HELP Math

Common Core Standards for Mathematics Correlations

Grades 6, 7, & 8

Ratios and Proportional Relationships		
6.RP GRADE 6	**7.RP GRADE 7**	**N/A**
Understand ratio concepts and use ratio reasoning to solve problems. 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."* NMS Lesson: 7 (Ratios & Proportions) 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."* NMS Lesson: 7 (Ratios & Proportions) 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	**Analyze proportional relationships and use them to solve real-world and mathematical problems.** 1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.* NMS Lesson: 7 (Ratios & Proportions) Algebra Lessons: 4 (Relationships) and 9 (Proportional and Non-Proportional Relationships) 2. Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. NMS Lesson:	

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. NMS Lesson: 7 (Ratios & Proportions) 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?* NMS Lesson: 7 (Ratios & Proportions) 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. NMS Lessons: 6 (Working with Decimals & Percents) and 7 (Ratios & Proportions) d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. NMS Lesson: 7 (Ratios & Proportions) Algebra Lesson: 4 (Relationships)	7 (Ratios & Proportions) Algebra Lessons: 4 (Relationships), 9 (Proportional and Non-Proportional Relationships), and 12 Graphing in the Coordinate Plane) b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. NMS Lesson: 7 (Ratios & Proportions) Algebra Lessons: 4 (Relationships), 9 (Proportional and Non-Proportional Relationships), and 12 Graphing in the Coordinate Plane) c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.* NMS Lesson: 7 (Ratios & Proportions) Algebra Lessons: 4 (Relationships), and 9 (Proportional and Non-Proportional Relationships) d. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0)	

	and (1, *r)* where *r* is the unit rate. Algebra Lessons: 4 (Relationships), 8 (Graphing Linear Equations), 9 (Proportional and Non-Proportional Relationships), and 12 Graphing in the Coordinate Plane) 3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* NMS Lesson: 2 (Fractions, Decimals, & Percents – Concepts), 6 (Working with Decimals and Percents), 7 (Ratios & Proportions) Algebra Lesson: 4 (Relationships)	

The Number System		
6.NS GRADE 6	**7.NS GRADE 7**	**8.NS GRADE 8**
Apply and extend previous understandings of multiplication and division to divide fractions by fractions. 1. Interpret and compute quotients of fractions, and solve word problems involving division of	**Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** 1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition	**Know that there are numbers that are not rational, and approximate them by rational numbers.** 1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions

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) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (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?* NMS Lesson: 5 (Divide Fractions) **Compute fluently with multi-digit numbers and find common factors and multiples.** 2. Fluently divide multi-digit numbers using the standard algorithm. Math Foundations 3 Lesson: 6 (Division Skills) 3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Math Foundations 3 Lesson: 7 (Add, Subtract, Multiply & Divide Decimals) NMS Lesson: 6 (Working	and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.* NMS Lessons: 1 (Positive & Negative Numbers), 3 (Add and Subtract Fractions), and 6 (Working With Decimals and Percents) b. Understand $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. NMS Lessons: 1 (Positive & Negative Numbers), 3 (Add and Subtract Fractions), 6 (Working With Decimals and Percents), and 11 (Working with Rational Numbers) c. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. NMS Lessons: 1 (Positive & Negative Numbers) and 11 (Working with Rational Numbers) d. Apply properties of operations as strategies to add and subtract rational numbers. NMS Lessons: 1 (Positive & Negative Numbers), 3 (Add and	that terminate in 0s or eventually repeat. Know that other numbers are called irrational. NMS Lessons: 2 (Fractions, Decimals, & Percents – Concepts), 11 (Working with Rational Numbers), and 12 (Working With Irrational Numbers) 2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.* NMS Lesson: 12 (Working With Irrational Numbers)

with Decimals and Percents) 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).* Math Foundations 3 Lesson: 8 (Add & Subtract Fractions) NMS Lessons: 3 (Add and Subtract Fractions) and 9 (Properties of Operations) **Apply and extend previous understandings of numbers to the system of rational numbers.** 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. Math Foundations 3 Lessons: 4 (Number Lines) and 5 (Add & Subtract	Subtract Fractions), 6 (Working With Decimals and Percents), 9 (Properties of Operations), and 11 (Working with Rational Numbers) 2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational by describing real-world contexts. NMS Lessons: 4 (Multiply Fractions), 9 (Properties of Operations), and 11 (Working with Rational Numbers) b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real world contexts. NMS Lessons: 1 (Positive & Negative Numbers), 2 (Fractions, Decimals, & Percents – Concepts), 9 (Properties of Operations), and 11 (Working with Rational Numbers) c. Apply properties of operations as strategies to multiply and divide rational numbers. NMS Lesson: 9 (Properties of Operations)	

