Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
Operations and Algebraic Thinking				
3.OA.A.1	Identify whole number products with visual support.	Interpret whole number products with visual support.	Interpret products of whole numbers as the total number of objects in equal groups (e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each).	Interpret products of whole numbers within 100, representing context using pictures, numbers, and words.
3.OA.A.2	Identify whole number quotients with visual support.	Interpret whole number quotients with visual support.	Interpret whole number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each group when 56 objects are partitioned equally into 8 groups, or as a number of groups when 56 objects are partitioned into equal groups of 8 objects each).	Interpret quotients of whole numbers within 100, representing context using pictures, numbers, and words.
3.OA.A.3	Identify products and quotients within 100 to solve word problems involving equal groups and arrays when a visual model is given.	Multiply and divide within 100 to solve word problems involving equal groups and arrays when a visual model is given.	Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.	Multiply and divide within 100 to solve multi-step word problems involving equal groups, arrays, and measurement quantities.
3.OA.A.4	Recognize the unknown whole number in a multiplication or division equation, when the unknown number is the solution using visual support/arrays.	Determine the unknown whole number in a multiplication or division equation, when the unknown number is the product or quotient using visual support/arrays.	Determine the unknown whole number in a multiplication or division equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 x □ = 48, 5 = □ ÷ 3, 6 x 6 = □ .	Determine an unknown whole number in a multiplication and division equation. Students will use the given context to generate an equation.
3.OA.B.5	Apply properties of operations as strategies to multiply and divide. Properties include commutative properties of multiplication. (Students do not need to use the formal terms for these properties.)	Apply properties of operations as strategies to multiply and divide. Properties include commutative and associative properties of multiplication. Students do not need to use the formal terms for these properties.)	Apply properties of operations as strategies to multiply and divide. Properties include commutative and associative properties of multiplication and the distributive property. (Students do not need to use the formal terms for these properties.)	Use multiple strategies of operations to multiply and divide within a word problem.
3.OA.B.6	Identify division as unknown factor problems by finding missing number in the second factor position with visual support/ arrays.	Solve division as unknown factor problems by finding missing number in the second factor position with visual support/arrays.	Understand division as an unknown-factor problem (e.g., find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8).	Solve division as unknown factor problems by using the relationship between multiplication and division. Model multiplication and division in a variety of ways.
3.OA.C.7	Multiply and divide within 100 using visual support/arrays.	Organize expressions to multiply and divide within 100 using visual support/ arrays.	Fluently multiply and divide within 100. By the end of Grade 3, know from memory all multiplication products through 10 x 10 and division quotients when both the quotient and divisor are less than or equal to 10.	Fluently multiply and divide within 100 within range of contexts.

3.OA.D.8	Solve one-step word problems using the four operations with visual support/arrays. Represent these problems using equations with a letter standing for the unknown quantity. Utilize understanding of the Order of Operations when there are no parentheses.	Solve two-step word problems using the four operations using visual support. Represent these problems using equations with a letter standing for the unknown quantity. Utilize understanding of the Order of Operations when there are no parentheses.	Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Utilize understanding of the Order of Operations when there are no parentheses.	Solve two-step word problems with large whole numbers and using multiple operations.
3.OA.D.9	Identify addition patterns using visual supports.	Identify multiplication and subtraction patterns using visual supports.	Identify patterns in the addition table and the multiplication table and explain them using properties of operations (e.g. observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends).	Create and extend arithmetic patterns, explain patterns using properties of operations.
3.OA.D.10	Recognize whether an answer is reasonable or not when rounding.	Use rounding to determine the reasonableness of answers when using the four operations to solve problems.	When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Recognize the reasonableness of answers using different types of estimation strategies when using the four operations to solve problems. Choose the best estimation strategy for a specific purpose.

Number and Operations in Base Ten				
3.NBT.A.1	Use place value understanding to round a two-digit number to the nearest 10.	Use place value understanding to round a three-digit number to the nearest 100.	Use place value understanding to round whole numbers to the nearest 10 or 100.	Use rounding strategies in real-world situations.
3.NBT.A.2	Fluently add and subtract within 1000 using strategies and algorithms based on the relationship between addition and subtraction.	Fluently add and subtract within 1000 using strategies and algorithms based on place value and/or the relationship between addition and subtraction.	Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.	Explain the method used in finding the sum or difference; recognize and identify an error and shows the correct answer.
3.NBT.A.3	Skip count by 10, 20 or 50 to multiply single-digit whole numbers by multiples of 10 in the range 10-90.	Use grouping strategies (associative property) to multiply single-digit whole numbers by multiples of 10 in the range 10-90.	Multiply one-digit whole numbers by multiples of 10 in the range 10 to 90 using strategies based on place value and the properties of operations (e.g., 9 x 80, 5 x 60).	Show product of single-digit whole numbers by multiples of 10 using multiple strategies.

Number and Operations - Fractions				
3.NF.A.1	Identify a fraction (1/b) as the quantity formed by one part when a whole is partitioned into b equal parts given visual support.	Understand a fraction (1/b) as the quantity formed by one part when a whole is partitioned into b equal parts.	Understand a fraction (1/b) as the quantity formed by one part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.	Apply understanding of unit fractions to real world, multi-step problems.
3.NF.A.2	Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Identify a unit fraction as being between 0 and 1 on a number line. b. Recognize a partition that creates 1/2 or 1/4 on a number line. c. Recognize that if 1 is in the numerator of a fraction, then it is a unit fraction.	Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Identify 1/2 and 1/3 on a number line. b. Identify the partitions on a number line that would represent common fractions. c. Identify unit fractions.	Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Represent a fraction 1/b on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Understand that each part has size 1/b and that the end point of the part based at 0 locates the number 1/b on the number line. b. Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Understand that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line including values greater than 1. c. Understand a fraction 1/b as a special type of fraction that can be referred to as a unit fraction (e.g. 1/2, 1/4).	Understand a fraction as a number on the number line; represent fractions on a number line diagram. a. Create a number line to locate any unit fraction that represents a real world value b. Create a number line to locate fractions greater than 1 that represents a real world value c. Create unit fractions to compare values in multi-step, real world contexts
3.NF.A.3	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand equivalent fractions using denominators of 2, 4 and 8 given visual models. b. Recognize and generate equivalent fractions using denominators of 2, 4 and 8 given visual models. c. Express and recognize fractions that are equivalent to 1. d. Compare two fractions with the same denominator and records results using symbols.	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand equivalent fractions using denominators of 2, 4 and 8. b. Recognize and generate equivalent fractions using denominators of 2, 4 and 8. c. Express and recognize fractions that are equivalent to whole numbers. d. Compare two fractions with the same numerator and records results using symbols.	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Understand two fractions as equivalent if they have the same relative size compared to 1 whole. b. Recognize and generate simple equivalent fractions. Explain why the fractions are equivalent. c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Understand that comparisons are valid only when the two fractions refer to the same whole. Record results of comparisons with the symbols >, =, or <, and justify conclusions.	Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size. a. Identify equivalent fractions by creating fraction models to compare fractions that pertain to the same whole. b. Explain why two fractions are equivalent. Identify equivalent fractions by creating fraction models to compare fractions that pertain to the same whole. c. Express whole numbers as fractions with denominators greater than 1. d. Create and compare two fractions that have the same numerator or same denominator using symbols within a context.

Measurement and Data				
3.MD.A.1	Solve problems involving measurement. a. Tell, write, and measure time to the nearest minute. b. Can add money using symbols $, ".", ¢.	Solve problems involving measurement. a. Solve one-step word problems involving addition or subtraction of time intervals in minutes with scaffolding. b. Can add money using symbols $, ".", ¢.	Solve problems involving measurement. a. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes (e.g., representing the problem on a number line diagram). b. Solve word problems involving money through $20.00, using symbols $, ".", ¢.	Solve problems involving measurement. a. Create and solve multi-step time interval problems. b. Solve two-step word problems involving money through $20 using symbols $, ".", ¢.
3.MD.A.2	Using grams, kilograms or liters, measure and estimate liquid volumes and masses of objects using models.	Using grams, kilograms or liters, solve simple one-step measurement word problems using either addition or subtraction.	Measure and estimate liquid volumes and masses of objects using metric units. (Excludes compound units such as cm3 and finding the geometric volume of a container.) Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units. Excludes multiplicative comparison problems (problems involving notions of “times as much”).	Using grams, kilograms or liters, estimate and solve multi-step measurement word problems involving any of the four operations.
3.MD.B.3	Complete a scaled picture graph or bar graph (with a scale factor of 1 or 5) to represent data set with support.	Complete a scaled picture graph or bar graph to represent a data set with support. Solve one-step "how many more" and "how many less" problems using information presented in scaled bar graphs.	Create a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.	Create own scale and graph based on given data parameters.
3.MD.B.4	Generate measurement data by measuring lengths to the nearest half-inch. Show the data by making a line plot, where the horizontal scale is marked by whole numbers or halves with supports.	Generate measurement data by measuring lengths to the nearest quarter-inch. Show the data by making a line plot, where the horizontal scale is marked by whole numbers, halves, or quarters with supports.	Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch to the nearest quarter-inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.	Show the data by making a line plot, where the student decides whether the horizonal scale is marked by whole numbers, halves, or quarters based on the given data.
3.MD.C.5	Understand area as an attribute of plane figures and understand concepts of area measurement. a. Can identify a square unit. b. Can distinguish area from length and width.	Understand area as an attribute of plane figures and understand concepts of area measurement. a. Understand area is measured using square units. b. Recognize overlapping and gaps in square unit place on a figure would not accurately describe area	Understand area as an attribute of plane figures and understand concepts of area measurement. a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area. b. A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units.	Understand area as an attribute of plane figures and understand concepts of area measurement. a. Can identify and use different unit squares. b. Cover a plane figure with unit squares of different sizes to show that the area of the same figure can be expressed as different numbers in different units.
3.MD.C.6	Find the area of a rectangle by counting squares covering the rectangle and expresses the area without units.	Find area of a rectangle by counting unit squares.	Measure areas by counting unit squares (e.g., square cm, square m, square in, square ft, and improvised units).	Find the area of 2 plane figures by creating and counting unit squares.

3.MD.C.7	Relate area to the operations of multiplication and addition. a. Find the area of one rectangles by tiling. b. Multiply side lengths with both sides less than or equal to 5 to find area. c. Determine a missing value in an area model that represents the distributive property where all values are less than of equal to 5. d. Find the area of a rectilinear figure that is composed of two rectangles with side lengths less than or equal to 5 in a mathematical context.	Relate area to the operations of multiplication and addition. a. Show that the area of a rectangle found by tiling is the same as would be found by multiplying the side lengths. b. Multiply side lengths with one side less than or equal to 5 to find area. c. Determines a missing value in an area model that represents the distributive property. d. Find the area of a simple decomposition.	Relate area to the operations of multiplication and addition. a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths. b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving realworld and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. c. Use tiling to show that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning. d. Understand that rectilinear figures can be decomposed into non-overlapping rectangles and that the sum of the areas of these rectangles is identical to the area of the original rectilinear figure. Apply this technique to solve problems in real-world contexts.	Relate area to the operations of multiplication and addition. a. Confirm tiling and multiplication of side lengths in self created example. b. Compare the area of 2 plane figures by multiplying their side lengths and compares their sizes. c. Create a word problem using the distributive property to find the area of rectangles. d. Design area problems in which decomposition is integral to understanding and solving the problem.
3.MD.C.8	Find the perimeter of plane figures (given the side lengths).	Solve mathematical problems involving perimeters of plane figures, understand the difference in area and perimeter.	Solve real-world and mathematical problems involving perimeters of plane figures and areas of rectangles, including finding the perimeter given the side lengths, finding an unknown side length. Represent rectangles with the same perimeter and different areas or with the same area and different perimeters.	Construct rectangles that have the same perimeter but different areas and the reverse.

Geometry				
3.G.A.1	Identify properties of squares.	Understand the properties of quadrilaterals and the subcategories of quadrilaterals.	Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples quadrilaterals that do not belong to any of these subcategories.	Recognize and sort examples of quadrilaterals that have shared attributes and that the shared attributes can define a larger category; draw examples and non-examples of quadrilaterals that are not rhombuses, rectangles, or squares.
3.G.A.2	Partition shapes into b parts with equal areas. Express the area of each part as a unit fraction 1/b of the whole. (limited to halves and quarters).	Partition shapes into b parts with equal areas. Express the area of each part as a unit fraction 1/b of the whole. (limited to halves, quarters, and eighths).	Partition shapes into b parts with equal areas. Express the area of each part as a unit fraction 1/b of the whole. (Grade 3 expectations are limited to fractions with denominators b = 2,3,4,6,8.)	Partition shapes into parts with equal areas and expresses the area as a unit fraction of the whole to answer questions presented in a context.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
Operations and Algebraic Thinking				
4.OA.A.1	Identify multiplication equations that represent verbal statements of multiplicative comparisons with visual support.	Interpret multiplication equations that represent verbal statements of multiplicative comparisons with visual support. Recognize that a multiplication equation is a comparison.	Represent verbal statements of multiplicative comparisons as multiplication equations. Interpret a multiplication equation as a comparison (e.g., 35 is the number of objects in 5 groups, each containing 7 objects, and is also the number of objects in 7 groups, each containing 5 objects).	Create verbal statements of multiplicative comparisons to represent a given multiplication equation. Explain how a multiplication equation is a comparison.
4.OA.A.2	Identify products and quotients within 1000 to solve word problems involving multiplicative comparison when a visual model is given.	Multiply or divide within 1000 to solve word problems involving multiplicative comparison when a visual model is given.	Multiply or divide within 1000 to solve word problems involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison).	Identify a word problem involving multiplicative comparison within 1000 that is solved by a given multiplication or division expression.
4.OA.A.3	Solve two-step word problems using the four operations with visual support. Identify the remainder as a fraction of the divisor. Identify equations with a letter standing for the unknown quantity that represents these problems.	Solve multistep word problems using the four operations. Identify the remainder as a fraction of the divisor. Identify equations with a letter standing for the unknown quantity that represents these problems.	Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity.	Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Explain why the remainder is a fraction of the divisor. Create word problems that can be solved using equations with a letter standing for the unknown quantity.
4.OA.B.4	Identify a factor pair for a whole number in the range 1 to 100.	Identify all factor pairs for a whole number in the range 1 to 100 and identify whole numbers that are a multiple of a given factor.	Find all factor pairs for a whole number in the range 1 to 100 and understand that a whole number is a multiple of each of its factors.	Explain why a whole number is a multiple of each of its factors.
4.OA.C.5	Identify a number pattern that follows a given rule.	Identify a number pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.	Generate a number pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself and explain the pattern informally (e.g., given the rule “add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers).	Create a rule for a given number pattern. Explain features of the pattern that are not explicit in the rule and explain the rule informally.
4.OA.C.6	Recognize whether an answer is reasonable or not when rounding.	Use rounding to determine the reasonableness of answers when using the four operations to solve problems.	When solving problems, assess the reasonableness of answers using mental computation and estimation strategies including rounding.	Recognize the reasonableness of answers using different types of estimation strategies when using the four operations to solve problems. Choose the best estimation strategy for a specific purpose.

