coordinates for the vertices?
5. How can students make an *x-y* table (t-chart) for an equation with 2 variables, graph the equation and describe the change that occurs as the value of one variable changes?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 3: **(Sept – Nov)** **Integers and the Coordinate Plane** **(29 days)** * standards continued on next page	6.NS.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	Understanding: • Syntax • Compare and Order Integers • Absolute Value • Graph Points • Solve Problems on the Coordinate Plane • Plot Points of Vertices to Draw Polygons • Tables	Lesson 2.1 Introduction to Integers *(Ordering Integers on a Number Line)* Real Number Line Development [CP] Number Line Worksheets [GR] Lesson 2.1 Introduction to Integers *(Absolute Value)* Lesson 2.6 The Coordinate Plane **Benchmark 1 – Units 1 – 3**
	6.NS.6	Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a) Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. b) Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c) Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.		

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Grade Level Mathematics Focus:
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Essential Questions for this Unit:

1. How can students compare and order integers using a number line and <, >, symbols?
2. How can students understand absolute value is the distance for a number from zero, and can determine the absolute value of integers?
3. How can students use integers in real world context, for example, elevation, temperature change, owing/having money?
4. How can students graph points in all four quadrants of a coordinate plane and use coordinate points to solve problems, for example find the distance between 2 points, as well as, draw polygons on the coordinate plane when given coordinates for the vertices?
1. How can students make an *x-y* table (t-chart) for an equation with 2 variables, graph the equation and describe the change that occurs as the value of one variable changes?

Unit (Time)	CCSS	Standard Description	Resources
Unit 3: (Sept – Nov) (continued) **Integers and the Coordinate Plane** **(29 days)**	6.NS.7	Understand ordering and absolute value of rational numbers. a) Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* b) Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.* c) Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* d) Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*	
	6.NS.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.	
	6.G.3	Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.	

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Grade Level/Course Title: Grade 6	**Quarter** 2	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
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Essential Questions for this Unit:
1. How can students find the greatest common divisor of two or more whole numbers less than or equal to 100 and apply this skill to real world problems?
2. How can students find the LCM of two or more whole numbers less than or equal to 12 and apply this skill to real world problems?
3. How can students use common denominators to compare and order fractions?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 4: **(Nov – Jan)** **Number Theory and Fractions** **(33 days)**	6.NS.4	Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example express* $36+8$ *as* $4(9+2)$.	Understanding • Syntax • Greatest Common Factor/Divisor • Least Common Multiple • Comparing and Ordering Fractions	Lesson 3.1 Prime Factorization Sieve of Eratosthenes [CP] Hundreds Chart [GMR] Lesson 3.2 Greatest Common Factor Lesson 3.3 Least Common Multiple Least Common Multiple [CP] LCM - Bubble Method Language [GMR] Lesson 3.6 Comparing & Ordering Rational Numbers Number Line Worksheets [GR]
	6.NS.6c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.		

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Grade Level/Course Title: Grade 6	**Quarter** 2/3	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division, and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

Essential Questions for this Unit:
1. How can students connect multiplying fractions by whole numbers and fractions to a visual model to help understand the procedure?
2. How can students divide fractions by whole numbers and fractions?
3. How can students convert mixed numbers to improper fractions to multiply and divide with mixed number?
4. How can students make visual models to show division of fractions?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 5: **(Jan – Feb)** **Division of Fractions** **(24 days)**	6.NS.1	Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for* $(2/3) \div (3/4)$ *and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that* $(2/3) \div (3/4) = 8/9$ *because* $3/4$ *of* $8/9$ *is* $2/3$*. (In general,* $(a/b) \div (c/d) = ad/bc$*.) How much chocolate will each person get if 3 people share* $1/2$ *lb. of chocolate equally? How many* $3/4$*–cup servings are in* $2/3$ *of a cup of yogurt? How wide is a rectangular strip of land with length* $3/4$ *mi and area* $1/2$ *square mi?*	Understanding • Syntax • Multiply Fractions by a Whole Number • Multiply and Divide Mixed Numbers • Make Visual Models	Converting – Improper Fractions and Mixed Numbers [L] Lesson 3.4 Equivalent Fractions & Mixed Numbers Simplifying Fractions [CP] Simplifying Fractions Activity [L] Lesson 4.4 Multiply Fractions & Mixed Numbers Multiplying Fractions [CP] Lesson 4.5 Dividing Fractions & Mixed Numbers Dividing Fractions [CP] Modeling Division of a Fraction by a Fraction [L] Number Line Division [L]

Grade 6 Mathematics Curriculum Guide

Grade Level/Course Title: Grade 6	**Quarter** 3	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
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Essential Questions for this Unit:
1. How can students use place value to compare and order decimal numbers?
2. How can students convert fractions to decimals or vice versa to compare and order rational numbers?
3. How can students line up the decimals to understand place value to add and subtract decimals?
4. How can students use models like generic rectangles to do partial products with place value in order to multiply two decimal numbers?
5. How can students use multiple methods to help them understand how to accurately divide decimals?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 6: **(March)** **Operations with Decimals** **(10 days)**	6.NS.2	Fluently divide multi-digit numbers using the standard algorithm.	Understanding • Syntax • Comparing and Ordering Decimals • Comparing and Ordering Rational Numbers • Adding and Subtracting Decimals • Multiplying and Dividing Decimals	Lesson 3.5 Equivalent Fractions & Decimals Lesson 3.6 Comparing & Ordering Rational Numbers Number Line Worksheets [GR] Lesson 4.7 Adding, Subtracting & Multiplying Decimals Decimal Operations [CP] Lesson 4.8 Dividing Decimals (2 days) Multiplying Decimals [L] Dividing Decimals [L] **Benchmark 2 – Units 4 – 6**
	6.NS.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.		
	6.NS.6c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.		

