         **White**: Indicates no change to the standard (exactly the same).

         **Yellow**: Indicates a minor change(s) to the standard.  This may be an addition or omission of any words.  Minor changes would require very little or no change by the classroom teacher.

         **Green**: Indicates a major change(s) to the standard.  In this case the content is very similar (ie. not a new standard), but the classroom teacher would have to make major instructional modifications.  This may be a change required more or less rigor.  Also use this color for new proposed standards or current standards that have been dropped in the proposed standards.  Please fill in a blank cell with “Not in the proposed standards.”

         **Red**: Indicates a proposed standard that is very similar to a current standard at a different grade level (lower or higher).

**Grade 6**

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| **Code** | **Proposed Standards**  **(listed in order proposed)** | **Code** | **Current Missouri Learning Standards** |
| **Ratios and Proportional Relationships** | | **Ratios and Proportional Relationships** | |
| **A. Understand and use ratios to solve problems.** | | 1. **Understand ratio concepts and use ratio reasoning to solve problems.** | |
| 6.RP.A.1 | Understand a ratio as a comparison of two quantities and represent these comparisons in the form of ratios and as verbal statements. | 6.RP.A.1 | Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."* |
| 6.RP.A.2 | Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and describe the meaning of unit rate in the context of the relationship. | 6.RP.A.2 | Understand 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. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*1 |
| 6.RP.A.3 | Solve real-world mathematical problems involving ratios and rates utilizing strategies such as tables of equivalent ratios, tape diagrams, bar models, double number line diagrams, and/or equations.   1. Make tables of equivalent ratios, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. 2. Solve unit rate problems.*e.g.,pricing and constant speed.* 3. Calculate a percent of a quantity as a rate per 100;; given a percent, solve problems involving finding the whole given a part and the part given the whole. 4. Convert measurement units within and between two systems of measurements while solving problems. Given a conversion factor such as 1” = 2.54 cm, use ratios to compare sizes of similar figures with different units. | 6.RP.A.3 | Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.  a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.  b. Solve unit rate problems including those involving unit pricing and constant speed.*For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*  c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.  d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. |
| **NUMBER SENSE AND OPERATIONS** | | **The Number System** | |
| 1. **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** | | 1. **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** | |
| 6.NS.A.1 | Compute and represent quotients of positive fractions.   1. Compute quotients of fractions divided by fractions. 2. Solve word problems involving division of fractions by fractions, including reasoning strategies such as using visual fraction models, area models, and/or equations to represent the problem. | [6.NS.A.1](http://www.corestandards.org/Math/Content/K/NBT/A/1/) | Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*.  . |
| **B. Compute with non-negative multi-digit numbers and**  **find common factors and multiples.** | | 1. **Compute fluently with multi-digit numbers and find common factors and multiples.** | |
| 6.NS.B.2 | Divide multi-digit whole numbers. | 6.NS.B.2 | Fluently divide multi-digit numbers using the standard algorithm. |
| 6.NS.B.3 | Add, subtract, multiply, and divide decimals. | 6.NS.B.3 | Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. |
| 6.NS.B.4 | Find common factors and multiples.   1. Find common factors and multiples, including the greatest common factor (GCF) of two whole numbers that are each ≤ 100 and the least common multiple (LCM) of two whole numbers that are each ≤ 12. 2. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers. *e.g., 48+24 could be as 24(2+1) or 6(8+4), etc .* | 6.NS.B.4 | Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* |
| **C. Apply and extend previous understandings of numbers to**  **the system of rational numbers.** | | 1. **Apply and extend previous understandings of numbers to the system of rational numbers.** | |
| 6.NS.C.5 | Use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. | 6.NS.C.5 | Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. |
| 6.NS.C.6 | Understand a rational number as a point on the number line.   1. Locate rational numbers on a horizontal or vertical number line. 2. Write, interpret, and explain statements of order for rational numbers in mathematical and real-world contexts. 3. Understand that a number and its opposite (additive inverse) are located on opposite sides of zero on the number line. Their sum will always be zero. | 6.NS.C.6  6.NS.C.7 | Understand a rational number as a point on the number line. ~~Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates~~. (moved to Geometry and Measurement)   1. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite. 2. ~~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.~~ (moved to Geometry and Measurement) 3. 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.~~ (moved to Geometry and Measurement) 4. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right*. 5. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write -3 oC > -7 oC to express the fact that -3 oC is warmer than -7 oC*. |
| 6.NS.C.7 | Understand that the absolute value of a rational number is its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real- world situation. | 6.NS.C.7 | Understand ordering and absolute value of rational numbers.   1. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right*. (moved to 6.NS.C.6) 2. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write -3 oC > -7 oC to express the fact that -3 oC is warmer than -7 oC*. (moved to 6.NS.C.6) 3. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of -30 dollars, write |-30| = 30 to describe the size of the debt in dollars*. 4. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars*. |
| 6.NS.C.8 | Extend prior knowledge to generate equivalent representations of rational numbers between fractions, decimals, and percentages (limited to terminating decimals and/or benchmark fractions of 1/3 and 2/3). | 6.NS.C.8 | Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. |
| **Expressions, Equations, and Inequalities** | | **Expressions and Equations** | |
| 1. **Apply and extend previous understandings of arithmetic to algebraic expressions.** | | 1. **Apply and extend previous understandings of arithmetic to algebraic expressions.** | |
| 6.EEI.A.1 | Understand the difference between an expression and an equation; write and evaluate numerical expressions involving whole-number exponents. | 6.EE.A.1 | Write and evaluate numerical expressions involving whole-number exponents. |