Number and Operations in Base Ten				
4.NBT.A.1	Identify which place value in a multi-digit whole number represents ten times the value of a given place value.	Given two multi-digit whole numbers, with a digit in different place values in each number, identify how many times the value of the digit is in one number compared to the other number.	Apply concepts of place value, multiplication, and division to understand that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right.	Apply concepts of place value, multiplication, and division to explain why a digit in one place represents ten times what it represents in the place to its right.
4.NBT.A.2	Identify three-digit whole numbers using base-ten numerals and number names. Compare two three-digit numbers based on meanings of the digits in each place.	Identify multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place.	Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Read, write, and order multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare more than two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
4.NBT.A.3	Use place value understanding to round three-digit whole numbers to the hundreds place.	Use place value understanding to round multi-digit whole numbers to the largest place.	Use place value understanding to round multi-digit whole numbers to any place.	Explain how to round multi-digit whole numbers to any place.
4.NBT.B.4	Fluently add and subtract multi-digit whole numbers using strategies and algorithms based on the relationship between addition and subtraction.	Fluently add and subtract multi-digit whole numbers using strategies and algorithms based on place value and/or the relationship between addition and subtraction.	Fluently add and subtract multi-digit whole numbers using a standard algorithm.	Recognize and explain an error made while finding a sum or a difference, and give the correct answer.
4.NBT.B.5	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and visual models.	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate the calculation by using rectangular arrays and/or area models.	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.	Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers. Explain the calculation by using equations.
4.NBT.B.6	Identify whole-number quotients with up to four-digit dividends and one-digit divisors.	Demonstrate understanding of division by identifying whole-number quotients and remainders with up to four-digit dividends and one-digit divisors.	Demonstrate understanding of division by finding whole-number quotients and remainders with up to four-digit dividends and one-digit divisors.	Demonstrate understanding of division by explaining the meaning of whole-number quotients and remainders with up to four-digit dividends and one-digit divisors.

Number and Operations - Fractions				
4.NF.A.1	Identify equivalent fractions.	Generate equivalent fractions.	Explain why a fraction *a/b* is equivalent to a fraction (*n x a*)/(*n x b*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to understand and generate equivalent fractions.	Explain why a fraction *a/b* is equivalent to a fraction (*n x a*)/(*n x b*) by using visual fraction models. Explain why the number and size of the parts is important in determining if two fractions are the same size. Use this principle to explain and generate equivalent fractions.
4.NF.A.2	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators and by comparing to a benchmark fraction). a. Determine whether or not two fractions refer to the same size whole. b. Compare two fraction models using the symbols >, =, or <.	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators and by comparing to a benchmark fraction). a. Determine whether or not comparing two fractions is valid based on whether or not the fractions refer to the same size whole. b. Compare two fractions using the symbols >, =, or <.	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators and by comparing to a benchmark fraction). a. Understand that comparisons are valid only when the two fractions refer to the same size whole. b. Record the results of comparisons with symbols >, =, or <, and justify the conclusions.	Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators and by comparing to a benchmark fraction). a. Explain why comparisons are valid only when two fractions refer to the same size whole. b. Record the results of comparing multiple fractions with symbols >, =, or <, and justify the conclusions.
4.NF.B.3	Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*). a. Recognize addition of fractions as joining parts referring to the same whole. b. Identify a correct decomposition of a fraction into a sum of fractions with the same denominator in one way (e.g., 3/8 = 1/8 + 1/8+1/8). c. Add mixed numbers with like denominators, where regrouping is not necessary. d. Identify the solution to word problems involving addition of fractions referring to the same whole and having like denominators.	Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*). a. Recognize addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Identify a correct decomposition of a fraction into a sum of fractions with the same denominator in more than one way (e.g., 3/8 = 1/8 + 1/8+1/8; 3/8 = 2/8 + 1/8; 2 1/8 = 1 + 1 + 1/8 + or 2 1/8 = 8/8 + 8/8 + 1/8). c. Add and subtract mixed numbers with like denominators where regrouping is not necessary. d. Identify the solution to word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.	Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*). a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. b. Decompose a fraction into a sum of fractions with the same denominator in more than one way (e.g., 3/8 = 1/8 + 1/8+1/8; 3/8 = 2/8 + 1/8; 2 1/8 = 1 + 1 + 1/8 + or 2 1/8 = 8/8 + 8/8 + 1/8). c. Add and subtract mixed numbers with like denominators (e.g., by using properties of operations and the relationship between addition and subtraction and/or by replacing each mixed number with an equivalent fraction). d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators.	Understand a fraction *a/b* with *a* > 1 as a sum of unit fractions (1/*b*). a. Explain how addition and subtraction of fractions is joining and separating parts referring to the same whole. b. Explain how to decompose a fraction into a sum of fractions with the same denominator in more than one way (e.g., 3/8 = 1/8 + 1/8+1/8; 3/8 = 2/8 + 1/8; 2 1/8 = 1 + 1 + 1/8 + or 2 1/8 = 8/8 + 8/8 + 1/8). c. Explain how to add and subtract mixed numbers with like denominators (e.g., by using properties of operations and the relationship between addition and subtraction and/or by replacing each mixed number with an equivalent fraction). d. Solve word problems involving addition and subtraction of fractions referring to the same whole but having different denominators.

4.NF.B.4	Build fractions from unit fractions. a. Identify the product when a whole number is multiplied by a unit fraction. In general, $a/b = a \times 1/b$. b. Identify the product when a whole number is multiplied by a fraction. In general, $n \times a/b = (n \times a)/b$. c. Identify the solution to word problems involving multiplication of a whole number by a fraction.	Build fractions from unit fractions. a. Determine the product when a whole number is multiplied by a unit fraction. In general, $a/b = a \times 1/b$. b. Determine the product when a whole number is multiplied by a fraction. In general, $n \times a/b = (n \times a)/b$. c. Determine the solution to word problems involving multiplication of a whole number by a fraction.	Build fractions from unit fractions. a. Understand a fraction a/b as a multiple of a unit fraction $1/b$. In general, $a/b = a \times 1/b$. b. Understand a multiple of a/b as a multiple of a unit fraction $1/b$, and use this understanding to multiply a whole number by a fraction. In general, $n \times a/b = (n \times a)/b$. c. Solve word problems involving multiplication of a whole number by a fraction. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*	Build fractions from unit fractions. a. Explain why a fraction a/b is a multiple of a unit fraction $1/b$. b. Understand a multiple of a/b as a multiple of a unit fraction $1/b$, and use this understanding to multiply a whole number by a fraction. In general, $n \times a/b = (n \times a)/b$. c. Create word problems involving multiplication of a whole number by a fraction.
4.NF.C.5	Identify equivalent fractions, one with denominator 10 and one with denominator 100. *For example, identify 3/10 as equivalent to 30/100.*	Identify equivalent fractions, one with denominator 10 and one with denominator 100. Identify the sum of two fractions with respective denominators 10 (tenths) and 100 (hundredths). *For example, identify 3/10 as equivalent to 30/100, and identify that 3/10 + 4/100 = 34/100.*	Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 (tenths) and 100 (hundredths). *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* (Note: Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators, in general, is not a requirement at this grade.)	Express a fraction with denominator 10 as an equivalent fraction with denominator a multiple of 10, and use this technique to add two fractions with the respective denominators. *For example, express 3/10 as 300/1000, and add 3/10 + 40/1000 = 340/1000.*
4.NF.C.6	Identify decimal notation for fractions with denominators 10 (tenths) or 100 (hundredths).	Identify decimal notation for fractions with denominators 10 (tenths) or 100 (hundredths), and locate these decimals on a number line.	Use decimal notation for fractions with denominators 10 (tenths) or 100 (hundredths), and locate these decimals on a number line.	Use decimal notation for fractions and mixed numbers with denominators a multiple of 10. Explain the location of these decimals on a number line.
4.NF.C.7	Compare two decimals, referring to the same whole, to hundredths.	Compare two decimals, referring to the same whole, to hundredths. Record the results of comparisons with the symbols >, =, or <.	Compare two decimals to hundredths by reasoning about their size. Understand that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <.	Compare two decimals to hundredths by reasoning about their size. Explain why comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <.

Measurement and Data				
4.MD.A.1	Identify the relative sizes of measurement units within one system of units which could include km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, identify measurements in a larger unit in terms of a smaller unit.	Identify the relative sizes of measurement units within one system of units which could include km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, identify measurements in a larger unit in terms of a smaller unit and in a smaller unit in terms of a larger unit.	Know relative sizes of measurement units within one system of units which could include km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit and in a smaller unit in terms of a larger unit. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1,12), (2,24), (3,36).*	Explain how different sizes of measurement units within one system of units relate to each other. Within a single system of measurement, explain how to convert measurements from a larger unit to a smaller unit and from a smaller unit to a larger unit. Generate a conversion table for measurements within one system of units.
4.MD.A.2	Use the four operations to identify solutions to word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals. Represent measurement quantities using number lines that feature a measurement scale.	Use the four operations to identify solutions to word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using a variety of representations, including number lines that feature a measurement scale.	Use the four operations to solve word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals and problems involving fractions with like denominators, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using a variety of representations, including number lines that feature a measurement scale.	Explain how to use the four operations to solve word problems and problems in real-world context involving distances, intervals of time (hr, min, sec), liquid volumes, masses of objects, and money, including decimals and problems involving fractions with like denominators, and problems that require expressing measurements given in a smaller unit in terms of a larger unit. Represent measurement quantities using a variety of representations, including number lines that feature a measurement scale.
4.MD.A.3	Identify the area and perimeter for rectangles in mathematical problems.	Identify the area and perimeter for rectangles in mathematical problems and problems in real-world contexts.	Apply the area and perimeter formulas for rectangles in mathematical problems and problems in real-world contexts including problems with unknown side lengths.	Explain the difference between the area and perimeter formulas for rectangles. Use the area and perimeter formulas to determine unknown side lengths of a rectangle.
4.MD.B.4	Identify a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition of fractions by using information presented in line plots.	Identify a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots.	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Create problems involving addition and subtraction of fractions by using information presented in line plots.

4.MD.C.5	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. Recognize that a “one-degree angle” turns through 1/360 of a circle. b. Recognize that an “*n* degree angle” turns through *n* /360 of a circle.	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. Identify a one-degree angle, with its common endpoint at the center of a circle, as being 1/360 of the circle. b. Identify an “*n* degree angle," with its common endpoint at the center of a circle, as being *n* /360 of the circle.	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles. b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.	Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement: a. Explain how an angle is measured with reference to a circle with its center at the common endpoint of the rays and how the angle measure is the same as the fraction of the circular arc between the points where the two rays intersect the circle. b. Explain why an angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
4.MD.C.6	Identify angles measures in whole-number degrees using a protractor, when one of the rays is horizontal.	Identify angles measures in whole-number degrees using a protractor. Add a second ray to sketch angles of specified measure when given a horizontal ray.	Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.	Measure angles in whole-number degrees using a protractor, including when the angle does not have a horizontal ray.
4.MD.C.7	Solve addition problems to find unknown angles on a diagram within mathematical problems as well as problems in real-world contexts.	Solve addition and subtraction problems to find unknown angles on a diagram within mathematical problems as well as problems in real-world contexts.	Understand angle measures as additive. (When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.) Solve addition and subtraction problems to find unknown angles on a diagram within mathematical problems as well as problems in real-world contexts.	Understand angle measures as additive. (When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts.) Create addition and subtraction problems, mathematical problems as well as problems in real-world contexts, for angles represented on a diagram.

Geometry				
4.G.A.1	Identify points, lines, line segments, rays, angles, and lines in two-dimensional figures.	Identify and draw points, lines, line segments, rays, angles, and perpendicular and parallel lines in two-dimensional figures.	Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.	Explain characteristics that define points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.
4.G.A.2	Identify two-dimensional figures based on the presence or absence of parallel or perpendicular lines.	Identify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size.	Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size (e.g., understand right triangles as a category, and identify right triangles).	Classify two-dimensional figures into more than one category based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size (e.g., understand right triangles as a category, and identify right triangles).
4.G.A.3	Identify a line of symmetry for a two-dimensional figure.	Identify line-symmetric figures and draw lines of symmetry.	Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.	Explain that a line of symmetry for a two-dimensional figure is a line across the figure such that the figure can be folded along the line into matching parts. Draw line-symmetric figures.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
Operations and Algebraic Thinking				
5.OA.A.1	Use parenthesis in numerical expressions and evaluate numeric expressions.	Evaluate numerical expressions with parentheses and brackets.	Use parentheses and brackets in numerical expressions, and evaluate expressions with these symbols (Order of Operations).	Use parentheses and brackets to create multiple numerical expressions equivalent to a given value.
5.OA.A.2	Identify simple expressions that record calculations with numbers, and identify numerical expressions without evaluating them.	Write simple expressions that record calculations with numbers, and identify numerical expressions without evaluating them.	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). Recognize that 3 x (18,932 + 921) is three times as large as 18,932 + 921, without having to calculate the indicated sum or product).	Write simple expressions that record multi-step calculations with numbers, and interpret multi-step numerical expressions without evaluating them.
5.OA.B.3	Identify two numerical patterns using two given rules (e.g., identify terms in the resulting sequences). Identify the apparent relationships between corresponding terms. Identify ordered pairs consisting of corresponding terms from the two patterns.	Determine the missing values in two numerical patterns using two given rules (e.g., determine the missing terms in the resulting sequences). Identify the apparent relationships between corresponding terms. Identify ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane.	Generate two numerical patterns using two given rules (e.g., generate terms in the resulting sequences). Identify and explain the apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane (e.g., given the rule "add 3" and the starting number 0, and given the rule "add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence).	Explain how the rules for two numerical patterns relate to the relationships between the corresponding terms in those patterns (e.g., given the rule "add 3" and the starting number 0, and given the rule "add 6" and the starting number 0, observe that the terms in one sequence are twice the corresponding terms in the other sequence, and recognize that "add 3" is twice "add 6").
5.OA.B.4	Identify prime numbers.	Understand prime numbers have only two factors and identify the prime factorization of numbers.	Understand primes have only two factors and decompose numbers into prime factors.	Explain how to decompose numbers into prime factors.