Negative Numbers) NMS Lesson: 1 (Positive & Negative Numbers) 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. Math Foundations 3 Lessons: 4 (Number Lines) and 5 (Add & Subtract Negative Numbers) NMS Lessons: 1 (Positive & Negative Numbers) and 11 (Working with Rational Numbers) 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. Geometry Lesson: 10 (Coordinate Geometry)	d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. NMS Lesson: 11 (Working with Rational Numbers) 3. Solve real-world and mathematical problems involving the four operations with rational numbers. NMS Lessons: 1 (Positive & Negative Numbers), 2 (Fractions, Decimals, & Percents – Concepts), 3 (Add and Subtract Fractions), 4 (Multiply Fractions), 5 (Divide Fractions), 6 (Working with Decimals and Percents), 7 (Ratios & Proportions), 9 (Properties of Operations), 10 (Estimation and Rounding), and 11 (Working with Rational Numbers)	

Algebra Lesson: 1 (Interpreting Graphs) 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. Math Foundations 3 Lessons: 4 (Number Lines) and 5 (Add & Subtract Negative Numbers) NMS Lessons: 1 (Positive & Negative Numbers) and 11 (Working with Rational Numbers) Geometry Lesson: 10 (Coordinate Geometry) Algebra Lesson: 1 (Interpreting Graphs) 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.* NMS Lesson: 1 (Positive & Negative Numbers) Algebra Lesson: 11 (Inequalities) b. Write, interpret, and		

explain statements of order for rational numbers in real-world contexts. *For example, write –3 ^{o}C > –7 ^{o}C to express the fact that –3 ^{o}C is warmer than –7 ^{o}C.* NMS Lesson: 1 (Positive & Negative Numbers) Math Foundations 3 Lessons: 4 (Number Lines) and 5 (Add & Subtract Negative Numbers) 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.* NMS Lesson: 1 (Positive & Negative Numbers) Algebra Lesson: 11 (Inequalities) 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.* NMS Lesson: 1 (Positive & Negative Numbers) Algebra Lesson: 11 (Inequalities)		

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. Geometry Lesson: 10 (Coordinate Geometry) Algebra Lessons: 1 (Interpreting Graphs), 11 (Inequalities), and 12 (Graphing in the Coordinate Plane)		

Expressions and Equations		
6.EE GRADE 6	**7.EE GRADE 7**	**8.EE GRADE 8**
Apply and extend previous understandings of arithmetic to algebraic expressions. 1. Write and evaluate numerical expressions involving whole-number exponents. NMS Lesson: 8 (Using Exponents & Scientific Notation) Algebra Lesson: 10 (Algebraic Expressions Involving Powers) 2. Write, read, and evaluate expressions in which letters stand for numbers.	**Use properties of operations to generate equivalent expressions.** 1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. NMS Lesson: 9 (Properties of Operations) Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 4 (Relationships), and 5 (Combining Like Terms) 2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities	**Work with radicals and integer exponents.** 1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, 32 × 3–5 = 3–3 = 1/33 = 1/27.* NMS Lesson: 8 (Using Exponents & Scientific Notation) Algebra Lesson: 10 (Algebraic Expressions Involving Powers) 2. Use square root and cube root symbols to represent solutions to equations of the

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.* Algebra Lessons: 2 (Variables) and 3 (Patterns and Equations) 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.* Algebra Lesson: 2 (Variables) Math Foundations 2 Lesson: 8 (Mathematical Expressions) 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 = s3 and A = 6 s2 to find the volume and surface area*	in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), and 4 (Relationships) **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** 3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* NMS Lessons: 2 (Fractions, Decimals, & Percents –Concepts), 6 (Working with Decimals and Percents), 7 (Ratios & Proportions), 10 (Estimation and Rounding), and 11 (Working with Rational Numbers) 4. Use variables to represent	form *x*2 = *p* and *x*3 = *p*, where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. NMS Lesson: 12 (Working with Irrational Numbers) Algebra Lesson: 10 (Algebraic Expressions Involving Powers) 3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger.* NMS Lesson: 8 (Using Exponents & Scientific Notation) 4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