| 6.EEI.A.2 | Read and write expressions involving whole number exponents in which letters are used to represent quantities that are either unknown, or that vary.   1. Identify parts of an expression using mathematical terminology. i.e., sum, term, product, factor, quotient, coefficient, constant. 2. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. 3. Evaluate expressions involving addition, subtraction, multiplication, and division of non-negative rational numbers, grouping symbols, and whole-number exponents using the order of operations. 4. Write expressions using variables (letters) to represent quantities in real-world and mathematical problems. 5. Understand the meaning of the variable in the context of the situation. e.g., express the calculation “Subtract y from 5” as 5 – y. | [6.EE.A.2](http://www.corestandards.org/Math/Content/K/OA/A/2/)  6.EE.B.6 | Write, read, and evaluate expressions in which letters stand for numbers.   1. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 - y*. 2. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms*. 3. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas V = s3 and A = 6 s2 to find the volume and surface area of a cube with sides of length s = 1/2*.   Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. |
| 6.EEI.A.3 | Identify and generate equivalent algebraic expressions using mathematical properties. i.e., commutative, associative, distributive. | 6.EE.A.3  6.EE.A.4 | Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y*.  Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*. |
| 1. **Reason about and solve one-variable equations and**   **inequalities.** | | 1. **Reason about and solve one-variable equations and inequalities.** | |
| 6.EEI.B.4  6.EEI.B.5 | Use substitution to determine whether a given number in a specified set makes a one-variable equation or inequality true.  Understand that if any solutions exist, the solution set for an equation or inequality consists of values that make the equation or inequality true. | 6.EE.B.5 | Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. |
| 6.EEI.B.6 | Write equations using variables (letters) to represent quantities in real-world and mathematical situations. Understand the meaning of the variable in the context of the situation. | 6.EE.B.6 | Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. |
| 6.EEI.B.7 | Solve one-step linear equations in one variable involving nonnegative rational numbers for real-world and mathematical problems. | 6.EE.B.7 | Solve real-world and mathematical problems by writing and solving equations of the form *x* + *p* = *q* and*px* = *q* for cases in which *p*, *q* and *x* are all nonnegative rational numbers. |
| 6.EEI.B.8 | Recognize that inequalities may have infinitely many solutions.   1. Write an inequality of the form x > c, x < c, x ≥ c, or x ≤ c to represent a constraint or condition in a real-world or mathematical problem, where c is a constant. 2. Graph solutions of such inequalities on a number line. | 6.EE.B.8 | Write an inequality of the form *x* > *c* or *x* < *c* to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form *x*> *c* or*x* < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. |
| 1. **Represent and analyze quantitative relationships**   **between dependent and independent variables.** | | 1. **Represent and analyze quantitative relationships between dependent and independent variables.** | |
| 6.EEI.C.9 | Identify and describe relationships between two variables that change in relationship to one another. e.g.,plant growth related to time   1. Write an equation to express one quantity, the dependent variable, in terms of the other quantity, the independent variable. 2. Analyze the relationship between the dependent and independent variables using graphs, tables, and equations and relate these representations to each other. | 6.EE.C.9 | Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time. |
| **GEOMETRY AND MEASUREMENT** | | **GEOMETRY** | |
| 1. **Solve real-world and mathematical problems involving**   **area, surface area, and volume.** | | 1. **Solve real-world and mathematical problems involving area, surface area, and volume.** | |
| 6.GM.A.1 | Find the area of polygons by composing or decomposing the shapes into rectangles or triangles and apply these techniques to solve real-world problems. | 6.G.A.1 | Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. |
| 6.GM.A.2 | Find the volume of right rectangular prisms.   1. Understand that the volume of a right rectangular prism can be found by filling the prism with multiple layers of the base. Discover that using visual models (e.g. model by packing) produces the same volume as using the formulas, whether the side lengths are whole or fractional edge lengths. 2. Apply V = l \* w \* h and V = Bh to find the volume of right rectangular prisms with whole or fractional edges for real-world and mathematical problems. | 6.G.A.2 | Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas *V = l w h* and *V = b h* to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. |
| 6.GM.A.3 | Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane.   1. 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. 2. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate (length of horizontal or vertical line segments). 3. Draw polygons in the coordinate plane given coordinates for the vertices. | 6.NS.C.6  6.NS.C.8  6.G.A.3 | ~~Understand a rational number as a point on the number line.~~ Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.   1. 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. 2. ~~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.   Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.  Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. |
| 6.GM.A.4 | Solve real-world and mathematical problems using nets.   1. Represent three-dimensional figures using nets made up of rectangles and triangles. 2. Use nets to find the surface area of three-dimensional figures whose sides are made up of rectangles and triangles to solve real-world and mathematical problems. | 6.G.A.4 | Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. |
| **Data Analysis, Statistics, and Probability** | | **Statistics and Probability** | |
| **A. Develop understanding of statistical variability.** | | 1. **Develop understanding of statistical variability.** | |
| 6.DSP.A.1 | Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. | 6.SP.A.1 | Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages*. |
| 6.DSP.A.2 | Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape of its representation. | 6.SP.A.2 | Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. |
| 6.DSP.A.3 | Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary from a single number. (See 6.DSP.B.5). | 6.SP.A.3 | Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. |
| **B. Summarize and describe distributions.** | | 1. **Summarize and describe distributions.** | |
| 6.DSP.B.4 | Display and interpret data.   1. Use dot plots, histograms, and box plots to display and interpret numerical data. 2. Create circle graphs and interpret the data in context of real-world and mathematical situations using sample sizes which yield whole number angle measurements. e.g.,sample sizes of 90, 180, 360 | 6.SP.B.4 | Display numerical data in plots on a number line, including dot plots, histograms, and box plots. |
| 6.DSP.B.5 | Summarize numerical data sets in relation to their context by the following:   1. Reporting the number of observations. 2. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. 3. 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 of the data. 4. Relating the choice of measures of center and variability to the shape of the data distribution and the context of the data. | 6.SP.B.5 | Summarize numerical data sets in relation to their context, such as by:   1. Reporting the number of observations. 2. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. 3. 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. 4. 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. |