Number and Operations in Base Ten				
5.NBT.A.1	Identify which place value in a multi-digit number represents 10 times the value of a given place value, or identify which place value in a multi-digit number represents 1/10 the value of a given place value.	Given two multi-digit numbers, with a digit in different place values in each number, identify how many times the value of the digit is in one number compared to the other number (e.g. the value of the 4 in 29,143 is 1/100 times the value of the 4 in 74,851).	Apply concepts of place value, multiplication, and division to understand that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.	Apply concepts of place value, multiplication, and division to explain why a digit in one place represents ten times what it represents in the place to its right and 1/10 of what it represents in the place to its left.
5.NBT.A.2	Identify patterns in the number of zeros of the product when multiplying a number by powers of 10, and identify patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.	Find patterns in the number of zeros of the product when multiplying a number by powers of 10, and find patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.	Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10.	Given a pattern in the number of zeros of the product when multiplying a number by powers of 10, or a pattern in the placement of the decimal point when multiplying or dividing a number by a power of 10, create a possible equation that represents the pattern and explain why there are multiple correct equations.
5.NBT.A.3	Read and write, decimals to tenths. a. Identify decimals to tenths using base-ten numerals and number names. b. Compare two decimals to tenths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Read, write, and compare decimals to hundredths. a. Identify decimals to hundredths using base-ten numerals, number names, and expanded form. b. Compare two decimals to hundredths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Read, write, and compare decimals to thousandths. a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form. b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.	Read, write, and compare decimals to thousandths. a. Order multiple decimals to thousandths using base-ten numerals, number names, and expanded form. b. Compare more than two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
5.NBT.A.4	Use place value understanding to round decimals to the tenths place.	Use place value understanding to round decimals to the hundredths place.	Use place value understanding to round decimals to any place.	Explain how to use place value understanding to round decimals to any place.
5.NBT.B.5	Identify the product of two multi-digit whole numbers.	Calculate the product of two multi-digit whole numbers.	Fluently multiply multi-digit whole numbers using a standard algorithm.	Explain how to use a standard algorithm to multiply multi-digit whole numbers.
5.NBT.B.6	Apply understanding of division to identify whole-number quotients of whole numbers with up to three-digit dividends and two-digit divisors.	Apply understanding of division to identify whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.	Apply and extend understanding of division to find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors.	Apply and extend understanding of division to find whole-number quotients of whole numbers with more than four-digit dividends and two-digit divisors.
5.NBT.B.7	Add and subtract decimals (without regrouping) to hundredths, connecting objects or drawings to strategies based on place value, properties of operations, and/or the relationship between operations.	Add, subtract, and multiply decimals to hundredths, connecting objects or drawings to strategies based on place value, properties of operations, and/or the relationship between operations.	Add, subtract, multiply, and divide decimals to hundredths, connecting objects or drawings to strategies based on place value, properties of operations, and/or the relationship between operations. Relate the strategy to a written form.	Add, subtract, multiply, and divide decimals to hundredths. Relate the strategy to a written form. Apply this to real-world context.

Number and Operations - Fractions				
5.NF.A.1	Identify the sum or difference of fractions with unlike denominators.	Identify the sum or difference of fractions with unlike denominators (including mixed numbers).	Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators (e.g., 2/3 + 5/4 = 8/12 + 15/12 = 23/12).	Explain how to find the sum or difference of fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like
5.NF.A.2	Identify the solution to word problems involving addition and subtraction of fractions referring to the same whole, by using visual models to represent the problem. Use benchmark fractions and number sense of fractions to identify an estimate.	Identify the solution to word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators by using a variety of representations, equations, and visual models to represent the problem. Use benchmark fractions and number sense of fractions to identify an estimate and assess the reasonableness of answers.	Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators by using a variety of representations, equations, and visual models to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers (e.g., recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2).	Create word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators. Explain how to estimate mentally and assess the reasonableness of answers.
5.NF.B.3	Identify a fraction that results from dividing the whole number numerator by the whole number denominator. Identify the solution to word problems involving division of whole numbers leading to answers in the form of fractions.	Determine the fraction that results from dividing the whole number numerator by the whole number denominator. Identify the solution to word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.	Interpret a fraction as the number that results from dividing the whole number numerator by the whole number denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people, each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*	Explain the meaning of a fraction as the number that results from dividing the whole number numerator by the whole number denominator, and why multiplying a fraction by the denominator results in the numerator. Create word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.

5.NF.B.4	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number and a fraction by a fraction. a. Identify the product (a/b) x q as a parts of a partition of q into b equal parts using a visual fraction model. b. Identify the product of a fraction multiplied by a fraction (a/b) x (c/d) as (ac /bd) using a visual fraction model. c. Identify the area of a rectangle with fractional side lengths that has been tiled with unit squares of the appropriate unit fraction side lengths. Identify the product of fractional side lengths to find areas of rectangles.	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number and a fraction by a fraction. a. Identify the product (a/b) x q as a parts of a partition of q into b equal parts. b. Identify the product of a fraction multiplied by a fraction (a/b) x (c/d) as ac /bd . Identify the correct story context for a given equation in the form (a /b) x (c /d) = ac /bd . c. Find the area of a rectangle with fractional side lengths that has been tiled with unit squares of the appropriate unit fraction side lengths. Identify the product of fractional side lengths to find areas of rectangles. Recognize that fraction products are rectangular areas.	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number and a fraction by a fraction. a. Interpret the product (a/b) x q as a parts of a partition of q into b equal parts. *For example, use a visual fraction model to show (2/3) x 4 = 8/3, and create a story context for this equation.* b. Interpret the product of a fraction multiplied by a fraction (a/b) x (c/d). Use a visual fraction model and create a story context for this equation. *For example, use a visual fraction model to show (2/3) x (4/5) = 8/15, and create a story context for this equation.* In general, (a/b) x (c/d) = ac/bd . c. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.	Apply and extend previous understandings of multiplication to multiply a fraction by a whole number and a fraction by a fraction. a. Explain why the product (a/b) x q is a parts of a partition of q into b equal parts, and create a word problem for an equation given in the form (a /b) x q . b. Explain why the product of a fraction multiplied by a fraction (a/b) x (c/d) is the product of the numerators divided by the product of the denominators ac /bd . Create a story context for an given equation in the form (a/b) x (c/d) = ac/bd . c. Given a rectangle with fractional side lengths, explain how tiling the rectangle with unit squares of the appropriate fractional side lengths and calculating the sum of area of those tiles is the same as multiplying the side lengths of the rectangle. Explain the connection between the product of two fractions and the area of a rectangle with side lengths equal to those fractions.

5.NF.B.5	Interpret multiplication as scaling (resizing), by: a. Identifying how the size of the product relates to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication, given a visual model. b. Identifying that multiplying a given number by a fraction greater than 1 results in a product greater than the given number; identifying that multiplying a given number by a fraction less than 1 results in a product smaller than the given number.	Interpret multiplication as scaling (resizing), by: a. Identifying how the size of the product relates to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication, given a visual model. b. Identifying that multiplying a given number by a fraction greater than 1 results in a product greater than the given number; identifying that multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and identifying that multiplying a given fraction by a fraction equal to 1 results in an equivalent fraction.	Interpret multiplication as scaling (resizing), by: a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number; explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.	Interpret multiplication as scaling (resizing), by: a. Explaining how the size of a product compares to the size of one factor on the basis of the size of the other factor. b. Demonstrating how multiplying a given number by a fraction greater than 1 results in a product greater than the given number; demonstrating how multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and demonstrating how the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ relates to the effect of multiplying a/b by 1.
5.NF.B.6	Identify the solutions to problems in real-world contexts involving multiplication of fractions, by using visual models.	Identify the solutions to problems in real-world contexts involving multiplication of fractions, by using a variety of representations including equations and models.	Solve problems in real-world contexts involving multiplication of fractions, including mixed numbers, by using a variety of representations including equations and models.	Create problems in real-world contexts involving multiplication of fractions, including mixed numbers, given a representation such as an equation or a model.

5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Identify the quotient of a unit fraction by a non-zero whole number. b. Identify the quotient of a whole number by a unit fraction. c. Identify the solutions to problems in real-world context involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, using visual models.	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Compute the quotient of a unit fraction by a non-zero whole number. b. Compute the quotient of a whole number by a unit fraction. c. Identify the solutions to problems in real-world context involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, using a variety of representations.	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. Use the relationship between multiplication and division to justify conclusions. b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient.* Use the relationship between multiplication and division to justify conclusions (e.g., 4 ÷ (1/5) = 20 because 20 x (1/5) = 4). c. Solve problems in real-world context involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, using a variety of representations.	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. a. Use the relationship between multiplication and division to explain how to divide a unit fraction by a non-zero whole number. b. Use the relationship between multiplication and division to explain how to divide a whole number by a unit fraction. c. Create problems in real-world context involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.

Measurement and Data				
5.MD.A.1	Identify equivalent, different-sized standard measurement units within a given measurement system, and use these conversions in solving one-step, real-world problems.	Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving two-step, real-world problems.	Convert among different-sized standard measurement units within a given measurement system, and use these conversions in solving multi-step, real-world problems.	Create multi-step, real-world problems that require converting among different-sized standard measurement units within a given measurement system.
5.MD.B.2	Identify a line plot that displays a data set of measurements in fractions of a unit (1/2, 1/4). Use operations on fractions for this grade to identify solutions to one-step problems involving information presented in line plots.	Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4). Use operations on fractions for this grade to solve one- or two-step problems involving information presented in line plots.	Make a line plot to display a data set of measurements in fractions of a unit (1/8, 1/2, 3/4). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*	Make a line plot to display a data set of measurements in fractions of a unit. Use operations on fractions for this grade to solve multi-step problems involving information presented in line plots.
5.MD.C.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. Identify a “unit cube,” and know that it can be used to measure volume. b. Match the number of unit cubes it takes to pack a solid figure without gaps or overlaps to the volume of the figure.	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. Define a “unit cube” and "one cubic unit." b. Identify that a solid figure which can be packed without gaps or overlaps using *n* unit cubes, and thus has a volume of *n* cubic units.	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume. b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.	Recognize volume as an attribute of solid figures and understand concepts of volume measurement. a. Explain why a cube with side length 1 unit, called a “unit cube,” and why it is said to have “one cubic unit” of volume. b. Explain why a solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.
5.MD.C.4	Identify volumes by counting unit cubes.	Measure volumes by counting unit cubes.	Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.	Look for patterns in measuring volumes of prisms by counting unit cubes. Fluently use cubic cm, cubic in, cubic ft, and improvised units.

5.MD.C.5	Relate volume to the operations of multiplication and addition and solve mathematical problems and problems in real-world contexts involving volume. a. Identify the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, or by multiplying the edge lengths. b. Understand and use the formula $V = l \times w \times h$ for rectangular prisms to identify volumes of right rectangular prisms with whole-number edge lengths. c. Understand volume as additive. Identify volumes of solid figures composed of two non-overlapping right rectangular prisms.	Relate volume to the operations of multiplication and addition and solve mathematical problems and problems in real-world contexts involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, or by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. b. Understand and use the formulas $V = l \times w \times h$ and $V = B \times h$, where in this case B is the area of the base ($B = l \times w$), for rectangular prisms to identify volumes of right rectangular prisms with whole-number edge lengths to solve mathematical problems. c. Understand volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms, applying this technique to solve mathematical problems.	Relate volume to the operations of multiplication and addition and solve mathematical problems and problems in real-world contexts involving volume. a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes (e.g., to represent the associative property of multiplication). b. Understand and use the formulas $V = l \times w \times h$ and $V = B \times h$, where in this case B is the area of the base ($B = l \times w$), for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths to solve mathematical problems and problems in real-world contexts. c. Understand volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms, applying this technique to solve mathematical problems and problems in real-world contexts.	Relate volume to the operations of multiplication and addition and solve mathematical problems and problems in real-world contexts involving volume. a. Explain why the volume of a right rectangular prism can be calculated by multiplying the edge lengths, and explain why this is equivalent to multiplying the height by the area of the base. Represent threefold whole-number products as volumes (e.g., to represent the associative property of multiplication). b. Create problems in real-world contexts that require understanding and using the formulas $V = l \times w \times h$ and $V = B \times h$. c. Understand volume as additive. Find volumes of solid figures composed of more than two non-overlapping right rectangular prisms, applying this technique to solve mathematical problems and problems in real-world contexts.