of a cube with sides of length $s = 1/2$. Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 5 (Combining Like Terms), and 10 (Algebraic Expressions Involving Powers) NMS Lessons: 8 (Using Exponents & Scientific Notation) and 9 (Properties of Operations) Math Foundations 2 Lesson: 8 (Mathematical Expressions) 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 $3y$.* Algebra Lesson: 5 (Combining Like Terms) NMS Lesson: 9 (Properties of Operations) Math Foundations 2 Lesson: 8 (Mathematical Expressions) 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*	quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 4 (Relationships), and 5 (Combining Like Terms) b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.* Algebra Lesson: 11 (Inequalities)	NMS Lesson: 8 (Using Exponents & Scientific Notation) **Understand the connections between proportional relationships, lines, and linear equations.** 5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), 8 (Graphing Linear Equations), and 9 (Proportional and Non-Proportional Relationships) 6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; 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. Algebra Lessons: 6 (Understanding Functions) and 7 (Linear and Nonlinear Functions) **Analyze and solve linear equations and pairs of**

name the same number regardless of which number y stands for. Algebra Lesson: 5 (Combining Like Terms) NMS Lesson: 9 (Properties of Operations) Math Foundations 2 Lesson: 8 (Mathematical Expressions) **Reason about and solve one-variable equations and inequalities.** 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. Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 5 (Combining Like Terms), 10 (Algebraic Expressions Involving Powers), and 11 (Inequalities) NMS Lesson: 9 (Properties of Operations) Math Foundations 2 Lesson: 9 (Equations) 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.		**simultaneous linear equations.** 7. Solve linear equations in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations) b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations) 8. Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables

Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 5 (Combining Like Terms), and 10 (Algebraic Expressions Involving Powers) NMS Lesson: 9 (Properties of Operations) Math Foundations 2 Lessons: 8 (Mathematical Expressions) and 9 (Equations) 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. Algebra Lessons: 2 (Variables), 3 (Patterns and Equations), 5 (Combining Like Terms), and 10 (Algebraic Expressions Involving Powers) NMS Lesson: 9 (Properties of Operations) Math Foundations 2 Lessons: 8 (Mathematical Expressions) and 9 (Equations) 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. Algebra Lesson: 11 (Inequalities) **Represent and analyze**		correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. No correlation. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.* No correlation. c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.* No correlation.

quantitative relationships between dependent and independent variables. 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.* Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations)		
N/A	**N/A**	**Functions**
GRADE 6	**GRADE 7**	**8.F GRADE 8**
		Define, evaluate, and compare functions. 1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Algebra Lesson: 6 (Understanding Functions)

		2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.* Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations) 3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* Algebra Lessons: 6 (Understanding Functions) and 7 (Linear and Nonlinear Functions) **Use functions to model relationships between quantities.** 4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the

		function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations) 5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions), and 8 (Graphing Linear Equations)

Geometry		
6.G GRADE 6	**7.G GRADE 7**	**8.G GRADE 8**
Solve real-world and mathematical problems involving area, surface area, and volume. 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. Geometry Lesson: 5 (Perimeter and Area) 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. Geometry Lesson: 7 (Volume and Surface Area) 3. Draw polygons in the coordinate plane given coordinates for the vertices;	**Draw, construct, and describe geometrical figures and describe the relationships between them.** 1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. Geometry Lesson: 9 (Similar and Congruent Figures) NMS Lesson: 7 (Ratios & Proportions) Algebra Lesson: 9 (Proportional and Non-Proportional Relationships) 2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. Geometry Lessons: 1 (Lines and Angles) and 6 (Circles) Math Foundations 3 Lesson: 9 (Geometry) 3. Describe the two-dimensional figures that result from slicing three dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. Geometry Lesson: 4 (Solid Figures)	**Understand congruence and similarity using physical models, transparencies, or geometry software.** 1. Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length. Geometry Lessons: 9 (Similar and Congruent Figures) and 11 (Transformations) b. Angles are taken to angles of the same measure. Geometry Lessons: 9 (Similar and Congruent Figures) and 11 (Transformations) c. Parallel lines are taken to parallel lines. Geometry Lessons: 9 (Similar and Congruent Figures) and 11 (Transformations) 2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a