**Grade 7**

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| **Code** | **Proposed Standards (listed in order proposed)** | **Code** | **Current MLS** |
| **Ratios and Proportional Relationships** | |  |  |
| * 1. **Analyze proportional relationships and use them to solve real-world and mathematical problems.** | | 1. **Analyze proportional relationships and use them to solve real-world and mathematical problems.** | |
| 7.RP.A.1 | Compute unit rates, including those that involve complex fractions, with like or different units. | 7.RP.A.1 | Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour*. |
| 7.RP.A.2 | Recognize and represent proportional relationships between quantities in equations, tables, graphs, diagrams, and real-world situations. The quantities y and x are proportional if 𝑦 𝑥 is a constant.   1. Determine when two quantities are in a proportional relationship. 2. Identify and/or compute the constant of proportionality (unit rate). 3. 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. 4. Realize that the graph of any proportional relationship will pass through the origin. | 7.RP.A.2 | Recognize and represent proportional relationships between quantities.   1. 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. 2. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. 3. 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*. 4. 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. |
| **Number Sense and Operations** | | **The Number System** | |
| 1. **Apply and extend previous understandings of operations to add, subtract, multiply, and divide rational numbers.** | | 1. **Apply and extend previous understandings of operations with fractions.** | |
| 7.NS.A.1 | Apply and extend previous understandings of numbers to add and subtract rational numbers.   1. Add and subtract rational numbers to include fractions, decimals, and integers. 2. Represent addition and subtraction on a horizontal or vertical number line. 3. Describe situations and show that a number and its opposite have a sum of 0 (are additive inverses). 4. Understand subtraction of rational numbers as adding the additive inverse, p – q = p + (–q). 5. Show that the distance between two rational numbers on the number line is the absolute value of their difference. 6. Interpret sums and differences of rational numbers by describing real world contexts. | 7.NS.A.1 | Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.   1. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged*. 2. Understand *p* + *q* as the number located a distance |*q*| from *p*, in the positive or negative direction depending on whether *q* is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts. 3. Understand subtraction of rational numbers as adding the additive inverse, *p* - *q* = *p*+ (-*q*). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts. 4. Apply properties of operations as strategies to add and subtract rational numbers. |
| 7.NS.A.2 | Apply and extend previous understandings of numbers to multiply and divide rational numbers.   1. Multiply and divide rational numbers to include fractions, decimals, and integers. 2. Show that a number and its reciprocal have a product of 1 (multiplicative inverse). 3. 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). 4. Convert a rational number to a decimal using long division. 5. Understand that some rational numbers can be written as integers and all rational numbers can be written as fractions or decimal numbers that terminate or repeat. 6. Interpret products and quotients of rational numbers by describing real-world contexts. | 7.NS.A.2 | Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.   1. 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 contexts. 2. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then -(*p*/*q*) = (-*p*)/*q* = *p*/(-*q*). Interpret quotients of rational numbers by describing real-world contexts. 3. Apply properties of operations as strategies to multiply and divide rational numbers. 4. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats. |
| 7.NS.A.3 | Solve real-world and mathematical problems involving the four arithmetic operations with rational numbers. | 7.NS.A.3 | Solve real-world and mathematical problems involving the four operations with rational numbers. |
| **Expressions, Equations, and Inequalities** | | **Expressions and Equations** | |
| **A. Use properties of operations to generate equivalent expressions.** | | 1. **Use properties of operations to generate equivalent** **expressions.** | |
| 7.EEI.A.1 | Apply properties of operations (i.e. commutative, associative, distributive) to simplify and to factor linear algebraic expressions with rational coefficients. | 7.EE.A.1 | Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. |
| 7.EEI.A.2 | Understand how to use equivalent expressions to clarify quantities in a problem context. e.g., Adding a 5% tax to the total is the same as multiplying the total by 1.05; a + 0.05a = 1.05a. | 7.EE.A.2 | Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."* |
| 1. **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** | | 1. **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** | |
| 7.EEI.B.3 | Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (i.e. integers, fractions, and decimals) by applying properties of operations as strategies to calculate with numbers.   1. Convert between forms as appropriate. 2. Assess the reasonableness of answers using mental computation and estimation strategies. | 7.EE.B.3 | Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation*. |
| 7.EEI.B.4 | Solve real-world and mathematical problems by using and solving linear equations and inequalities in one variable.   1. Write and solve equations of the form x+p = q and px = q in which p and q are rational numbers. 2. Write and solve two-step equations of the form px + q = r and p(x + q) = r, where p, q, and r are rational numbers and interpret the meaning of the solution in the context of the problem. 3. Write and solve 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 a problem. | 7.EE.B.4 | Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.   1. Solve word problems leading to equations of the form *px* + *q* = *r* and *p*(*x* + *q*) = *r*, where *p*, *q*, and *r* are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?* 2. Solve word problems leading to inequalities of the form *px* + *q* > *r* or *px* + *q* < *r*, where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions*. |
| **Geometry and Measurement** | | **Geometry** | |
| 1. **Draw and describe geometrical figures and describe the relationships between them.** | | 1. **Draw construct, and describe geometrical figures and describe the relationships between them.** | |
| 7.GM.A.1 | Solve problems involving scale drawings of real-world objects and geometric figures, including computing actual lengths and areas from a scale drawing and reproducing the drawing at a different scale. | 7.G.A.1 | Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. |
| 7.GM.A.2 | Use a variety of tools (freehand, ruler, protractor, and/or technology) to construct geometric shapes.   1. Construct triangles given 3 sides, given 3 angles, or given a combination of 3 sides and/or angles and decide if the measurements determine a unique triangle, more than one triangle, or no triangle. 2. Construct special quadrilaterals given specific parameters about angles or sides. i.e., kite, trapezoid (a quadrilateral that has exactly two parallel sides), rhombus, parallelogram, rectangle. | 7.G.A.2 | Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. |
| 7.GM.A.3 | Describe two-dimensional cross sections of pyramids, cones, cylinders, and prisms including cross-sections that are not necessarily parallel to the base of the figure. | 7.G.A.3 | Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. |
| 1. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** | | 1. **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** | |
| 7.GM.B.4 | Understand concepts of circles.   1. Demonstrate an understanding of the relationships among radius, diameter, and circumference of a circle. 2. Understand the relationship among the circumference, the diameter, and 𝜋. 3. Explore the relationship between circumference and area of a circle. 4. Know and apply the formulas for circumference and area of circles to solve real-world and mathematical problems | 7.G.B.4 | Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. |
| 7.GM.B.5 | Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. | 7.G.B.5 | Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. |
| 7.GM.B.6 | Solve real-world and mathematical problems involving area, volume and surface area.   1. Understand the concept of area and find area of triangles, quadrilaterals, and other polygons composed of triangles and rectangles. 2. Understand the concepts of volume and surface area and find related measures for cubes, right triangular prisms and pyramids, right rectangular prisms and pyramids, and cylinders. | 7.G.B.6 | Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. |
| **Data Analysis, Statistics, and Probability** | | **Statistics and Probability** | |
| 1. **A. Use random sampling to draw inferences about a population.** | | 1. **Use random sampling to draw inferences about a population.** | |
| 7.DSP.A.1 | Understand that statistics can be used to gain information about a population by examining a sample of the population.   1. Understand that a sample is a subset of a population and both the sample and the population have similar characteristics. 2. Understand that generalizations from a sample are valid only if the sample is representative of the population. 3. Understand that random sampling is used to produce representative samples and support valid inferences. | 7.SP.A.1 | Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. |
| 7.DSP.A.2 | Use data from multiple samples to draw inferences about a population and investigate variability in estimates of the characteristic of interest. e.g., 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 each of the estimates or predictions might be. | 7.SP.A.2 | Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*. |
| 1. **Draw informal comparative inferences about two populations.** | | 1. **Draw informal comparative inferences about two populations.** | |
| 7.DSP.B.3 | 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. e.g., 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. | 7.SP.B.3 | 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*. |
| 7.DSP.B.4 | Compare the numerical measures of center (mean and median), measures of frequency (mode) and measures of variability (range, interquartile range, and mean absolute deviation) from two random samples to draw inferences about the populations. | 7.SP.B.4 | Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*. |
| **C. Develop, use, and evaluate probability models.** | | 1. **Investigate chance processes and develop, use, and evaluate probability models.** | |
| 7.DSP.C.5 | Investigate probability of chance events.   1. Determine probabilities of simple (single) events. 2. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. 3. Understand that a probability near 0 indicates an unlikely event, a probability near 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. | 7.SP.C.5 | Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. |
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| 7.DSP.C.6 | Investigate the relationship between theoretical and experimental probabilities for simple events.   1. Predict outcomes using theoretical probability. 2. Perform experiments that model theoretical probability. 3. Compare theoretical and experimental probabilities | 7.SP.C.6 | Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times*. |
| 7.DSP.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.   1. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. e.g., 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. 2. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. e.g., 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? | 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.   1. 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*. 2. 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?* |
| 7.DSP.C.8 | Find probabilities of compound events using organized lists, tables, tree diagrams, and simulations.   1. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event. 2. Design and use a simulation to generate frequencies for compound events. | 7.SP.C.8 | Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.   1. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs. 2. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event. 3. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* |