Geometry				
5.G.A.1	Identify the axes and the origin (0 , 0) of a coordinate system. Identify the *x* - and *y*- coordinates of an ordered pair.	Describe a coordinate system as having 2 axes that intersect at the origin (0 , 0). Identify an ordered pair and the *x* - and *y* -coordinates of an ordered pair.	Understand and describe a coordinate system as perpendicular number lines, called axes, that intersect at the origin (0 , 0). Identify a given point in the first quadrant of the coordinate plane using an ordered pair of numbers, called coordinates. Understand that the first number (*x*) indicates the distance traveled on the horizontal axis, and the second number (*y*) indicates the distance traveled on the vertical axis.	Understand and describe a coordinate system. Identify points in the coordinate plane using coordinates. Explain that the *x* -coordinate indicates the distance traveled on the horizontal axis, and the *y* -coordinate indicates the distance traveled on the vertical axis.
5.G.A.2	Identify points graphed in the first quadrant of the coordinate plane.	Graph points in the first quadrant of the coordinate plane, and identify the coordinate values of points in the context of the situation.	Represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.	Create real-world and mathematical problems that can be solved by graphing points in the first quadrant of the coordinate plane. Explain the meaning of the coordinate values of points in the context of the situation.
5.G.B.3	Identify attributes belonging to a category of two-dimensional figures.	Recognize that attributes belonging to a category of two-dimensional figures also belong to a subcategory of that category.	Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.	Explain why attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
5.G.B.4	Identify two-dimensional figures based on properties limited to sides and angles.	Classify two-dimensional figures based on properties limited to sides and angles.	Classify two-dimensional figures in a hierarchy based on properties.	Draw or construct two-dimensional figures based on properties or classifications.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
Ratios and Proportional Relationships				
6.RP.A.1	Understand the concept of a ratio as comparing two quantities. Use ratio language to identify a ratio relationship between two quantities.	Understand the concept of a ratio as comparing two quantities multiplicatively. Use ratio language to describe a ratio relationship between two quantities using a limited variety of representations.	Understand the concept of a ratio as comparing two quantities multiplicatively or joining/composing the two quantities in a way that preserves a multiplicative relationship. Use ratio language to describe a ratio relationship between two quantities. *For example, "There were 2/3 as many men as women at the concert."*	Explain the concept of a ratio as comparing two quantities multiplicatively or joining/composing the two quantities in a way that preserves a multiplicative relationship. Use ratio language to describe a ratio relationship between two quantities.
6.RP.A.2	Identify a unit rate associated with a ratio and use basic unit rate language to describe it.	Determine a unit rate associated with a ratio and use unit rate language to describe it.	Understand the concept of a unit rate a/b associated with a ratio a : b with b ≠ 0, and use rate language (e.g., for every, for each, for each 1, per) in the context of a ratio relationship. (Complex fraction notation is not an expectation for unit rates in this grade level.)	Explain the concept of a unit rate a/b associated with a ratio a : b with b ≠ 0, and use rate language in the context of a ratio relationship.
6.RP.A.3	Use ratio and rate reasoning to solve mathematical problems and problems in real-world context (e.g., by reasoning about data collected from measurements, tables of equivalent ratios, tape diagrams, double number line diagrams, or equations). a. Use tables of equivalent ratios relating quantities with whole-number measurements, identify missing values in the tables, and identify the pairs of values plotted on the coordinate plane. Use tables to compare ratios. b. Identify the unit rate for unit rate problems including those involving unit pricing and constant speed. c. Identify a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). Identify solutions to percent problems when the percent is the unknown. d. Use ratio reasoning to match measurement units; transform units appropriately when multiplying quantities.	Use ratio and rate reasoning to solve mathematical problems and problems in real-world context (e.g., by reasoning about data collected from measurements, tables of equivalent ratios, tape diagrams, double number line diagrams, or equations). a. Use tables of equivalent ratios relating quantities with whole-number measurements, determine missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Define unit rate for unit rate problems including those involving unit pricing and constant speed. c. Identify a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity). Identify solutions to percent problems when the percent or the part is the unknown. d. Use ratio reasoning to identify measurement units; transform units appropriately when multiplying or dividing quantities.	Use ratio and rate reasoning to solve mathematical problems and problems in real-world context (e.g., by reasoning about data collected from measurements, 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. 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 percent problems with the unknown in all positions of the equation. d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.	Use ratio and rate reasoning to solve mathematical problems and problems in real-world context (e.g., by reasoning about data collected from measurements, tables of equivalent ratios, tape diagrams, double number line diagrams, or equations). a. Explain the pattern in tables of equivalent ratios relating quantities with whole-number measurements, explain how to find missing values in the tables, and how to plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve unit rate problems involving more than one unit rate. c. Explain why a percent of a quantity is a rate per 100. Create and solve percent problems with the unknown in all positions of the equation. d. Use ratio reasoning to convert measurement units when more than one conversion is required; manipulate and transform units appropriately when multiplying or dividing quantities.

The Number System				
6.NS.A.1	Compute quotients of fractions to solve mathematical problems using visual fraction models to represent the problem.	Compute quotients of fractions to solve mathematical problems using visual fraction models and equations to represent the problem.	Interpret and compute quotients of fractions to solve mathematical problems and problems in real-world context involving division of fractions by fractions 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.*	Compute quotients of fractions to solve mathematical problems and problems in real-world context involving mixed numbers using visual fraction models and equations to represent the problem. Interpret the solution in the context of the problem.
6.NS.B.2	Fluently divide three-digit numbers by two-digit numbers using a standard algorithm.	Fluently divide four-digit numbers by two-digit numbers using a standard algorithm.	Fluently divide multi-digit numbers using a standard algorithm.	Fluently divide multi-digit numbers to solve real-world problems, not including multi-digit decimals, using a standard algorithm and assess the reasonableness of the result.
6.NS.B.3	Fluently add, subtract, and multiply multi-digit decimals, where decimals are limited to the hundredths, using a standard algorithm for each operation.	Fluently add, subtract, multiply, and divide multi-digit decimals, where the divisor is a whole number, using a standard algorithm for each operation.	Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.	Fluently add, subtract, multiply, and divide multi-digit decimals to solve real world problems, using a standard algorithm for each operation, and assess the reasonableness of the result..
6.NS.B.4	Use previous understanding of factors to find the greatest common factor and the least common multiple. a. Select the greatest common factor of two whole numbers less than or equal to 100 using visual models. b. Select the least common multiple of two whole numbers less than or equal to 12 using visual models. c. Identify the distributive property to express a sum of two whole numbers 1 to 100 with a common factor as a multiple of a sum of two whole numbers. For example, express 16 + 8 as 2(8 + 4).using visual models.	Use previous understanding of factors to find the greatest common factor and the least common multiple. a. Identify the greatest common factor of two whole numbers less than or equal to 100. b. Identify the least common multiple of two whole numbers less than or equal to 12. c. Identify the distributive property to express a sum of two whole numbers 1 to 100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 16 + 8 as 8(2 + 1).	Use previous understanding of factors to find the greatest common factor and the least common multiple. a. Find the greatest common factor of two whole numbers less than or equal to 100. b. Find the least common multiple of two whole numbers less than or equal to 12. c. Use the distributive property to express a sum of two whole numbers 1 to 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).	Use previous understanding of factors to find the greatest common factor and the least common multiple. a. Find two whole numbers when given their greatest common factor. b. Find two whole numbers when given their least common multiple. c. Use the greatest common factor and the distributive property to express a sum of two whole numbers greater than 100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express 336 + 270 as 6(56 + 45).

6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Identify positive and negative numbers that represent quantities in real-world context, identifying the meaning of 0 in each situation.	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Identify real-world context that can be represented with positive and negative numbers, defining the meaning of 0 in each situation.	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers to represent quantities in real-world context, explaining the meaning of 0 in each situation.	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values. Use positive and negative numbers to represent quantities in real-world context, explaining the meaning of 0 in each situation. Interpret and represent changes in positive and negative numbers representing quantities in real-world situations in terms of the context.
6.NS.C.6	Understand a rational number can be represented 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. Identify the opposite of a number. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize a negative coordinate indicates left or down while a positive coordinate indicates up or right. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram.	Understand a rational number can be represented 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 and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; indicate the quadrant a point lies in based on the sign of the coordinates. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and on a coordinate plane.	Understand a rational number can be represented 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 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.	Understand a rational number can be represented 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 and that 0 is its own opposite. Indicate whether a number will be to the left or right of 0 on the number line, given the number of negative symbols it has. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; explain why it is that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Create real world problems that are solved by given rational numbers on a number line diagram; create real world problems that are solved by given pairs of integers and other rational numbers on a coordinate plane.

6.NS.C.7	Understand ordering and absolute value of rational numbers. a. Identify a statement of inequality given the position of the two numbers on a number line. b. Identify correct statements of order for rational numbers in real-world context. c. Understand the absolute value of a rational number is always positive. d. Compare the absolute value of two positive numbers in mathematical problems and problems in real-world context.	Understand ordering and absolute value of rational numbers. a. Create a statement of inequality given the position of the two numbers on a number line. b. Write statements of order for rational numbers in real-world context. c. Understand the absolute value of a rational number as its distance from 0 on the number line. d. Compare the absolute value of two numbers in mathematical problems and problems in real-world context.	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. b. Write, interpret, and explain statements of order for rational numbers in real-world context. 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 real-world context. d. Distinguish comparisons of absolute value from statements about order in mathematical problems and problems in real-world context.	Understand ordering and absolute value of rational numbers. a. Justify the relative position of multiple numbers on a number line given statements of inequality about their relative positions. b. Create scenarios in real-world context that fit statements of order for rational numbers. c. Solve problems involving understanding 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 real-world context. d. Explain comparisons of absolute value from statements about order in mathematical problems and problems in real-world context.
6.NS.C.8	Solve mathematical problems by graphing points in all one quadrant of the coordinate plane. Count spaces between coordinates to find whole number distances between points with the same first coordinate or the same second coordinate.	Solve mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates to find whole number distances between points with the same first coordinate or the same second coordinate.	Solve mathematical problems and problems in real-world context 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.	Justify solutions to mathematical problems and problems in real-world context solved 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.

Expressions and Equations				
6.EE.A.1	Write and evaluate numerical expressions involving a single number with a whole-number exponent.	Write and evaluate numerical expressions involving a single term and whole-number exponents.	Write and evaluate numerical expressions involving whole-number exponents.	Write and evaluate numerical expressions involving multiple terms and whole-number exponents.
6.EE.A.2	Write, read, and evaluate algebraic expressions. a. Write expressions that record a single operation with numbers and variables. b. Match part of an expression to its mathematical term (sum, term, and product); view one part of an expression as a single entity. c. Identify the value of an expression with one variable given the specific value of the variable. Include expressions that arise from formulas used to solve mathematical problems and problems in real-world context. Perform arithmetic operations in the conventional order when there are no parentheses to specify a particular order (Order of Operations).	Write, read, and evaluate algebraic expressions. a. Write expressions that record two operations with numbers and variables. b. Identify parts of an expression using mathematical terms (sum, term, and product); view one or more parts of an expression as a single entity. c. Identify the value of an expression with two variables given specific values of their variables. Include expressions that arise from formulas used to solve mathematical problems and problems in real-world context. 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).	Write, read, and evaluate algebraic expressions. a. Write expressions that record operations with numbers and variables. b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, and coefficient); view one or more parts of an expression as a single entity. c. Evaluate expressions given specific values of their variables. Include expressions that arise from formulas used to solve mathematical problems and problems in real-world context. 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).	Write, read, and evaluate algebraic expressions. a. Write expressions that record operations, including exponents, with numbers and variables. b. Create expressions given mathematical terms (sum, term, product, factor, quotient, and coefficient); explain how one part of an expression relates to other parts of the expression. c. Evaluate expressions with multiple variables and multiple operations given specific values of their variables. Include expressions that arise from formulas used to solve mathematical problems and problems in real-world context. 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).
6.EE.A.3	Apply the Associative and Commutative properties of operations to generate equivalent expressions involving whole-numbers.	Apply the properties of operations to generate equivalent expressions involving whole-numbers.	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 properties of operations to generate equivalent expressions involving rational numbers and whole-number exponents in real-world contexts.
6.EE.A.4	Identify when two expressions are equivalent in cases of repeated addition.	Identify when two expressions are equivalent in cases where the resulting expression only has one term.	Identify when two expressions are equivalent. *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*	Create equivalent expressions.
6.EE.B.5	Understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. Use substitution to identify a whole number in a specified set that makes an equation or inequality true.	Understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. Use substitution to identify a number in a specified set that makes an equation or inequality true.	Understand solving an equation or inequality as a process of reasoning to find the value(s) of the variables that make that equation or inequality true. Use substitution to determine whether a given number in a specified set makes an equation or inequality true.	Explain how solving an equation or inequality is the process of reasoning to find the value(s) of the variables that make that equation or inequality true.

6.EE.B.6	Identify what the variables represent when solving mathematical problems and problems in real-world context; understand that a variable can represent an unknown number.	Identify what the expressions represent when solving mathematical problems and problems in real-world context; understand that a variable can represent an unknown number or any number in a specified set.	Use variables to represent numbers and write expressions when solving mathematical problems and problems in real-world context; understand that a variable can represent an unknown number or any number in a specified set.	Solve problems by writing an expression with a variable that represents several possible rational numbers within a mathematical or real-world context; understand that a variable can represent an unknown number or any number in a specified set.
6.EE.B.7	Solve mathematical equations of the form $x + p = q$, $x - p = q$, and $px = q$, for cases in which p, q and x are all non-negative whole numbers.	Solve mathematical problems and problems in real-world context by solving equations of the form $x + p = q$, $x - p = q$, $px = q$, and $x/p = q$ for cases in which p, q and x are all non-negative whole numbers.	Solve mathematical problems and problems in real-world context by writing and solving equations of the form $x + p = q$, $x - p = q$, $px = q$, and $x/p = q$ for cases in which p, q and x are all non-negative rational numbers.	Create mathematical problems and problems in real-world context that can be solved using equations of the form $x + p = q$, $x - p = q$, $px = q$, and $x/p = q$ for cases in which p, q and x are all non-negative rational numbers.
6.EE.B.8	Recognize that inequalities of the form $x > c$, $x < c$, $x \geq c$, or $x \leq c$ have infinitely many solutions; identify solutions of such inequalities on number lines.	Recognize that inequalities of the form $x > c$, $x < c$, $x \geq c$, or $x \leq c$ have infinitely many solutions; identify solutions of compound inequalities on number lines.	Write an inequality of the form $x > c$, $x < c$, $x \geq c$, or $x \leq c$ to represent a constraint or condition to solve mathematical problems and problems in real-world context. Recognize that inequalities have infinitely many solutions; represent solutions of such inequalities on number lines.	Given an inequality of the form $x > c$, $x < c$, $x \geq c$, or $x \leq c$ create mathematical problems and problems in real-world context that could be represented by the inequality.
6.EE.C.9	Given a graph or table representing two quantities that change in relationship to one another, identify an equation that expresses one quantity in terms of the other quantity.	Given a graph or table representing two quantities that change in relationship to one another, identify the dependent and independent variables, and write an equation that expresses one quantity in terms of the other quantity.	Use variables to represent two quantities that change in relationship to one another to solve mathematical problems and problems in real-world context. Write an equation to express one quantity (the dependent variable) in terms of the other quantity (the independent variable). Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.	Given an equation where variables represent two quantities that change in relationship to one another, create a problem in real-world context that could be represented by the equation. Explain the relationship between the dependent and independent variables and relate these to the equation.