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. Geometry Lessons: 2 (Polygons) and 10 (Coordinate Geometry) Algebra Lesson: 12 (Graphing in the Coordinate Plane) 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. Geometry Lessons: 4 (Solid Figures) and 7 (Surface Area)	Math Foundations 3 Lesson: 9 (Geometry) **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** 4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. Geometry Lesson: 6 (Circles) 5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. Geometry Lessons: 1 (Lines and Angles) and 6 (Circles) Math Foundations 3 Lesson: 9 (Geometry) 6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. Geometry Lessons: 5 (Perimeter and Area) and 7 (Volume and Surface Area)	sequence that exhibits the congruence between them. Geometry Lessons: 9 (Similar and Congruent Figures) and 11 (Transformations) 3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. Geometry Lesson: 11 (Transformations) 4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two dimensional figures, describe a sequence that exhibits the similarity between them. Geometry Lessons: 9 (Similar and Congruent Figures) and 11 (Transformations) 5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* Geometry Lessons:

		1 (Lines and Angles), 3 (Triangles), and 9 (Similar and Congruent Figures) **Understand and apply the Pythagorean Theorem.** 6. Explain a proof of the Pythagorean Theorem and its converse. Geometry Lesson: 12 (Pythagorean Theorem) 7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. Geometry Lesson: 12 (Pythagorean Theorem) 8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. No correlation. **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** 9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. Geometry Lesson: 7 (Volume and Surface Area)

Statistics and Probability		
6.SP GRADE 6	**7.SP GRADE 7**	**8.SP GRADE 8**
Develop understanding of statistical variability. 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.* DA Lesson: 1 (Data Collection and Organization) 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. DA Lesson: 3 (Central Tendency) 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. DA Lesson: 3 (Central Tendency) **Summarize and describe**	**Use random sampling to draw inferences about a population.** 1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. DA Lesson: 1 (Data Collection and Organization) 2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.* DA Lessons: 1 (Data Collection and Organization) and 4 (Interpret Data) **Draw informal comparative inferences about two populations.** 3. Informally assess the degree of	**Investigate patterns of association in bivariate data.** 1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. DA Lessons: 2 (Representing Data), 3 (Central Tendency,) and 4 (Interpret Data) 2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. DA Lessons: 2 (Representing Data), 3 (Central Tendency,) and 4 (Interpret Data) Algebra Lesson: 1 (Interpreting Data) 3. Use the equation of a linear model to solve problems in the context of bivariate measurement data,

distributions. 4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots. Algebra Lesson: 1 (Interpreting Graphs) DA Lessons: 1 (Data Collection and Organization), 2 (Representing Data), and 4 (Interpret Data) 5. Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. DA Lessons: 1 (Data Collection and Organization) and 2 (Representing Data) b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. Algebra Lesson: 1 (Interpreting Graphs) DA Lessons: 1 (Data Collection and Organization), 2 (Representing Data), 3 (Central Tendency), and 4 (Interpret Data) c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any	visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater* than the mean height of players on the *team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.* DA Lesson: 3 (Central Tendency) 4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.* DA Lessons: 3 (Central Tendency) and 4 (Interpret Data) **Investigate chance processes and develop, use, and evaluate probability models.** 5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor	interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* Algebra Lessons: 6 (Understanding Functions), 7 (Linear and Nonlinear Functions,) and 8 (Graphing Linear Functions) 4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?* DA Lessons: 2 (Representing Data), 3 (Central Tendency,) and 4 (Interpret Data) Algebra Lesson: 1 (Interpreting Data)

overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Algebra Lesson: 1 (Interpreting Graphs) DA Lessons: 1 (Data Collection and Organization), 2 (Representing Data), 3 (Central Tendency), and 4 (Interpret Data) 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. Algebra Lesson: 1 (Interpreting Graphs) DA Lesson: 3 (Central Tendency)	likely, and a probability near 1 indicates a likely event. DA Lessons: 5 (Probability) and 6 (Estimate the Probability of Future Events and Design Probability Experiments) 6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* DA Lessons: 6 (Estimate the Probability of Future Events and Design Probability Experiments) and 7 (Evaluate Predictions and Conclusions Based on Data Analysis) 7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* DA Lesson: 5 (Probability) b. Develop a probability model (which may not be uniform) by	

	observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* DA Lessons: 6 (Estimate the Probability of Future Events and Design Probability Experiments) and 7 (Evaluate Predictions and Conclusions Based on Data Analysis) 8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. DA Lesson: 5 (Probability) b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. DA Lesson: 5 (Probability) c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If*	

	40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood? DA Lessons: 6 (Estimate the Probability of Future Events and Design Probability Experiments) and 7 (Evaluate Predictions and Conclusions Based on Data Analysis)	