**Grade 8**

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| **Code** | **Proposed Standards (listed in order proposed)** | **Code** | **Current MLS** |
| **Number Sense and Operations** | | **The Number System** | |
| 1. **Know that there are numbers that are not rational, and approximate them by rational numbers.** | | 1. **Know that there are numbers that are not rational, and approximate them by rational numbers**. | |
| 8.NS.A.1 | Explore the real number system.   1. Know the differences between rational and irrational numbers. 2. Understand that all rational numbers have a decimal expansion that terminates or repeats. 3. Convert decimals which repeat into fractions and fractions into repeating decimals. 4. Generate equivalent representations of rational numbers (fractions, decimals, and percentages). | 8.NS.A.1 | Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. |
| 8.NS.A.2 | Estimate the value and compare the size of irrational numbers and approximate their locations on a number line. | 8.NS.A.2 | Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). *For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations*. |
| **Expressions, Equations, and Inequalities** | | **Expressions and Equations** | |
| 1. **Work with radicals and integer exponents** | | 1. **Expressions and Equations Work with radicals and integer exponents.** | |
| 8.EEI.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | 8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 × 3-5 = 3-3 = 1/33 = 1/27. |
| 8.EEI.A.2 | Investigate concepts of square and cube roots.   1. 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. 2. Evaluate square roots of perfect squares less than or equal to 625 and cube roots of perfect cubes less than or equal to 1000. 3. Recognize that square roots of non-perfect squares are irrational. i.e., explain why numbers are or are not perfect squares using area models. | 8.EE.A.2 | Use square root and cube root symbols to represent solutions to equations of the form *x*2 = *p* and *x*3 = p, where *p* is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational. |
| 8.EEI.A.3 | Express very large and very small quantities in scientific notation and approximate how many times larger one is than the other. | 8.EE.A.3 | Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger*. |
| 8.EEI.A.4 | Use scientific notation to solve real-world and mathematical problems.   1. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 2. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. e.g., Use millimeters per year for tectonic plate movement. 3. Input and interpret scientific notation using technology. | 8.EE.A.4 | Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology |
| 1. **Understand the connections between proportional relationships, lines, and linear equations.** | | 1. **Understand the connections between proportional relationships, lines, and linear equations.** | |
| 8.EEI.B.5 | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships given multiple representations including tables, graphs, and equations. | 8.EE.B.5 | Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. |
| 8.EEI.B.6 | Apply concepts of slope and 𝑦-intercept to graphs, equations, and proportional relationships.   1. Explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. 2. Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. | 8.EE.B.6 | Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation *y* = *mx* + *b* for a line intercepting the vertical axis at *b*. |
| 1. **Analyze and solve linear equations and inequalities and pairs of simultaneous linear equations.** | | 1. **Analyze and solve linear equations and pairs of simultaneous linear equations.** | |
| 8.EEI.C.7 | Solve linear equations and inequalities in one variable.   1. Give examples of linear equations with one solution, infinitely many solutions, or no solutions. 2. Solve linear equations and inequalities with rational number coefficients, including equations and inequalities whose solutions require expanding expressions using the distributive property and combining like terms. | 8.EE.C.7 | Solve linear equations in one variable.   1. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x* = *a*, *a* = *a*, or *a* = *b* results (where *a* and *b* are different numbers). 2. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. |
| 8.EEI.C.8 | Analyze and solve systems of linear equations.   1. Graph systems of linear equations and recognize the approximation of their intersection as the solution to the system 2. Explain why solution(s) to a system of two linear equations in two variables correspond to point(s) of intersection of their graphs. 3. Explain why systems of linear equations can have one solution, no solution, or infinitely many solutions. 4. Solve systems of two linear equations in two variables algebraically, including methods of substitution and elimination, or through inspection. 5. Solve real-world and mathematical problems leading to two linear equations in two variables. | 8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations.   1. 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. 2. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6*. 3. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair*. |
| **Functions** | | **Functions** | |
| 1. **Define, evaluate, and compare functions.** | | 1. **Define, evaluate, and compare functions.** | |
| 8.F.A.1 | Explore the concept of functions. (The use of function notation is not required.)   1. Understand that a function assigns to each input exactly one output. 2. Determine if a relation is a function using multiple representations including mappings, tables, and graphs. 3. Graph a function from a table of values | 8.F.A.1 | Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. |
| 8.F.A.2 | Compare characteristics of two functions each represented in a different way. e.g., algebraically, graphically, numerically in tables, or by verbal descriptions. | 8.F.A.2 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).*For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change*. |
| 8.F.A.3 | Investigate the differences between linear and nonlinear functions.   1. Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line. 2. Recognize that the graph of a linear function has a constant rate of change. 3. Give examples of nonlinear functions. | 8.F.A.3 | Interpret the equation *y = mx + b* as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line*. |
| 1. **Use functions to model relationships between quantities.** | | 1. **Use functions to model relationships between quantities.** | |
| 8.F.B.4 | Use functions to model linear relationships between quantities.   1. Understand that the slope is the constant rate of change and the initial value is the y-intercept. Describe their meanings in the context of a given situation. 2. Determine the slope and the y-intercept of a linear function given a description of the relationship or from two points, tables, or graphs. 3. Determine the x-intercept, if it exists. Describe its meaning in the context of a given situation. | 8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x, y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. |
| 8.F.B.5 | Describe the functional relationship between two quantities from a graph (e.g., constant, increasing/decreasing, linear/nonlinear, continuous/discontinuous) and be able to sketch a graph given a verbal description. | 8.F.B.5 | Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally. |
| **Geometry and Measurement** | | **Geometry** | |
| 1. **Understand congruence and similarity using physical models, transparencies, or geometry software.** | | 1. **Understand congruence and similarity using physical models, transparencies, or geometry software.** | |
| 8.GM.A.1 | Verify experimentally the congruence properties of rigid transformations (rotations, reflections, and translations).   1. Verify that lines are mapped to lines, including parallel lines. 2. Verify that corresponding angles are congruent. 3. Verify that corresponding line segments are congruent | 8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations:   1. Lines are taken to lines, and line segments to line segments of the same length. 2. Angles are taken to angles of the same measure. 3. Parallel lines are taken to parallel lines. |
| 8.GM.A.2 | Understand that two-dimensional figures are congruent if a series of rigid transformations (rotations, reflections, translations) can be performed to map the pre-image to the image. Given two congruent figures, describe the sequence of transformations that justifies the congruence between them. | 8.G.A.2 | Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. |
| 8.GM.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | 8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. |
| 8.GM.A.4 | Understand that two-dimensional figures can be similar if a series of transformations (rotations, reflections, translations and dilations) can be performed to map the pre-image to the image. Given two similar figures, describe a sequence of transformations that justifies the similarity between them. | 8.G.A.4 | Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. |
| 8.GM.A.5 | Explore angle relationships and establish informal arguments for the following:   1. The sum of the angles in a triangle. 2. The relationship between the interior and exterior angles of a triangle. 3. The angles created when parallel lines are cut by a transversal. 4. Congruent corresponding angles in similar figures. | 8.G.A.5 | Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so*. |
| 1. **Understand and apply the Pythagorean Theorem.** | | 1. **Understand and apply the Pythagorean Theorem.** | |
| 8.GM.B.6 | Use models to demonstrate a proof of the Pythagorean Theorem and its converse. | 8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. |
| 8.GM.B.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensional contexts. | 8.G.B.7 | Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. |
| 8.GM.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | 8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. |
| 1. **Solve real-world and mathematical problems involving volume of cones, pyramids, and spheres.** | | 1. **Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.** | |
| 8.GM.C.9 | Solve real-world and mathematical problems involving surface area and volume.   1. Understand the concept of surface area and find surface area of pyramids (triangular and rectangular). 2. Understand the concepts of volume and find the relationships among pyramids (triangular and rectangular), cones, and spheres. | 8.G.C.9 | Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. |
| **Data Analysis, Statistics, and Probability** | | **Statistics and Probability** | |
| 1. **Investigate patterns of association in bivariate data.** | | 1. **Investigate patterns of association in bivariate data.** | |
| 8.DSP.A.1 | Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative correlation, linear association, and nonlinear association. | 8.SP.A.1 | Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. |
| 8.DSP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally find a line of best fit, and informally assess the fit of the line by evaluating the closeness of the data points to the line. | 8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. |
| 8.DSP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. e.g., In a linear model for a biology experiment, interpret a slope of 1.5 mm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 mm in mature plant height | 8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height*. |