Geometry				
6.G.A.1	Find the area of right triangles and polygons decomposed into right triangles and rectangles, given all the measurements.	Find the area of triangles and polygons decomposed into right triangles and rectangles, given some of the measurements.	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 to solve mathematical problems and problems in real-world context.	Find the area of triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques to solve mathematical problems and problems in real-world context, including decimal and fractional measurements..
6.G.A.2	Use the formula V = B · h, where in this case, B is the area of the base (B = l x w) to find volumes of right rectangular prisms with whole number edge lengths in mathematical problems and problems in real-world context.	Use the formula V = B · h, where in this case, B is the area of the base (B = l x w) to find volumes of right rectangular prisms with one fractional edge length in mathematical problems and problems in real-world context.	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. Understand and use the formula V = B · h, where in this case, B is the area of the base (B = l x w) to find volumes of right rectangular prisms with fractional edge lengths in mathematical problems and problems in real-world context.	Explain that the volume of a right rectangular prism with fractional edge lengths found by multiplying the edge lengths of the prism. Understand the formula V = B · h, where in this case, B is the area of the base (B = l x w). Given the volume, use the formula to find edge lengths of right rectangular prisms with fractional edge lengths in mathematical problems and problems in real-world context.
6.G.A.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.	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 to solve mathematical problems and problems in a real-world context.	Use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques to solve mathematical problems and problems in a real-world context. Finds a missing vertex of a polygon given other vertices.
6.G.A.4	Represent three-dimensional figures using nets made up of rectangles and triangles.	Use the nets representing three-dimensional figures to find the surface area of these figures.	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 to solve mathematical problems and problems in real-world context.	Represent three-dimensional figures with fractional edges using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques to solve mathematical problems and problems in real-world context.

Statistics and Probability				
6.SP.A.1	Identify a statistical question.	Change a non-statistical question into a statistical question.	Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for variability 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.*	Create a statistical question given a context.
6.SP.A.2	Identify a set of data by its center, spread, and overall shape.	Describe a set of data by its center, spread, and overall shape.	Understand that a set of data collected to answer a statistical question has a distribution whose general characteristics can be described by its center, spread, and overall shape.	Create a set of data with a distribution whose general characteristics can be described by a given center, spread, and overall shape.
6.SP.A.3	Recognize mean, median, and mode as measures of center and range as a measure of variation.	Calculate mean, median, and mode as measures of center and range as a measure of variation.	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 uses a single number to describe the spread of the data set.	Recognize how a measure of center or a measure of variation would be impacted by outliers in a numerical data set.
6.SP.B.4	Identify an appropriate display for numerical data including histograms, dot plots, and box plots.	Construct an appropriate display for numerical data including histograms, dot plots, and box plots.	Display and interpret numerical data by creating plots on a number line including histograms, dot plots, and box plots.	Display and interpret numerical data by creating plots on a number line including histograms, dot plots, and box plots, and explaining what the display indicates about the data.
6.SP.B.5	Summarize numerical data sets in relation to their context by: a. Reporting the number of observations in a dot plot. b. For the attribute under investigation, identify its units of measurement. c. Distinguish between measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation). d. Identify mean and mean absolute deviation as the best choice of measures of center and variability for a symmetric data distribution.	Summarize numerical data sets in relation to their context by: a. Reporting the number of observations in a histogram. b. For the attribute under investigation, identify how it was measured. c. Calculate measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation. d. Identify median and interquartile range as the best choice of measures of center and variability for a skewed data distribution.	Summarize numerical data sets in relation to their context 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.	Summarize numerical data sets in relation to their context by: a. Reporting the number of observations given calculations for a measure of center or variability. b. Describing the nature of the attribute under investigation including explaining why it was measured a particular way and why certain units of measurement were used. c. Comparing data sets using 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. Choose the appropriate measure of center and variability for data set and explains the reasoning for the choice.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
Ratios and Proportional Relationships				
7.RP.A.1	Identify unit rates associated with ratios involving simple fractions, including ratios of quantities measured in like units.	Compute unit rates associated with ratios involving simple fractions, including ratios of quantities measured in like units.	Compute unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.	Interpret unit rates associated with ratios involving both simple and complex fractions, including ratios of quantities measured in like or different units.
7.RP.A.2	Recognize and represent proportional relationships between quantities. a. Identify two quantities in a proportional relationship. b. Identify the constant of proportionality (unit rate) in tables or graphs. c. Identify equations to represent proportional relationships. d. Identify a point (x, y) on the graph of a proportional relationship.	Recognize and represent proportional relationships between quantities. a. Decide whether two quantities are in a proportional relationship. b. Identify the constant of proportionality (unit rate) in tables, graphs, equation. c. Represent proportional relationships by equations. d. Identify 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.	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). b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 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. 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.	Recognize and represent proportional relationships between quantities. a. Explain 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). b. Interpret the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 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. 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.
7.RP.A.3	Use proportional relationships to solve one-step ratio and percent mathematical problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to solve one-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Use proportional relationships to solve multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).	Interpret proportional relationships when solving multi-step ratio and percent problems (e.g., simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).

The Number System				
7.NS.A.1	Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Identify opposite quantities. b. Identify a number and its opposite that have a sum of 0. c. Identify the distance between two rational numbers on the number line as the absolute value of their difference. d. Identify properties of operations as strategies to add and subtract rational numbers.	Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Identify situations in which opposite quantities combine to make 0. b. Recognize $p + q$ as the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. Identify a number and its opposite that have a sum of 0 (are additive inverses). c. Recognize 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. d. Identify properties of operations as strategies to add and subtract rational numbers.	Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Describe situations in which opposite quantities combine to make 0. 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 context. 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 context. d. Apply properties of operations as strategies to add and subtract rational numbers.	Add and subtract integers and other rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Interpret situations in which opposite quantities combine to make 0. b. Explain $p + q$ 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 context. 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 context. d. Apply properties of operations as strategies to add and subtract rational numbers.

7.NS.A.2	Multiply and divide integers and other rational numbers. a. Identify 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. Identify products of rational numbers. b. Identify 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 $–(p/q) = (–p)/q = p/(–q)$. c. Multiply and divide rational numbers. d. Identify decimal form of a rational number.	Multiply and divide integers and other rational numbers. a. Recognize 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. Identify products of rational numbers by describing real-world context. b. Recognize 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 $–(p/q) = (–p)/q = p/(–q)$. Identify quotients of rational numbers by describing real-world context. c. Use properties of operations as strategies to multiply and divide rational numbers. d. Identify decimal form of a rational number ; know that the decimal form of a rational number terminates in 0's or eventually repeats.	Multiply and divide integers and other 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 numbers by describing real-world context. 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 context. c. Apply properties of operations as strategies to multiply and divide rational numbers. d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.	Multiply and divide integers and other rational numbers. a. Explain 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 numbers by describing real-world context. b. Explain 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 context. c. Apply properties of operations as strategies to multiply and divide rational numbers in a real-world context. d. Convert a rational number to decimal form using long division; know that the decimal form of a rational number terminates in 0's or eventually repeats.
7.NS.A.3	Identify the solution of mathematical problems four operations with rational numbers.	Identify the solution of mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and d are all integers and $b, c,$ and $d \neq 0$.	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where $a/b \div c/d$ when $a, b, c,$ and d are all integers and b, c , and $d \neq 0$.	Solve mathematical problems and problems in real-world context involving the four operations with rational numbers and interpert the solution. Computations with rational numbers extend the rules for manipulating fractions to complex fractions where a/b ÷ c/d when a,b,c,and d are all integers and b,c, and d ≠ 0.

Expressions and Equations				
7.EE.A.1	Identify properties of operations used to add, subtract, factor, and expand linear expressions with integer coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with integer coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients and interpret the meaning in a real-world context.
7.EE.A.2	Identify an expression in different forms.	Identify an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."	Rewrite an expression in different forms, and understand the relationship between the different forms and their meanings in a problem context. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."	Rewrite an expression in different forms, and explain the relationship between the different forms and their meanings in a problem context. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."
7.EE.B.3	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in one form.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate.	Solve multi-step mathematical problems and problems in real-world context posed with positive and negative rational numbers in any form. Convert between forms as appropriate and assess the reasonableness of answers. 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 per hour.	Create problems with a real-world context given multi-step equations with positive and negative rational numbers. Convert between forms as appropriate and interpret the reasonableness of answers.
7.EE.B.4	Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are integers. b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are integers.	Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are integers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are rational numbers. Graph the solution set of the inequality.	Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. 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. b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.	Use variables to represent quantities in mathematical problems and problems in real-world context, and construct simple equations and inequalities to solve problems. a. Solve real-world 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, explaining the sequence of the operations used in each approach. b. Solve real-world problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Geometry				
7.G.A.1	Solve problems involving scale drawings of geometric figures, by identifying the scale.	Solve problems involving scale drawings of geometric figures, with a given scale.	Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	Solve complex problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
7.G.A.2	Classify geometric shapes with given conditions using a variety of methods. 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.	Identify geometric shapes with given conditions using a variety of methods. 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.	Draw geometric shapes with given conditions using a variety of methods. 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.	Draw complex geometric shapes with given conditions using a variety of methods. Focus on constructing triangles from three measures of angles or sides, explaining when the conditions determine a unique triangle, more than one triangle, or no triangle.
7.G.A.3	Identify the two-dimensional figures that result from slicing three-dimensional figures parallel or perpindicular to the base.	Identify the two-dimensional figures that result from slicing three-dimensional figures.	Describe the two-dimensional figures that result from slicing three-dimensional figures.	Describe the two-dimensional figures that result from slicing irregular three-dimensional figures.
7.G.B.4	Identify area and circumference of a circle to solve problems.	Understand and use the formulas for the area and circumference of a circle to solve problems.	Understand and use the formulas for the area and circumference of a circle to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.	Understand and use the formulas for the area and circumference of a circle to solve problems and interpret the solution; explain the relationship between the circumference and area of a circle.
7.G.B.5	Identify supplementary, complementary, vertical, and adjacent angles in a figure.	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to solve simple equations for an unknown angle in a figure.	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure.	Use facts about supplementary, complementary, vertical, and adjacent angles in multi-step problems to write and solve simple equations for an unknown angle in a figure and explain the solution.
7.G.B.6	Identify solutions mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons.	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Identify solutions to mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects composed of cubes and right prisms.	Solve mathematical problems and problems in a real-world context involving area of two-dimensional objects composed of triangles, quadrilaterals, and other polygons. Solve mathematical problems and problems in real-world context involving volume and surface area of three-dimensional objects.

Statistics and Probability				
7.SP.A.1	Identify statistics that 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.	Recognize 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. Recognize that random sampling tends to produce representative samples and support valid inferences.	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.	Interpret statistics that 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.
7.SP.A.2	Use data from a random sample to identify inferences about a population with an unknown characteristic of interest.	Use data from a random sample to identify 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.	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.	Interpret data from a random sample to draw inferences about multiple populations with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.
7.SP.B.3	Compare the degree of visual overlap of two numerical data distributions with similar variabilities.	Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities.	Informally assess the degree of 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 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.	Interpret the degree of 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.
7.SP.B.4	Identify measures of center and measures of variability for numerical data from random samples for two populations.	Use measures of center and measures of variability for numerical data from random samples to identify informal comparative inferences about two populations.	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.	Interpret measures of center and measures of variability for numerical data from random samples to draw comparative inferences about two populations.
7.SP.C.5	Identify that a probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.	Identify 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 likely, and a probability near 1 indicates a likely event.	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 likely, and a probability near 1 indicates a likely event.	Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring and use this to solve real-world problems.

7.SP.C.6	Identify the approximate probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency.	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 identify the approximate relative frequency given the probability.	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.	Explain 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.
7.SP.C.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. Identify a uniform probability model that assigns equal probability to all outcomes to determine probabilities of events. b. Identify a probability model (which may not be uniform) that observes frequencies in data generated from a chance process.	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. Use a uniform probability model that assigns equal probability to all outcomes to determine probabilities of events. b. Use a probability model (which may not be uniform) that observes frequencies in data generated from a chance process.	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. 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?	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 and explain 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. b. Develop and explain 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?

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
The Number System				
8.NS.A.1	Identify irrational numbers.	Know that numbers that are not rational are called irrational. Identify a decimal expansion of irrational number.	Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Know that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational.	Explain that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion. Explain that numbers whose decimal expansions do not terminate in zeros or in a repeating sequence of fixed digits are called irrational.
8.NS.A.2	Approximate irrational numbers on a number line diagram.	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate them approximately on a number line diagram.	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate them approximately on a number line diagram, and estimate their values.	Use rational approximations of irrational numbers to compare the size of irrational numbers. Locate them approximately on a number line diagram, and calculate their values.
8.NS.A.3	Understand that given any two distinct rational numbers, $a < b$, identify a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$.	Understand that given any two distinct rational numbers, $a < b$, identify a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$. Given any two distinct irrational numbers, $a < b$, identify a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$.	Understand that given any two distinct rational numbers, $a < b$, there exist a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$. Given any two distinct irrational numbers, $a < b$, there exists a rational number c and an irrational number d, such that $a < c < b$ and $a < d < b$.	Explain that given any two distinct rational numbers, $a < b$, there exist a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$. Given any two distinct irrational numbers, $a < b$, there exist a rational number c and an irrational number d such that $a < c < b$ and $a < d < b$.

Expressions and Equations				
8.EE.A.1	Apply the properties of integer exponents to identify equivalent numerical expressions.	Apply the properties of integer exponents to generate equivalent numerical expressions.	Understand and apply the properties of integer exponents to generate equivalent numerical expressions.	Understand and apply the properties of integer exponents to generate and interpret equivalent numerical expressions.
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3= p, where p is a positive rational number. Know that √2 is irrational. a. Identify square roots of perfect squares less than or equal to 100. b. Identify cube roots of perfect cubes less than or equal to 500.	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3= p, where p is a positive rational number. Know that √2 is irrational. a. Identify square roots of perfect squares less than or equal to 225. b.Identify cube roots of perfect cubes less than or equal to 1000.	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3= p, where p is a positive rational number. Know that √2 is irrational. a. Evaluate square roots of perfect squares less than or equal to 225. b. Evaluate cube roots of perfect cubes less than or equal to 1000.	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3= p, where p is a positive rational number. Know that √2 is irrational. a. Evaluate square roots less than or equal to 225. b. Evaluate cube roots less than or equal to 1000.
8.EE.A.3	Identify numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities.	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities.	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 express how many times larger or smaller one is than the other.	Use numbers expressed in the form of a single digit times an integer power of 10 to interpret very large or very small quantities, and express how many times larger or smaller one is than the other.
8.EE.A.4	Perform operations with numbers expressed in scientific notation.	Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. Use scientific notation for measurements of very large or very small quantities.	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.	Perform operations with numbers expressed in scientific notation including problems where both decimal and scientific notation are used. Use scientific notation to interpret for measurements of very large or very small quantities.
8.EE.B.5	Graph proportional relationships.	Graph proportional relationships interpreting the unit rate as the slope of the graph. Compare two different proportional relationships.	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.	Graph proportional relationships interpreting the unit rate as the slope of the graph. Compare and explain two different proportional relationships represented in different ways.
8.EE.B.6	Use similar triangles to identify that the slope is the same between any two distinct points on a non-vertical line in the coordinate plane.	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. Use the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at (0, b).	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 (0, b).	Use similar triangles to prove 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 (0, b).