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Grade Level/Course Title: Grade 6	**Quarter** 3/4	**Academic Year:** 2013-2014

Grade Level Mathematics Focus:
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Essential Questions for this Unit:

1. How can students develop understanding of the use of variables in mathematical expressions, write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems?
2. How can students understand that expressions in different forms can be equivalent, and use the properties of operations to rewrite expressions in equivalent forms?
3. How can students know that the solutions of an equation are the values of the variables that make the equation true?
4. How can students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations?
5. How can students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and use equations (such as $3x = y$) to describe relationships between quantities?

Unit (Time)	CCSS	Standard Description	Content	Resources(Suggested Number of Days)
Unit 7: **(Mar – Apr)** **Equations** **(11 days)**	6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Understanding • Syntax • Use Substitution to Check an Answer Solve One-Step Equations Using: • Flow Charts • Inverse Operations by Making Zeros or Ones • Bar Models • Decomposition	Lesson 1.7 Equations and Their Solutions Lesson 1.8 Solve Equations by Adding Lesson 1.9 Solve Equations by Subtracting Solving Equations [CP] One Step Equations [L] Equations with Algebra Tiles [L] Lesson 1.10 Solving Equations by Dividing Lesson 1.11 Solving Equations by Multiplying Lesson 4.6 Solving Equations Containing Fractions Lesson 4.10 Solving Equations Containing Decimals
	6.EE.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.		
	6.EE.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.*		

Grade 6 Mathematics Curriculum Guide

Grade Level/Course Title: Grade 6	**Quarter** 4	**Academic Year:** 2014-2015

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Essential Questions for this Unit:
1. How can students describe which value(s) make an inequality true or false by substitution?
2. How can students write inequalities based on real world situations and represent solutions of inequalities on a number line?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 8: **(April)** **Inequalities** **(10 days)**	6.EE.5	Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Understanding • Syntax • Inequalities and Values that Make It true • Write Inequalities based on real world situations • Represent Inequalities on a Number Line	
	6.EE.8	Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.		

Grade 6 Mathematics Curriculum Guide

Grade Level/Course Title: Grade 6	**Quarter** 4	**Academic Year:** 2014-2015

Grade Level Mathematics Focus:
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Essential Questions for this Unit:
1. How can students find and compare unit rates (average cost and speed) to help determine if two ratios are proportional and use it to solve proportions?
2. How can viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and analyzing simple drawings that indicate the relative size of quantities, help students connect their understanding of multiplication and division with ratios and rates?
3. How can students go between a fraction decimal and percent and use that to solve percent problems?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 9: (Apr – May) **Ratios, Proportions and Percents** **(30 days)**	6.RP.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*	Understanding • Syntax • Ratios • Proportions Solve Using: • Cross Products or Clear the Denominator • Tables • Common Denominators Understand: • Percent's • Percent Problems	Lesson 5.1 Ratios (1 day) Rates, Ratios, and Proportions [CP] Lesson 5.2 Rates (2 days) Bar Models – Rate, Percent, Equations [L] Lesson 5.3 Identifying & Writing Proportions Lesson 5.4 Solving Proportions Lesson 6.2 Fractions, Decimals & Percents Fractions, Decimals, and Percents [L] Lesson 6.4 Percent of a Number Lesson 6.5 Solving Percent Problems Percent Problems – Multiple Methods [CP] Bar Models - Percents & Fractions [L] **Benchmark 3 – Units 7 – 8**
	6.RP.2	Understand the concept of a unit rate *a*/*b* associated with a ratio *a*:*b* with $b \neq 0$, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* (Expectations for unit rates in this grade are limited to non-complex fractions.)		
	6.RP.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. a) Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b) Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* c) Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. d) Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.		

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Essential Questions for this Unit:
1. How can students make, describe and summarize data displays like histograms and box plots using their knowledge of mean, median and mode?
2. How can students describe statistical variability like inner quartile range and describe a distribution by its center, spread and overall shape?
3. How can students use recognize statistical questions and describe the differences between a measure of central tendency and a measure of variation?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 10: (June) **Statistics**	6.SP.1	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*	Understanding • Syntax • Data Displays • Statistical Variability • Statistical Questions • Mean • Median • Mode • Central Tendency • Measure of Variation	Lesson 7.1 Mean, Median, Mode & Range Mean Part I [L] Mean Part Two [L] Lesson 7.2 Additional Data & Outliers Lesson 7.3 Choosing the Most Useful Measure Lesson 7.4 Analyzing Data Displays Comparing Data Displays [L] Interpreting Data in Graphs [L]
	6.SP.2	Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.		
	6.SP.3	Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.		
	6.SP.4	Display numerical data in plots on a number line, including dot plots, histograms, and box plots.		
	6.SP.5	Summarize numerical data sets in relation to their context, such as by: a) Reporting the number of observations. b) Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c) Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. d) Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.		

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Grade Level Mathematics Focus:
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Essential Questions for this Unit:
1. How can students find volume of a right rectangular prism with fractional edge lengths?
2. How can students use nets to find the surface area of triangular and rectangular prisms?

Unit (Time)	CCSS	Standard Description	Content	Resources (Suggested Number of Days)
Unit 11: (June) **Volume and Surface Area**	6.G.2	Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	Understanding • Syntax • Volume • Nets • Surface Area	Lesson 10.7 3D Figures Lesson 10.8 Volume of Prisms (3 days) Volume of Prisms [CP] Lesson 10.10 Surface Area Surface Area of Prisms [CP] Rectangular Prisms [L]
	6.G.4	Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.		