**Algebra I**

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| **Code** | **Proposed Standards (listed in order proposed)** | **Code** | **Current MLS** |
| **Algebra -Number and Quantity** | | **Number and Quantity** | |
| 1. **Extend and use properties of rational exponents.** | | 1. **Extend the properties of exponents to rational exponents.** | |
| A1.NQ.A.1 | Explain how the meaning of rational exponents extends from the properties of integer exponents to rational exponents e.g., (51/3)3 = 5 | HSN-RN.A.1 | Explain how the definition of the meaning 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. *For example, we define 51/3 to be the cube root of 5 because we want (51/3)3= 5(1/3)3 to hold, so (51/3)3 must equal 5*. |
| A1.NQ.A.2 | Rewrite expressions involving simple radicals and rational exponents using the properties of exponents. Limit to rational exponents with a numerator of 1. e.g., = | HSN-RN.A.2 | Rewrite expressions involving radicals and rational exponents using the properties of exponents. |
|  |  | **Use properties of rational and irrational numbers.** | |
|  |  | HSN-RN.B.3 | 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. |
| 1. **Use units to solve problems.** | | 1. **Reason quantitatively and use units to solve problems.** | |
| A1.NQ.B.3 | Use units of measure as a way to understand and solve problems involving quantities such as rates, time, length, area, and capacity.   1. Identify, label, and use appropriate units of measure within a context. 2. Convert units and rates within a system without conversion factors provided and between systems with the conversion factor provided. 3. Use units within multi-step problems. e.g., An L-shaped concrete slab is composed of a rectangular piece 30 feet 6 inches by 20 feet 4 inches and a second piece 10 feet 8 inches by 8 feet 3 inches. If the slab is 4 inches thick, how many cubic yards (to the nearest greater ¼ cubic yard) need to be ordered? 4. Choose and interpret the scale and the origin in graphs and data displays. | HSN-Q.A.1 | 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. |
| A1.NQ.B.4 | Define and use appropriate quantities for representing a given context or problem. | HSN-Q.A.2 | Define appropriate quantities for the purpose of descriptive modeling. |
| A1.NQ.B.5 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. e.g., Problems involving money are normally computed to the nearest cent. | HSN-Q.A.3 | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. |
| **Algebra – Seeing Structure in Expressions** | | **Seeing Structure in Expressions** | |
| 1. **Interpret and use structure.** | | 1. **Interpret the structure of expressions.** | |
| A1.SSE.A.1 | Interpret the contextual meaning of individual terms or factors from a given situation that utilizes formulas or expressions. | HSA-SSE.A.1  HSA-SSE.B.3  HSF-IF.C.8b | Interpret expressions that represent a quantity in terms of its context.   1. Interpret parts of an expression, such as terms, factors, and coefficients. 2. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)n as the product of P and a factor not depending on P*.   Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.   1. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1.01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%*. 2. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)ᵗ, y = (0.97)ᵗ, y = (1.01)12ᵗ, y = (1.2)ᵗ/10, and classify them as representing exponential growth or decay. |
| A1.SSE.A.2 | Analyze the structure of polynomial expressions in order to rewrite the expressions in equivalent forms. | HSA-SSE.A.2 | Use the structure of an expression to identify ways to re. write it. *For example, see x4 - y4 as (x2)2 - (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 - y2)(x2 + y2)*. |
| A1.SSE.A.3 | Choose and produce equivalent forms of a quadratic expression to reveal and explain properties of the quantity represented by the expression.   1. Find the zeros of a quadratic function by rewriting it in factored form. 2. Find the maximum or minimum value of a quadratic function by completing the square. | HSA-SSE.B.3  HSF-IF.C.8a | Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.   1. Factor a quadratic expression to reveal the zeros of the function it defines. 2. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.   Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. |
| **Algebra – Creating Equations** | | **Algebra – Creating Equations** | |
| 1. **Create equations that describe linear, quadratic, and exponential relationships.** | | 1. **Create equations that describe numbers or relationships.** | |
| A1.CED.B.4 | Create equations and inequalities in one variable and use them to model and/or solve problems, including, linear, quadratic, and exponential (integer inputs only) relationships. | HSA-CED.A.1 | Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and exponential functions*. |
| A1.CED.B.5 | Create linear and simple quadratic (y =ax 2, y = ax2 +b) and exponential (y = abx) equations in two variables. Graph the equations on coordinate axes with labels and scales. | HSA-CED.A.2 | Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. |
| A1.CED.B.6 | Represent constraints by equations or inequalities, and by systems of equations or inequalities. Interpret data points as a solution or non-solution in a modeling context. | HSA-CED.A.3 | Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods*. |
| A1.CED.B.7 | Solve literal equations and formulas for a specified variable that highlights a quantity of interest. | HSA-CED.A.4 | 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*. |
| **Algebra – Reasoning with Equations and Inequalities** | | **Reasoning with Equations and Inequalities** | |
| 1. **Understand solving equations as a process and solve equations and inequalities in one variable.** | | 1. **Understand solving equations as a process of reasoning and explain the reasoning.** 2. **Solve equations and inequalities in one variable**. | |
| A1.REI.C.8 | Explain how each step taken when solving a simple equation or inequality in one variable creates a new equation or inequality that has the same solution as the original. | HSA-REI.A.1  HSA-REI.B.3 | Explain each step in solving a simple 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.  Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. |
| A1.REI.C.9 | Solve mathematical and real-world problems involving quadratic equations in one variable.   1. Use the method of completing the square to transform a quadratic equation in 𝑥 into an equation of the form (𝑥 − 𝑝)2 = 𝑞 that has the same solution. 2. Derive the quadratic formula from 𝑎𝑥2 + 𝑏𝑥 + 𝑐 = 0, (a,b,c any real number) 3. Solve quadratic equations by inspection, using the square root property, completing the square, using the quadratic formula, and factoring as appropriate to the initial form of the equation. If students encounter complex solutions, they should state “no real solution.” | HSA-REI.B.4 | Solve quadratic equations in one variable.   1. Use the method of completing the square to transform any quadratic equation in *x* into an equation of the form (*x* - *p*)2 = *q* that has the same solutions. Derive the quadratic formula from this form. 2. 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*. |
| 1. **Solve systems of equations.** | | 1. **Solve systems of equations.** | |
| A1.REI.D.10 | Solve a system of linear equations algebraically and graphically. | HSA-REI.C.6 | Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. |
| A1.REI.D.11 | Solve a simple system consisting of a linear equation and a quadratic function algebraically and graphically. | HSA-REI.C.7 | Solve a simple 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* = -3*x* and the circle *x*2+ *y*2 = 3. |
| A1.REI.D.12 | Justify that given a system of two equations in two variables, the solution is not changed when one of the equations is replaced by a linear combination of itself. | HSA-REI.C.5 | 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. |
| 1. **Represent and solve linear and exponential equations and inequalities graphically.** | | 1. **Represent and solve equations and inequalities graphically** | |
| A1.REI.E.13 | Explain that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. | HSA-REI.D.10 | 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). |
| A1.REI.E.14 | Graphically show that the solution to the equation 𝑓(𝑥) = 𝑔(𝑥) is the x-coordinate(s) of the point(s) of intersection of 𝑦 = 𝑓(𝑥) and 𝑦 = 𝑔(𝑥). | HSA-REI.D.11 | 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 cases where *f*(*x*) and/or *g*(*x*) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.\* |
| A1.REI.E.15 | Graph the solution to a linear inequality in two variables. | HSA-REI.D.12 | 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. |
| A1.REI.E.16 | Solve a system of linear inequalities by graphing. |
| **Algebra- Arithmetic with Polynomials and Rational Expressions** | | **Arithmetic with Polynomials and Rational Expressions** | |
| 1. **Perform operations on polynomials.** | | 1. **Perform arithmetic operations on polynomials.** | |
| A1.APR.F.17 | Add, subtract and multiply polynomials, and understand that polynomials follow the same general rules as arithmetic and are closed under these operations. | HSA-APR.A.1 | 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. |
| A1.APR.F.18 | Divide polynomials by monomials. |  |  |
| **Functions – Interpreting Functions** | | **Interpreting Functions** | |