8.EE.C.7	Fluently solve linear equations and inequalities in one variable. a. Identify linear equations in one variable with one solution, infinitely many solutions, or no solution. b. Identify the solution to linear equations and inequalities with rational number coefficients.	Fluently solve linear equations and inequalities in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. b. Solve linear equations and inequalities with rational number coefficients.	Fluently solve linear equations and inequalities in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. 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). b. Solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.	Fluently solve linear equations and inequalities in one variable. a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solution. Explain 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). b. Explain how to solve linear equations and inequalities with rational number coefficients, including solutions that require expanding expressions using the distributive property and collecting like terms.
8.EE.C.8	Analyze and solve pairs of simultaneous linear equations. a. Identify the point of intersection for graphs of two linear equations in two variables. b. Identify solutions to simple systems of equations by inspection. c. Solve mathematical problems using two linear equations in two variables.	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs. b. Estimate solutions to sytems of two lyniear equations in two variables by graphing the equations,including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world context using two linear equations in two variables.	Analyze and solve pairs of simultaneous linear equations. a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations, including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world contexts leading to two linear equations in two variables.	Analyze and solve pairs of simultaneous linear equations. a. Explain that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs because points of intersection satisfy both equations simultaneously. b. Solve systems of two linear equations in two variables algebraically, and solve solutions by graphing the equations including cases of no solution and infinite number of solutions. Solve simple cases by inspection. c. Solve mathematical problems and problems in real-world context by creating two linear equations in two variables.

Functions				
8.F.A.1	Identify a function rule that assigns to each input exactly one output. (Function notation is not required in Grade 8.)	Generate a function rule that assigns to each input exactly one output. Identify the graph of a function as the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)	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. (Function notation is not required in Grade 8.)	Explain that a function is a rule that assigns to each input exactly one output. Explain that the graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)
8.F.A.2	Identify properties of two functions each represented in the same way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Compare properties of two functions each represented in the same way (algebraically, graphically, numerically in tables, or by verbal descriptions).	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.	Interpret properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
8.F.A.3	Identify a linear function whose graph is a straight line.	Interpret the equation y = mx + b as defining a linear function whose graph is a straight line.	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 = s^2 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.	Interpret the equation y = mx + b as defining a linear function whose graph is a straight line; give real-world examples of functions that are not linear.
8.F.B.4	Given a description of a situation, identify a function to model a linear relationship between two quantities.	Given a description of a situation, generate a function to model a linear relationship between two quantities. Identify 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 a graph.	Given a description of a situation, generate 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 a graph. Track how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.	Given a description of a situation, generate 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 a graph. Interpret how the values of the two quantities change together. Interpret the rate of change and initial value of a linear function in terms of the situation it models, its graph, or its table of values.
8.F.B.5	Identify a graph that exhibits the qualitative features of a function that has been described verbally.	Identify 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.	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.	Interpret 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.

Geometry				
8.G.A.1	Identify the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.	identify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.	Verify experimentally the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.	Prove the properties of rotations, reflections, and translations. Properties include: lines are taken to lines, line segments are taken to line segments of the same length, angles are taken to angles of the same measure, parallel lines are taken to parallel lines.
8.G.A.2	Given two congruent figures, identify a sequence that demonstrates congruence.	Understand that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, identify a sequence that demonstrates congruence.	Understand that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that demonstrates congruence.	Prove that a two-dimensional figure is congruent to another if one can be obtained from the other by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that demonstrates congruence.
8.G.A.3	Identify the effect of dilations, translations, rotations, and reflections on two-dimensional figures.	Identify the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	Describe and interpret the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.A.4	Given two similar two-dimensional figures, identify a sequence that demonstrates similarity.	Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, identify a sequence that demonstrates similarity.	Understand that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.	Explain that a two-dimensional figure is similar to another if, and only if, one can be obtained from the other by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that demonstrates similarity.
8.G.A.5	Use 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.	Identify 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.	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 explaining why this is so.	Prove 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.
8.G.B.6	Identify examples of the application of the converse of the Pythagorean Theorem.	Apply the converse of the Pythagorean Theorem.	Understand the Pythagorean Theorem and its converse.	Prove the converse of the Pythagorean Theorem.
8.G.B.7	Apply the Pythagorean Theorem to determine the hypotenuse in right triangles in real-world context and mathematical problems in two dimensions.	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two dimensions.	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world contexts and mathematical problems in two and three dimensions.	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world context and mathematical problems in two and three dimensions and interpret the results.

8.G.B.8	Use the Pythagorean Theorem to find the distance between two points in the first quadrant of a coordinate system.	Use the Pythagorean Theorem to find the distance between two points in a coordinate system.	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	Apply the Pythagorean Theorem to find the scaled distance between two points in a coordinate system.
8.G.C.9	Apply formulas for volumes of cones, cylinders, and spheres.	Understand and use formulas for volumes of cones, cylinders, and spheres.	Understand and use formulas for volumes of cones, cylinders, and spheres and use them to solve real-world context and mathematical problems.	Know and use formulas for volumes of cones, cylinders and spheres and use them to solve real-world context and mathematical problems.

Statistics and Probability				
8.SP.A.1	Construct scatter plots for bivariate measurement data.	Construct scatter plots for bivariate measurement data to investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Construct and interpret scatter plots for bivariate measurement data to investigate and describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Construct and interpret scatter plots for bivariate measurement data to investigate and interpret patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2	For scatter plots that suggest a linear association, informally fit a straight line.	Identify straight lines 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.	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.	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.A.3	Identify properties of the equation of a linear model to solve problems in the context of bivariate measurement data.	Use the equation of a linear model to solve problems in the context of bivariate measurement data, identifying the slope and intercept.	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	Create an equation for a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
8.SP.A.4	Construct a two-way table summarizing data on two categorical variables collected from the same subjects.	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.	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.	Explain patterns of association 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.
8.SP.B.5	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Identify the probability of a compound event. b. Identify sample spaces for compound events using organized lists, tables, tree diagrams and other methods. c. Use a simulation to identify frequencies for compound events.	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Identify the probability of a compound event as the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using organized lists, tables, tree diagrams, and other methods. c. Use a simulation to generate frequencies for compound events.	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations. a. Understand that the probability of a compound event is the fraction of outcomes in the sample space in which the compound event occurs. b. Represent sample spaces for compound events using organized lists, tables, tree diagrams, and other methods. Identify the outcomes in the sample that composes the event. c. Design and use a simulation to generate frequencies for compound events.	Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. a. Explain why the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. b. Represent sample spaces for compound events using organized lists, tables, tree diagrams, and other methods. Identify and interpret the outcomes in the sample space that composes the event. c. Design and use a simulation to generate frequencies for compound events and interpret in context.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
The Real Number System				
A1.N-RN.B.3	Recognize that the sum or product of two rational numbers is rational.	Recognize that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational.	Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	Generalize and develops rules for the sum or product of two rational numbers being rational; the sum of a rational number and an irrational number being irrational; and the product of a nonzero rational number and an irrational number being irrational.

Quantities				
A1.N-Q.A.1	Identify units for the solution of multi-step problems; Identify units consistently in formulas; Identify the scale and the origin in graphs and data displays, include utilizing real-world context.	Choose units for the solution of multi-step problems; choose units consistently in formulas; choose the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to justify the solution of multi-step problems; choose and interpret units consistently in formulas; interpret and explain the scale and the origin in graphs and data displays, include utilizing real-world context.
A1.N-Q.A.2	Identify appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.	Define and use appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.
A1.N-Q.A.3	Identify a level of accuracy on measurement when reporting quantities utilizing real-world context.	Identify a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Compare the levels of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.

Seeing Structure in Expressions				
A1.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context. a. Identify parts of an expression, such as terms, factors, and coefficients. b. Match expressions by viewing one or more of their parts as a single entity.	Interpret expressions that represent a quantity in terms of its context. a. Define parts of an expression, such as terms, factors, and coefficients. b. Use expressions by viewing one or more of their parts as a single entity.	Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret expressions by viewing one or more of their parts as a single entity.	Interpret expressions that represent a quantity in terms of its context. a. Differentiate parts of an expression, such as terms, factors, and coefficients. b. Make observations about expressions by viewing one or more of their parts as a single entity.
A1.A-SSE.A.2	Identify equivalent numerical and polynomial expressions. Focus on polynomial multiplication patterns.	Identify ways to rewrite equivalent numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.	Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.	Assess ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns.
A1.A-SSE.B.3a	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Identify a factored quadratic expression that reveals the zeros of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Use a factored quadratic expression that reveals the zeros of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Explain conditions forthe zeros of a quadratic function.
A1.A-SSE.B.3b	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Identify a quadratic expression that reveals the maximum or minimum value of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Use a quadratic expression that reveals the maximum or minimum value of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines and use it to solve problems

Arithmetic with Polynomials and Rational Expressions				
A1.A-APR.A.1	Add and subtract polynomials.	Add, subtract, and multiply polynomials.	Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	Explain that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.
A1.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.	Use the zeros of polynomials to construct a rough graph of the function defined by the polynomial. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus on quadratic and cubic polynomials in which linear and quadratic factors are available.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus cubic polynomials in which quadratic factors are available.

Creating Equations				
A1.A-CED.A.1	Identify equations and inequalities in one variable that can be used to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Use equations and inequalities in one variable to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Analyze equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.A-CED.A.2	Identify equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Use equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Analyze equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
A1.A-CED.A.3	Identify constraints of equations or inequalities, and of systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.	Apply constraints of equations or inequalities, and of systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.	Justify constraints of equations or inequalities, and by systems of equations and/or inequalities, and justify solutions as viable or non-viable options in a modeling context.
A1.A-CED.A.4	Identify formulas that highlight a quantity of interest, using the same reasoning as in solving equations.	Apply formulas that highlight a quantity of interest, using the same reasoning as in solving equations.	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*	Rearrange and apply formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

Reasoning with Equations and Inequalities				
A1.A-REI.A.1	Identify each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.	Carry out each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Identify a viable argument to justify a solution method.	Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	Critique each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
A1.A-REI.B.3	Solve one-step and two-step linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Solve two- step linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	Compare different methods to solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
A1.A-REI.B.4	Solve quadratic equations in one variable. a. Identify the quadratic formula. b. Solve quadratic equations by inspection (e.g., x^2 = 49), taking square roots, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – k)^2 = q that has the same solutions where q=0. Use the quadratic formula. b. Solve quadratic equations by inspection (e.g., x^2 = 49), taking square roots, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.	Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – k)^2 = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.	Solve quadratic equations in one variable. a. Derive the quadratic formula. b. Determine whether to solve quadratic equations by inspection (e.g., x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.
A1.A-REI.C.5	Understand that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	Explain that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.	Given two systems of two equations in two variables, verify that they have the same solutions by replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
A1.A-REI.C.6	Solve systems of linear equations approximately, focusing on pairs of linear equations in two variables.	Solve systems of linear equations approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context.	Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context.	Analyzes a system of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context.
A1.A-REI.D.10	Identify the graph of an equation in two variables.	Identify a solution given the graph of an equation in two variables.	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line.	Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line.

A1.A-REI.D.11	Identify the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect as the solutions of the equation f(x) =g(x). Focus on cases where f(x) and/or g(x) are linear.	Identify the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect as the solutions of the equation f(x) =g(x); find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where f(x) and/or g(x) are linear and exponential functions.	Explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x) =g(x); find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where f(x) and/or g(x) are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Explain why the x-coordinates of the points where the graphs of the equations y=f(x) and y=g(x) intersect are the solutions of the equation f(x) =g(x); find the solutions exactly (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Focus on cases where f(x) and/or g(x) are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.A-REI.D.12	Identify a solution to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality.	Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality.	Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	Create a system of linear inequalities given a graph of the solution set.

Interpreting Functions				
A1.F-IF.A.1	Understand that the graph of f is the graph of the equation y = f(x).	Understand that if f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).	Create a function or non-function based on understanding that a function from the domain to the range assigns to each element of the domain exactly one element of the range.
A1.F-IF.A.2	Evaluate a function for an input in the domain.	Evaluate a function for inputs in the domain.	Evaluate a function for inputs in the domain, and interpret statements that use function notation in terms of a context.	Evaluate a function for inputs in the domain, and apply statements that use function notation in terms of a context.
A1.F-IF.A.3	Identify sequences or functions defined recursively, whose domain is a subset of the integers.	Use sequences or functions defined recursively, whose domain is a subset of the integers.	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.	Create a function defined recursively.
A1.F-IF.B.4	For a function that models a relationship between two quantities, identify key features of graphs and tables in terms of the quantities. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear and exponential and functions.	For a function that models a relationship between two quantities, identify key features of graphs and tables in terms of the quantities. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear and exponential and functions.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	For a function that models a relationship between two quantities, explain key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.F-IF.B.5	Identify the domain of a function from its graph.	Identify the domain of a function from its graph and, where applicable, relate it to the quantitative relationship it describes.	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes in a real-world context.
A1.F-IF.B.6	Estimate the rate of change from a graph. Focus on linear and exponential functions.	Calculate the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear and exponential functions.	Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Analyze the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.F-IF.C.7	Identify key features of linear and exponential functions shown on a graph.	Identify key features functions shown on a graph. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Graph more than one function expressed symbolically, and compare key features of the graphs. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

A1.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring a quadratic function to show zeros.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square of a quadratic function to show zeros, extreme values, and symmetry of the graph.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square of a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Determine an appropriate method to rewrite a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
A1.F-IF.C.9	Identify properties of two functions each represented in a different way (graphically or numerically in tables). Focus on linear and exponential functions.	Define properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, and exponential functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Analyze two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

Building Functions				
A1.F-BF.A.1	Identify a function that describes a relationship between two quantities. Identify an explicit expression, steps for calculation from real-world context. Focus on linear and exponential functions.	Identify a function that describes a relationship between two quantities. Identify an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic and exponential functions.	Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Write a function that describes a relationship between two quantities. Compare the explicit expression to the recursive process. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).
A1.F-BF.B.3	Identify the effect on the graph of replacing f(x) by f(x) + k, and f(x+k) for specific positive values of k. Illustrate the effects on the graph. Focus on linear and exponential functions.	Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x+k) for specific positive values of k; identify the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph. Focus on linear, quadratic, and exponential functions.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k f(x)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	Explain the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x+k) for specific values of k (both positive and negative rational numbers); determine the value of k given the graphs. Experiment with cases and explain an explanation of the effects on the graph. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).