| **A. Understand the concept of a function and use function notation.** | | 1. **Understand the concept of a function and use function notation.** | |
| A1.IF.A.1 | Extend previous knowledge of a function to apply to general behavior and features of a function. Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range.   1. Represent a function using function notation and explain that 𝑓(𝑥) denotes the elements of the range of a function 𝑓 that correspond to the elements of the domain. 2. Understand that the graph of a function labeled 𝑓 is the set of all ordered pairs (𝑥, 𝑦) that satisfy the equation 𝑦 = 𝑓(𝑥). | HSF-IF.A.1 | 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*). |
| A1.IF.A.2 | Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context | HSF-IF.A.2 | Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. |
| 1. **Interpret linear, quadratic, and exponential functions in terms of the context.** | | 1. **Interpret functions that arise in applications in terms of the context.** | |
| A1.IF.B.3 | Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function that models the relationship between two quantities. Sketch a graph showing key features including: intercepts; intervals where the function is increasing, decreasing, positive or negative; relative maximum or minimum; symmetries; and end behavior. | HSF-IF.B.4 | 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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*. |
| A1.IF.B.4 | Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes. | HSF-IF.B.5 | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* |
| A1.IF.B.5 | Given a function in graphical, symbolic, or tabular form, determine the average rate of change of the function over a specified interval. Interpret the meaning of the average rate of change in a given context. | HSF-IF.B.6 | Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
| A1.IF.B.6 | Interpret the parameters of a linear or exponential function in terms of the context. | HSF-LE.B.5 | Interpret the parameters in a linear or exponential function in terms of a context. |
| 1. **Analyze linear, quadratic, and exponential functions using different representations.** | | 1. **Analyze functions using different representations.** | |
| A1.IF.C.7 | Graph functions, including simple piecewise-defined functions (linear, simple quadratic and simple exponential), from their symbolic representation and show key features of the graph both by hand and by using technology. | HSF-IF.C.7 | Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.   1. Graph linear and quadratic functions and show intercepts, maxima, and minima. 2. Graph piecewise-defined functions, including step functions and absolute value functions. 3. Graph exponential, showing intercepts and end behavior.. |
| A1.IF.C.8 | Translate between different but equivalent forms of a function to reveal and explain different properties of the function and interpret these in terms of a context, i.e., slope, intercepts, extreme values. | HSF-IF.C.8 | Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.   1. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. 2. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)ᵗ, y = (0.97)ᵗ, y = (1.01)12ᵗ, y = (1.2)ᵗ/10, and classify them as representing exponential growth or decay. |
| A1.IF.C.9 | Compare the properties of two functions given different representations. e.g., tables, graphs, equations or verbal descriptions. | HSF-IF.C.9 | Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*. |
| **Functions – Building Functions** | | **Building Functions** | |
| 1. **Build new functions from existing functions (limited to linear, quadratic, and exponential).** | | 1. **Build new functions from existing functions.** | |
| A1.BF.D.10 | Describe the effect of the transformations on the graph of (𝑥) by 𝑘(𝑥), 𝑓(𝑥) + 𝑘, 𝑓(𝑥 + 𝑘) for specific values of k (any real number). Find the specific value of k given the graphs of 𝑓(𝑥) and the graph after a transformation has been performed. | HSF-BF.B.3 | Identify the effect on the graph of replacing *f*(*x*) by *f*(*x*) + *k*,*k* *f*(*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 – Linear, Quadratic, and Exponential Models** | | **Linear, Quadratic, and Exponential Models** | |
| 1. **Construct and compare linear, quadratic, and exponential models and solve problems.** | | 1. **Construct and compare linear, quadratic, and exponential models and solve problems.** | |
| A1.LQE.E.11 | Distinguish between situations that can be modeled with linear or with exponential functions.   1. Show that linear functions change by equal differences over equal intervals. Show that exponential functions change by equal factors over equal intervals. e.g., by algebraic proof, with a table showing differences, or by calculating average rates of change over equal intervals 2. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. 3. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. | HSF-LE.A.1 | Distinguish between situations that can be modeled with linear functions and with exponential functions.   1. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. 2. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. 3. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. |
| A1.LQE.E.12 | Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. | HSF-LE.A.3 | Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. |
| A1.LQE.E.13 | Construct linear and exponential equations given graphs, verbal descriptions or tables. | HSF-LE.A.2 | Construct linear and exponential functions, ~~including arithmetic and geometric sequences~~, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). |
| 1. **Use arithmetic and geometric sequences**. | |  |  |
| A1.LQE.F.14 | Write arithmetic and geometric sequences in recursive and explicit forms, use them to model situations, and translate between the two forms. Connect arithmetic sequences to linear functions and geometric sequences to exponential functions. e.g., Explicit form: f(n)=3n+2; Recursive Form: f(n+1)= f(n) + 1 | HSF-BF.A.2  HSF-LE.A.2 | Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.  Construct linear and exponential functions, including arithmetic and geometric sequences, ~~given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).~~ |
| A1.LQE.F.15 | Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the set of integers. | HSF-IF.A.3 | Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1*. |
| A1.LQE.F.16 | Construct arithmetic and geometric sequences, given graphs, verbal descriptions, or tables. | HSF-LE.A.2 | Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). |
| A1.LQE.F.17 | Find the terms of general sequences given an explicit or recursive formula. | HSF-BF.A.1 | Write a function that describes a relationship between two quantities.   1. Determine an explicit expression, a recursive process, or steps for calculation from a context.   Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model*. |
| **Data and Statistical Analysis** | | **Statistics and Probability** | |
| 1. **Summarize, represent, and interpret data.** | | 1. **Summarize, represent, and interpret data on a single count or measurement variable** | |
| A1.DS.A.1 | Analyze and interpret data with plots on the real number line (dot plots, histograms, and box plots). | HSS-ID.A.1 | Represent data with plots on the real number line (dot plots, histograms, and box plots). |
| A1.DS.A.2 | 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. \*The standard deviation should be limited to a small data set with an integral mean. e.g., a sample of 10 quiz scores. | HSS-ID.A.2 | 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. |
| A1.DS.A.3 | Interpret differences in shape, center, and spreads in the context of the data sets, accounting for possible effects of extreme data points (outliers). | HSS-ID.A.3 | Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). |
| A1.DS.A.4 | 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. | HSS-ID.B.5 | 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. |
| A1.DS.A.5 | Given a table of data (or data in context) for two quantitative variables, represent the relationship on a scatter plot and describe how the variables are related. Identify a function that best describes the relationship and use this function to solve problems.   1. Using estimation and/or technology, fit a linear function. 2. Using technology, fit an exponential or quadratic function to bivariate data represented on a scatter plot that minimizes residuals | HSS-ID.B.6 | Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.   1. 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. Emphasize linear, quadratic, and exponential models. 2. Informally assess the fit of a function by plotting and analyzing residuals. 3. Fit a linear function for a scatter plot that suggests a linear association. |
| A1.DS.A.6 | Interpret the slope (rate of change) and the y-intercept (constant term) of a linear model in the context of the data. | HSS-ID.C.7 | Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. |
| A1.DS.A.7 | Using available technology, determine the correlation between two numerical unknowns, interpret the correlation, and describe the strengths and weaknesses of the correlation coefficient as a measure of linear association. | HSS-ID.C.8 | Compute (using technology) and interpret the correlation coefficient of a linear fit. |
| A1.DS.A.8 | Distinguish between correlation and causation. | HSS-ID.C.9 | Distinguish between correlation and causation. |

**Geometry**

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| **Code** | **Proposed Standards (listed in order proposed)** | **Code** | **Current MLS** |
| **Congruence** | |  |  |
| 1. **Experiment with transformations in the plane** | |  |  |
| G.CO.A.1 | Know precise definitions of angle, circle, perpendicular line, parallel line, line segment, and ray based on the undefined notions of point, line, distance along a line, and distance around a circular arc. | HSG-CO.A.1 | 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. |
| G.CO.A.2 | Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations 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. e.g. translation versus horizontal stretch | HSG-CO.A.2 | Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations 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 (e.g., translation versus horizontal stretch). |
| G.CO.A.3 | Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. | HSG-CO.A.3 | Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. |
| G.CO.A.4 | Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. | HSG-CO.A.4 | Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. |
| G.CO.A.5 | Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. | HSG-CO.A.5 | Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another. |
| 1. **Understand congruence in terms of rigid motions.** | | 1. **Understand congruence in terms of rigid motions** | |
| G.CO.B.6 | Use the descriptions of rigid motions (translations, rotations, reflections) to transform figures and 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 (preserving size and shape) to decide if they are congruent (i.e., Is there a combination of rigid motions that transforms the first figure onto the second?) | HSG-CO.B.6 | Use geometric descriptions 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. |
| G.CO.B.7 | 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. | HSG-CO.B.7 | 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. |
| G.CO.B.8 | Explain how the criteria for triangle congruence (ASA, AAS, SAS, and SSS) follow from the definition of congruence in terms of rigid motions and that they represent minimum requirements for congruence of any two triangles. | HSG-CO.B.8 | Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. |
| 1. **Prove geometric theorems.** | | 1. **Prove geometric theorems.** | |
| G.CO.C.9 | Prove theorems about lines and angles. (Theorems should include the following: 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.) | HSG-CO.C.9 | 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*. |
| G.CO.C.10 | Prove theorems about triangles. (Theorems should include the following: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles 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.) | HSG-CO.C.10 | Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles 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.CO.C.11 | Prove theorems about parallelograms. (Theorems should include the following: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.) | HSG-CO.C.11 | Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals*. |
| 1. **Make geometric constructions.** | | 1. **Make geometric constructions.** | |
| G.CO.D.12 | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).   1. Construct basic geometric components. e.g. Copying a segment; copying an angle; bisecting a segment; bisecting an angle; 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. 2. Construct specific geometric shapes. e.g.regular hexagons inscribed in circles, equilateral triangles, squares | HSG-CO.D.12  HSG-CO.D.13 | Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; 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*.  Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. |
| **Similarity, Right Triangles, and Trigonometry** | | **Similarity, Right Triangles, and Trigonometry** | |
| 1. **Understand similarity in terms of similarity transformations.** | | 1. **Understand similarity in terms of similarity transformations** | |
| G.SRT.A.1 | Verify experimentally the properties of dilations given by a center and a scale factor:   1. 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. 2. The dilation of a line segment is longer or shorter in the same ratio as given by the scale factor | HSG-SRT.A.1 | Verify experimentally the properties of dilations given by a center and a scale factor:   1. 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. 2. The dilation of a line segment is longer or shorter in the ratio given by the scale factor. |
| G.SRT.A.2 | 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. | HSG-SRT.A.2 | 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. |
| G.SRT.A.3 | Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. | HSG-SRT.A.3 | Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. |
| 1. **Prove theorems involving similarity.** | | 1. **Prove theorems involving similarity** | |
| G.SRT.B.4 | Prove theorems about triangles. (Theorems should include: a line parallel to one side of a triangle divides the other two sides proportionally, and conversely, the Pythagorean Theorem proved using triangle similarity.) | HSG-SRT.B.4 | Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.* |
| G.SRT.B.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. | HSG-SRT.B.5 | Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. |
| 1. **Define trigonometric ratios and solve problems involving right triangles.** | | 1. **Define trigonometric ratios and solve problems involving right triangles** | |
| G.SRT.C.6 | Understand, using similarity, that side ratios in right triangles define the trigonometric ratios (sine, cosine, tangent, secant, cosecant, cotangent) for acute angles. | HSG-SRT.C.6 | 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. |
| G.SRT.C.7 | Explain and use the relationship between the sine and cosine of complementary angles. | HSG-SRT.C.7 | Explain and use the relationship between the sine and cosine of complementary angles. |
| G.SRT.C.8 | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. | HSG-SRT.C.8 | Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. |
| **Circles** | | **Circles** | |
| 1. **Understand and apply theorems about circles** | | 1. **Understand and apply theorems about circles** | |
| G.C.A.1 | Prove that all circles are similar using similarity transformations (dilations). | HSG-C.A.1 | Prove that all circles are similar. |
| G.C.A.2 | 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.) | HSG-C.A.2 | 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.* |
| G.C.A.3 | Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. | HSG-C.A.3 | Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. |
| 1. **Find arc lengths and areas of sectors of circles.** | | 1. **Find arc lengths and areas of sectors of circles** | |