Linear, Quadratic, and Exponential Models				
A1.F-LE.A.1	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Recognize that linear functions grow by equal differences over equal intervals. b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another. c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Recognize that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Identify situations in which one quantity changes at a constant rate per unit interval relative to another as a situation that can be modeled with a linear function. c. Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another as a situation that can be modeled with an exponential function.	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Explain why linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Create situations in which one quantity changes at a constant rate per unit interval relative to another. c. Create situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.
A1.F-LE.A.2	Identify linear functions, including arithmetic sequences, given a graph, a description of a relationship, or input/output pairs.	Identify linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.	Explain how linear and exponential functions, can model arithmetic and geometric sequences.
A1.F-LE.A.3	Identify graphs and tables that have a quantity increasing linearly, exponentially, or quadratically.	Compare graphs and tables that have quantities increasing linearly, exponentially, and quadratically.	Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.	Explain why a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically.
A1.F-LE.B.5	Identify the parameters in a linear function with integer exponents utilizing real world context.	Identify the parameters in a linear or exponential function with integer exponents utilizing real world context.	Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context.	Define the parameters while creating a linear or exponential function with integer exponents utilizing real world context.

Summarize, represent, and interpret data on a single count or measurement variable.				
A1.S-ID.A.1	Match real-value data with dot plots, histograms, and box plots.	Represent real-value data with dot plots, histograms, and box plots.	Represent real-value data with plots for the purpose of comparing two or more data sets.	Represent real-value data with the most appropriate plots and analyze the similarityes and differences between two or more data sets.
A1.S-ID.A.2	Identify the center (median, mean) and spread (interquartile range) of two or more different data sets.	Compare the center (median, mean) or spread (interquartile range, standard deviation) of two or more different data sets.	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	Use statistics appropriate to the shape of the data distribution to analyze and explain the similarities and differences between the center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
A1.S-ID.A.3	Identify differences in shape, center, and spread in the context of the data sets.	Compare informally differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present.	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present.	Interpret and explain differences in shape, center, and spread in the context of the data sets, make observations about the effects different outlier would have.
A1.S-ID.B.5	For categorical data summarized for two categories in two-way frequency tables, identify relative frequencies in the context of the data.	Complete a partially filled in frequency table to summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data, including joint, and conditional relative frequencies.	Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data, including joint, marginal, and conditional relative frequencies. Recognize possible associations and trends in the data.	Summarize categorical data for two categories in two-way frequency tables. Interpret and explain relative frequencies in the context of the data, including joint, marginal, and conditional relative frequencies. Explain possible associations and trends in the data.
A1.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Identify a linear function that best fits the data represented in a scatter plot. b. Informally assess the fit of a function when given a residual plot.	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Identify a linear function that best fits the data represented in a scatter plot; use functions fitted to data to identify the solutions to problems in the context of the data. Focus on linear models. b. Plot the residuals of a function.	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Focus on linear models. b. Informally assess the fit of a function by plotting and analyzing residuals.	Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Compare the fit of different functions to the data, including exponential functions with domains in the integers; use functions fitted to data to solve problems in the context of the data. b. Informally assess the fit of different functions by plotting and analyzing their residuals.
A1.S-ID.C.7	Match the slope and the constant term of a linear model with their meaning in the context of the data.	Identify the slope of a linear model as a rate of change in the context of the data, and identify the constant term of a linear model in the context of the data.	Interpret the slope as a rate of change and the constant term of a linear model in the context of the data.	Define the meaning of the slope as a rate of change in the context of the data, and define the constant term of a linear model in the context of the data.

A1.S-ID.C.8	Select the correlation coefficient of a linear relationship represented with a scatter plot where the correlation coefficient can be easily estimated.	Identity the correlation coefficient of a linear relationship.	Compute and interpret the correlation coefficient of a linear relationship.	Explain the meaning of different correlation coefficients for linear relationships.
A1.S-ID.C.9	Define correlation and causation.	Identify examples of correlation and causation.	Distinguish between correlation and causation.	Supports or refutes claims of causation, distinguishing between correlation and causation.

Conditional Probability and the rules of Probability				
A1.S-CP.A.1	Identify an event as a subset of a sample space.	Identify events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events, as shown in a visual model.	Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.	Using complex representations, explain how specific events are subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.
A1.S-CP.A.2	Use the Multiplication Rule for independent events to calculate the probability of 2 independent events.	Use the Multiplication Rule for independent events to determine if two events A and B are independent, given the probability of A, the probability of B, and the probability of A and B occurring together.	Use the Multiplication Rule for independent events to understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.	Use the Multiplication Rule for independent events to understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if several events in a sample space are dependent or independent.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
			Congruence	
G.G-CO.A.1	Identify precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Informally define angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	Create precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.
G.G-CO.A.2	Identify transformations in the plane as functions that take points in the plane as inputs and give other points as outputs.	Interpret transformations in the plane as functions that take points in the plane as inputs and give other points as outputs. Identify transformations that preserve distance and angle to those that do not.	Represent and describe transformations in the plane as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not.	Create and rewrite transformations in the plane as functions that take points in the plane as inputs and give other points as outputs. Evaluate and compare transformations that preserve distance and angle to those that do not.
G.G-CO.A.3	Given a rectangle, parallelogram, trapezoid, or regular polygon, identify a rotation or reflection that could carry it onto itself.	Given a rectangle, parallelogram, trapezoid, or regular polygon, identify the rotations and reflections that carry it onto itself.	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	Given a rectangle, parallelogram, trapezoid, or regular polygon, create and justify the rotations and reflections that carry it onto itself.
G.G-CO.A.4	Identify definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Interpret definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	Create and evaluate definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.
G.G-CO.A.5	Given a geometric figure and a rotation, reflection, or translation, identify the transformed figure.	Given a geometric figure and a rotation, reflection, or translation, describe the transformed figure. Identify a sequence of transformations that will carry a given figure onto another.	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify a sequence of transformations that will carry a given figure onto another.	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure. Specify sequences of transformations that will carry a given figure onto another.
G.G-CO.B.6	Use geometric definitions of rigid motions to transform a figure; given two figures, use the definition of congruence in terms of rigid motions to identify if they are congruent.	Use geometric definitions of rigid motions to transform a figure or to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to identify if they are congruent.	Use geometric definitions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	Use geometric definitions of rigid motions to transform figures and to predict and describe the effect of a sequence of rigid motions on a given figure; given two figures, use the definition of congruence in terms of rigid motions to describe if and why they are congruent.
G.G-CO.B.7	Use the definition of congruence in terms of rigid motions to understand that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	Use the definition of congruence in terms of rigid motions to identify that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	Use the definition of congruence in terms of rigid motions to justify that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
G.G-CO.B.8	Understand how the criteria for triangle congruence (ASA, AAS, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	Show how the criteria for triangle congruence (ASA, AAS, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	Explain how the criteria for triangle congruence (ASA, AAS, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	Justify how the criteria for triangle congruence (ASA, AAS, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

G.G-CO.C.9	Identify theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	Interpret theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	Construct and evaluate proofs for theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.
G.G-CO.C.10	Identify theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of an isosceles triangle are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	Interpret theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of an isosceles triangle are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of an isosceles triangle are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.	Construct and evaluate proofs for theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of an isosceles triangle are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.
G.G-CO.C.11	Identify theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and rectangles are parallelograms with congruent diagonals.	Interpret theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and rectangles are parallelograms with congruent diagonals.	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and rectangles are parallelograms with congruent diagonals.	Construct and evaluate proofs for theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and rectangles are parallelograms with congruent diagonals.
G.G-CO.D.12	Identify formal geometric constructions with a variety of tools and methods. Constructions include: copying segments; copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	Complete formal geometric constructions with a variety of tools and methods. Constructions include: copying segments; copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	Make formal geometric constructions with a variety of tools and methods. Constructions include: copying segments; copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	Critique formal geometric constructions with a variety of tools and methods. Constructions include: copying segments; copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.
G.G-CO.D.13	Identify steps needed to construct an equilateral triangle, a square, or a regular hexagon inscribed in a circle.	Identify steps needed to construct an equilateral triangle, a square, or a regular hexagon inscribed in a circle with a variety of tools and methods.	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle with a variety of tools and methods.	Make observations about a constructed equilateral triangle, square, and regular hexagon inscribed in a circle with a variety of tools and methods.

Similarity, Right Triangles and Trigonometry				
G.G-SRT.A.1	Identify the properties of dilations given by a center and a scale factor: a. Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Interpret examples demonstrating the properties of dilations given by a center and a scale factor: a. Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Verify experimentally the properties of dilations given by a center and a scale factor: a. Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	Explain quantitatively the properties of dilations given by a center and a scale factor: a. Dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
G.G-SRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; identify the meaning of similarity for triangles as the equality of all corresponding pairs of angles or the proportionality of all corresponding pairs of sides.	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; qualitatively describe the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; make observations using similarity transformations on the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.
G.G-SRT.A.3	Use the properties of similarity transformations to identify the AA, SAS, and SSS criterion for two triangles to be similar.	Use the properties of similarity transformations to interpret the AA, SAS, and SSS criterion for two triangles to be similar.	Use the properties of similarity transformations to establish the AA, SAS, and SSS criterion for two triangles to be similar.	Use the properties of similarity transformations to develop definitions for the AA, SAS, and SSS criterion for two triangles to be similar.
G.G-SRT.B.4	Identify theorems about triangles. Theorems include: an interior line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	Interpret theorems about triangles. Theorems include: an interior line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	Prove theorems about triangles. Theorems include: an interior line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	Construct and evaluate proofs of theorems about triangles. Theorems include: an interior line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.
G.G-SRT.B.5	Use congruence and similarity criteria to interpret problems.	Use congruence and similarity criteria to identify relationships in geometric figures and solve problems utilizing real-world context.	Use congruence and similarity criteria to prove relationships in geometric figures and solve problems utilizing real-world context.	Use congruence and similarity criteria to construct and evaluate proofs for relationships in geometric figures and solve complex problems utilizing real-world context.
G.G-SRT.C.6	Identify that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	Specify that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	Explain that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G.G-SRT.C.7	Identify the relationship between the sine and cosine of complementary angles.	Interpret and use the relationship between the sine and cosine of complementary angles.	Explain and use the relationship between the sine and cosine of complementary angles.	Prove the relationship between the sine and cosine of complementary angles.
G.G-SRT.C.8	Use trigonometric ratios and the Pythagorean Theorem to identify unknown measurements in right triangles.	Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to find unknown measurements in right triangles.	Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to find unknown measurements in right triangles utilizing real-world context.	Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to describe a solution process to find unknown measurements in right triangles utilizing real-world context.

Circles				
G.G-C.A.1	Recognize that all circles are similar.	Explain qualitatively that all circles are similar.	Prove that all circles are similar.	Construct and evaluate proofs that all circles are similar.
G.G-C.A.2	Use relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	Find relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.	Prove relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.
G.G-C.A.3	Identify inscribed and circumscribed circles of a triangle.	Construct the inscribed and circumscribed circles of a triangle, and use properties of angles for a quadrilateral inscribed in a circle.	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	Evaluate constructions of inscribed and circumscribed circles of a triangle, and prove unique relationships between the angles for a quadrilateral inscribed in a circle.
G.G-C.B.5	Identify that the length of the arc intercepted by an angle is proportional to the radius and that the radian measure of the angle is the constant of proportionality; define the formula for the area of a sector. Identify the relationship between degrees and radians.	Solves problems using the fact that the length of the arc intercepted by an angle is proportional to the radius and that the radian measure of the angle is the constant of proportionality; solve problems using the formula for the area of a sector. Convert between degrees and radians.	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. Convert between degrees and radians.	Prove using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; prove the formula for the area of a sector. Derive the formula to convert between degrees and radians.

Geometric Properties with Equations				
G.G-GPE.A.1	Identify the center and radius of a circle given by an equation of the form $(x - h)^2 + (y - k)^2 = r^2$.	Create the equation of a circle of given center and radius; find the center and radius of a circle given by an equation of the form $(x - h)^2 + (y - k)^2 = r^2$.	Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	Explain the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
G.G-GPE.B.4	Use coordinates to identify geometric relationships. Relationships include: proving or disproving geometric figures given specific points in the coordinate plane; and proving or disproving if a specific point lies on a given circle.	Use coordinates to algebraically solve problems involving geometric relationships. Relationships include: proving or disproving geometric figures given specific points in the coordinate plane; and proving or disproving if a specific point lies on a given circle.	Use coordinates to algebraically prove or disprove geometric relationships. Relationships include: proving or disproving geometric figures given specific points in the coordinate plane; and proving or disproving if a specific point lies on a given circle.	Use coordinates to algebraically justify statements about geometric relationships. Relationships include: proving or disproving geometric figures given specific points in the coordinate plane; and proving or disproving if a specific point lies on a given circle.
G.G-GPE.B.5	Use the slope criteria for parallel or perpendicular lines to solve simple geometric problems, including finding the equation of a line parallel or perpendicular to a given line.	Use the slope criteria for parallel and perpendicular lines to solve simple geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.	Prove and explain the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.
G.G-GPE.B.6	Identify the point on a directed horizontal or vertical line segment between two given points that partitions the segment in a given ratio, given visual representation.	Identify the point on a directed line segment between two given points that partitions the segment in a given ratio, given visual representation.	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	Construct a line segment that partitions the segment in a given ratio.
G.G-GPE.B.7	Use coordinates to compute perimeters and areas of right triangles and rectangles.	Use coordinates to compute perimeters of regular polygons and areas of right triangles and rectangles.	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles.	Use coordinates to justify perimeters of polygons and areas of triangles and rectangles.

Geometric Measurement and Dimension				
G-GMD.A.1	Identify the formulas for the volume of a cylinder, pyramid, and cone.	Informally describe the formulas for the volume of a cylinder, pyramid, and cone.	Analyze and verify the formulas for the volume of a cylinder, pyramid, and cone.	Create and interpret the relationships between the formulas for the volume of a cylinder, pyramid, and cone.
G-GMD.A.3	Substitute given measures into volume formulas for cylinders, pyramids, cones, and spheres to solve simple problems.	Use volume formulas for cylinders, pyramids, cones, and spheres to solve simple problems.	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems utilizing real-world context.	Compare volume formulas for cylinders, pyramids, cones, and spheres.
G-GMD.B.4	Identify the shapes of two-dimensional horizontal or vertical cross-sections of three-dimensional objects.	Identify three-dimensional objects generated by rotations of two-dimensional objects about a line of symmetry.	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	Describe or create the shapes of two-dimensional cross-sections of three-dimensional objects, and describe three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry				
G.G-MG.A.1	Use simple geometric shapes to qualitatively describe objects utilizing real-world context.	Use geometric shapes and their properties to qualitatively describe objects utilizing real-world context.	Use geometric shapes, their measures, and their properties to describe objects utilizing real-world context.	Use geometric shapes, their measures, and their properties to model complex objects utilizing real-world context.
G.G-MG.A.2	Calculate density based on area and volume.	Calculate density based on area and volume in modeling situations utilizing real-world context.	Apply concepts of density based on area and volume in modeling situations utilizing real-world context.	Apply concepts of density based on area and volume in comparative modeling situations utilizing real-world context.
G.G-MG.A.3	Identify relevant geometric models to solve design problems utilizing real-world context.	Apply geometric methods to identify solutions for design problems utilizing real-world context.	Apply geometric methods to solve design problems utilizing real-world context.	Apply geometric methods to create composite structures as solutions for design problems utilizing real-world context.

Standard	Minimally Proficient	Partially Proficient	Proficient	Highly Proficient
	The Minimally Proficient student	The Partially Proficient student	The Proficient student	The Highly Proficient student
The Real Number System				
A2.N-RN.A.1	Identify how the properties of integer exponents extend to rational exponents, allowing for a notation for radicals in terms of rational exponents.	Understand how the definition of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	Explain how the definition of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.	Show how the definition of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.
A2.N-RN.A.2	Identify expressions involving radicals and rational exponents using the properties of exponents.	Evaluate expressions involving radicals and rational exponents using the properties of exponents.	Rewrite expressions involving radicals and rational exponents using the properties of exponents.	Show that two expressions involving radicals and rational exponents are equivalent using the properties of exponents.

Quantities				
A2.N-Q.A.1	Identify units as a way to understand problems and to guide the solution of multi-step problems; identify units consistently in formulas; identify the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and use units consistently in formulas; determine the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.	Use units as a way to understand problems and to justify the solution of multi-step problems; choose and justify units consistently in formulas; choose and justify the scale and the origin in graphs and data displays, include utilizing real-world context.
A2.N-Q.A.2	Identify appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling.	Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.	Define and use appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.
A2.N-Q.A.3	Identify a level of accuracy appropriate to be reported quantities utilizing real-world context.	Identify a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	Compare levels of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.

The Complex Number System				
A2.N-CN.A.1	Know the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, or multiply complex numbers. Identify complex numbers in the form $(a+bi)$ with a and b real.	Apply the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, or multiply complex numbers. Identify complex numbers in the form $(a+bi)$ with a and b real.	Apply the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the form $(a+bi)$ with a and b real.	Explain the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the form $(a+bi)$ with a and b real.
A2.N-CN.C.7	Identify quadratic equations with real coefficients that have complex solutions.	Interpret quadratic equations with real coefficients that have complex solutions.	Solve quadratic equations with real coefficients that have complex solutions.	Create quadratic equations with real coefficients that have complex solutions.

Seeing Structure in Expressions				
A2.A-SSE.A.2	Use structure to identify one way to rewrite polynomials. Focus on polynomial operations.	Use structure to identify one way to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns.	Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns.	Use structure to assess ways to rewrite complex polynomial and rational expressions. Focus on polynomial operations and factoring patterns.
A2.A-SSE.B.3	Select an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to identify transformed expressions for exponential functions given graphs.	Produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to identify transformed expressions for exponential functions.	Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform expressions for exponential functions.	Justify an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform and justify expressions for exponential functions.
A2.A-SSE.B.4	Identify the formula for the sum of a finite geometric series (when the common ratio is not 1).	Interpret the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*	Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve complex/multi-step problems in real-world context.

Arithmetic with Polynomials and Rational Expressions				
A2.A-APR.B.2	Know the Remainder and Factor Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $(x - a)$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	Know and understand the Remainder and Factor Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $(x - a)$ is p (a), so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	Know and apply the Remainder and Factor Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $(x - a)$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	Know and explain the Remainder and Factor Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $(x - a)$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.
A2.A-APR.B.3	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to identify a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to complete a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.	Interpret zeros of polynomials when suitable factorizations are available, and use the zeros to– construct a rough graph of the function defined by the polynomial. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided.
A2.A-APR.C.4	Identify polynomial identities and use them to identify numerical relationships.	Identify polynomial identities and use them to interpret numerical relationships.	Prove polynomial identities and use them to describe numerical relationships.	Prove polynomial identities and use them to create numerical relationships.
A2.A-APR.D.6	Identify rational expressions in different forms; identify $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.	Interpret rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.	Rewrite rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and r(x) are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.	Create rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or for the more complicated examples, a computer algebra system.

Creating Equations				
A2.A-CED.A.1	Identify equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Interpret equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.	Justify equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions.

Reasoning with Equations and Inequalities				
A2.A-REI.A.1	Identify each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Identify a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	Show each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Evaluate a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.	Prove each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Justify a viable argument to justify a solution method. Extend from quadratic equations to rational and radical equations.
A2.A-REI.A.2	Identify rational and radical equations in one variable, and identify examples showing how extraneous solutions may arise.	Interpret rational and radical equations in one variable, and identify examples showing how extraneous solutions may arise.	Solve rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	Create rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.
A2.A-REI.B.4	Fluently solve quadratic equations in one variable. Identify quadratic equations that can be solved by inspection (e.g., for x^2 = 49) and taking square roots, as appropriate to the initial form of the equation.	Fluently solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x^2 = 49), and taking square roots, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions.	Fluently solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.	Fluently solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, explaining why it is appropriate to the initial form of the equation. Explain when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.
A2.A-REI.C.7	Identify the solutions of a system consisting of a linear equation and a quadratic equation in two variables graphically.	Identify the solutions of a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. *For example, find the points of intersection between the line y = -3x and the circle x2+ y2 = 3.*	Solve and justify the solution of a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
A2.A-REI.D.11	Find the solutions approximately to $f(x) = g(x)$ given graphs of the functions. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial functions.	Identify that the x-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)* ; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where f(x) and/or g(x) are polynomial, rational, exponential, and logarithmic functions.	Explain why the x-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)* ; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions.	Prove why the x-coordinates of the points where the graphs of the equations *y = f(x)* and *y = g(x)* intersect are the solutions of the equation *f(x) = g(x)* ; find the solutions approximately (e.g., using technology to graph the functions, make tables of values, or find successive approximations). Include problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions.

Interpreting Functions				
A2.F-IF.B.4	For a function that models a relationship between two quantities, identify key features of graphs and tables in terms of the quantities, and match graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; and relative maximums and minimums. Functions include linear, quadratic, exponential, and polynomial.	For a function that models a relationship between two quantities, define key features of graphs and tables in terms of the quantities, and identify graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and construct graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.
A2.F-IF.B.6	Identify the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Identify the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Calculate the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Calculate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Interpret and explain the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.
A2.F-IF.C.7	Identify the graph of functions expressed symbolically. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and identify key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Graph functions expressed symbolically and show and interpret key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

A2.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Identify exponential functions and classify those functions as exponential growth or decay using graphs.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Identify the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay.	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Explain the properties of exponents that are used to interpret expressions for exponential functions and explain why those functions model exponential growth or decay.
A2.F-IF.C.9	Identify properties of two functions each represented in a different way (graphically or numerically in tables). Functions include linear, quadratic, exponential, and polynomial functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, and polynomial functions.	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Create functions given comparisons about the properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

Building Functions				
A2.F-BF.A.1	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Identify an explicit expression. b. Combine function types using addition and subtraction.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, or steps for calculation from a context. b. Combine function types using arithmetic operations.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using arithmetic operations and function composition.	Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Justify an explicit expression, a recursive process, or steps for calculation from a context. b. Combine function types using a combination of arithmetic operations and function composition.
A2.F-BF.A.2	Identify arithmetic sequences both recursively and with an explicit formula.	Write arithmetic sequences both recursively and with an explicit formula, and translate between the two forms.	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	Create arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
A2.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ and $f(x+k)$ for specific values of k (both positive and negative); identify the value of k given the graphs. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Include recognizing even and odd functions from their graphs. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	Justify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x+k)$ for specific values of k (both positive and negative); justify the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.

A2.F-BF.B.4	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, given visual representations. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a) given visual representations. c. Identify the meaning of a function and its inverse.	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a) in concrete situations. c. Identify the meaning of and relationship between a function and its inverse utilizing real-world context.	Find inverse functions. a. Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$ for all values of x in the domain of f and all values of y in the domain of g. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a). c. Interpret the meaning of and relationship between a function and its inverse utilizing real-world context.	Find inverse functions. a. Explain that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions f and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$ for all values of x in the domain of f and all values of y in the domain of g. b. Explain that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a). c. Explain the meaning of and relationship between a function and its inverse utilizing real-world context.

Linear, Quadratic, and Exponential Models				
A2.F-LE.A.4	For exponential models, identify as a logarithm the solution to *ab* ^(*ct) = d* where *a, c,* and *d* are numbers and the base *b* is 2, 10, or *e.*	For exponential models, express as a logarithm the solution to *ab* ^(*ct) = d* where *a, c,* and *d* are numbers and the base *b* is 2, 10, or *e* ; identify the logarithms that are not readily found by hand or observation using technology.	For exponential models, express as a logarithm the solution to *ab* ^(*ct) = d* where *a, c,* and *d* are numbers and the base *b* is 2, 10, or *e* ; evaluate the logarithms that are not readily found by hand or observation using technology.	For exponential models, express as a logarithm the solution to *ab* ^(*ct) = d* where *a, c,* and *d* are numbers and the base *b* is 2, 10, or *e* in a real-world context; evaluate the logarithms that are not readily found by hand or observation using technology in a real-world context.
A2.F-LE.B.5	Identify the intercepts in an exponential function with rational exponents utilizing real-world context.	Identify the parameters in an exponential function with rational exponents utilizing real-world context.	Interpret the parameters in an exponential function with rational exponents utilizing real-world context.	Explain the parameters in an exponential function with rational exponents utilizing real-world context.

Trigonometric Functions				
A2.F-TF.A.1	Identify angles given radian measures.	Use radian measures to describe central angles of a circle.	Understand radian measure of an angle as the length of the arc on any circle subtended by the angle, measured in units of the circle's radius.	Use the fact that a radian measure of an angle is the length of the arc on any circle subtended by the angle, measured in units of the circle's radius, to solve problems.
A2.F-TF.A.2	Identify how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Show how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.
A2.F-TF.B.5	Match sine, cosine and tangent functions that model periodic phenomena with specified amplitude, and midline.	Identify sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.	Create and interpret sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.	Create and compare sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline.
A2.F-TF.C.8	Identify the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ as sufficient for finding $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$ or $\cos(\theta)$.	Use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to identify $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$ or $\cos(\theta)$.	Use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$ or $\cos(\theta)$.	Create problems that use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and the quadrant of the angle θ to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$ or $\cos(\theta)$.

Interpreting Categorical and Quantitative Data				
A2.S-ID.A.4	Identify the mean and standard deviation of a data set from a normal curve.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve.	Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution to estimate population percentages. Explain why there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve.
A2.S-ID.B.6a	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Use functions fitted to data given scatter plots and the graphs of the functions to solve problems in the context of the data.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data given scatter plots to solve problems in the context of the data. Use given functions or choose a function suggested by the context.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context.	Represent data of two quantitative variables on a scatter plot, and describe how the quantities are related. Extend to polynomial and exponential models. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose and justify a function suggested by the context.
A2.S-ID.C.10	Match parameters of exponential models.	Identify parameters of exponential models.	Interpret parameters of exponential models.	Compare parameters of exponential models.

Making Inferences and Justifying Conclusions				
A2.S-IC.A.1	Understand that random sampling is necessary for making inferences about population parameters.	Understand statistics as a process for making inferences about population parameters.	Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	Understand that inferences about population parameters can only be generalized based on a random sample from that population.
A2.S-IC.A.2	Identify whether a specified model is consistent with results from a given data-generating process.	State whether a specified model is consistent with results from a given data-generating process.	Explain whether a specified model is consistent with results from a given data-generating process.	Explain whether a specified model is consistent with results from a given data-generating process.
A2.S-IC.B.3	Identify examples of designed experiments, sample surveys, and observational studies.	Recognize situations where designed experiments, sample surveys, and observational studies are the most appropriate.	Recognize the purposes of and differences between designed experiments, sample surveys, and observational studies.	Compare the purposes of and differences between designed experiments, sample surveys, and observational studies.
A2.S-IC.B.4	Recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to estimate a population mean; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to estimate a population mean or proportion; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.	Use data from a sample survey to compare population mean or proportion; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes.

Conditional Probability and the Rules of Probability				
A2.S-CP.A.3	Identify a conditional probability as *A* given *B*.	Understand the conditional probability of *A* given *B* as $P(A \text{ and } B)/P(B)$, and identify independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	Understand the conditional probability of *A* given *B* as $P(A \text{ and } B)/P(B)$, and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	Evaluate the conditional probability of *A* given *B* as $P(A \text{ and } B)/P(B)$, and show independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of B.
A2.S-CP.A.4	Identify a missing value in two-way frequency tables of data when two categories are associated with each object being classified.	Complete and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to approximate conditional probabilities.	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.	Construct and compare two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
A2.S-CP.A.5	Identify the concepts of conditional probability and independence utilizing real-world context.	Recognize and interpret the concepts of conditional probability and independence utilizing real-world context.	Recognize and explain the concepts of conditional probability and independence utilizing real-world context.	Create examples of and explain the concepts of conditional probability and independence utilizing real-world context.
A2.S-CP.B.6	Recognize Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*.	Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A* given visual models.	Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.	Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and justify the answer in terms of the model.
A2.S-CP.B.7	Recognize the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.	Calculate probabilities using the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$.	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in terms of the model.	Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and justify the answer in terms of the model.
A2.S-CP.B.8	Recognize the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$.	Calculate probabilities using the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$.	Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$, and interpret the answer in terms of the model.	Apply the general Multiplication Rule in a uniform probability model, $P(A \text{ and } B) = P(A)P(B \mid A) = P(B)P(A \mid B)$, and justify the answer in terms of the model.