| G.C.B.4  G.C.B.5 | 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 that constant of proportionality.  Derive the formula for the area of a sector of a circle using ratios of arc lengths. | HSG-C.A.4 | 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. |
| **Expressing Geometric Properties with Equations** | | **Expressing Geometric Properties with Equations** | |
| 1. **Translate between the geometric description and the equation for a conic section.** | | 1. **Translate between the geometric description and the equation for a conic section.** | |
| G.GPE.A.1 | 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. | HSG-GPE.A.1 | 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. |
| G.GPE.A.2 | Derive the equation of a parabola given a focus and directrix, using the fact that the distances to the focus and to the directrix are equal from any point on the parabola. | HSG-GPE.A.2 | Derive the equation of a parabola given a focus and directrix. |
| 1. **Use coordinates to prove simple geometric theorems algebraically.** | | 1. **Use coordinates to prove simple geometric theorems** | |
| G.GPE.B.3 | Use coordinates to prove simple geometric theorems algebraically. (e.g. prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3 ) lies on the circle centered at the origin and containing the point (0, 2).) | HSG-GPE.B.4 | Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).* |
| G.GPE.B.4 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems. e.g. Find the equation of a line parallel or perpendicular to a given line that passes through a given point. | HSG-GPE.B.5 | Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). |
| G.GPE.B.5 | Find the point on a directed line segment between two given points that partitions the segment in a given ratio. | HSG-GPE.B.6 | Find the point on a directed line segment between two given points that partitions the segment in a given ratio. |
| G.GPE.B.6 | Use coordinates to compute perimeters of polygons and areas of triangles and rectangles. e.g. using the distance formula. | HSG-GPE.B.7 | Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. |
| **Geometric Measurement and Dimension** | | **Geometric Measurement and Dimension** | |
| 1. **Explain volume formulas and use them to solve problems.** | | 1. **Explain volume formulas and use them to solve problems.** | |
| G.GMD.A.1 | Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri’s principle, or informal limit arguments. | HSG-GMD.A.1 | Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments*. |
| G.GMD.A.2 | Use volume formulas for cylinders, pyramids, cones, spheres, and composite figures to solve mathematical modeling problems. | HSG-GMD.A.2 | Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems |
| 1. **Visualize relationships between two-dimensional and three dimensional objects.** | | 1. **Visualize relationships between two-dimensional and three dimensional objects** | |
| G.GMD.B.3 | Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by transformations of two-dimensional objects. | HSG-GMD.B.3 | Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. |
| **Modeling with Geometry** | | **Modeling with Geometry** | |
| 1. **Apply geometric concepts in modeling situations** | | 1. **Apply geometric concepts in modeling situations** | |
| G.MG.A.1 | Use geometric shapes, their measures, and their properties to describe objects. e.g. modeling a tree trunk or a human torso as a cylinder. | HSG-MG.A.1 | Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder) |
| G.MG.A.2 | Apply concepts of density based on area and volume in modeling situations. e.g., persons per square mile, BTUs per cubic foot | HSG.MG.A.2 | Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot) |
| G.MG.A.3 | Apply geometric methods to solve design mathematical modeling problems. e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios. | HSG-MG.A.3 | Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios). |
| **Conditional Probability and the Rules of Probability** | | **Conditional Probability and the Rules of Probability** | |
| 1. **Understand independence and conditional probability and use them to interpret data.** | | 1. **Understand independence and conditional probability and use them to interpret data.** | |
| G.CP.A.1 | Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”). | HSG-CP.A.1 | Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). |
| G.CP.A.2 | 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. | HSG-CP.A.2 | 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. |
| G.CP.A.3 | Understand the conditional probability of A given B as P(A 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. | HSG-CP.A.3 | Understand the conditional probability of *A* given *B* as *P*(*A* 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*. |
| G.CP.A.4 | Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Using the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. e.g. Collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results. | HSG-CP.A.4 | 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. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.* |
| G.CP.A.5 | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. e.g. Compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer. | HSG-CP.A.5 | Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* |
| 1. **Use the rules of probability to compute probabilities of compound events in a uniform probability model.** | | 1. **Use the rules of probability to compute probabilities of compound events.** | |
| G.CP.B.6 | 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. | HSG-CP.B.6 | 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. |
| G.CP.B.7 | Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model. | HSG-CP.B.7 | Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model. |

**Algebra II**

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| **Code** | **Proposed Standards (listed in order proposed)** | **Code** | **Current MLS** |
| **Number and Quantity** | | **Number and Quantity** | |
| 1. **Extend and use the relationship between rational exponents and radicals** | |  |  |
| A2.NQ.A.1 | Extend the system of powers and roots to include rational exponents, particularly rational exponents with integer numerators other than 1. | HSN-RN.A.1 | Explain how the definition of the meaning 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. (Algebra I Standard) |
| A2.NQ.A.2 | Simplify and recognize equivalent expressions involving radical and exponential forms of expressions containing exponents, including rational exponents. | HSN-RN.A.2  HSA-APR.D.6 | Rewrite expressions involving radicals and rational exponents using the properties of exponents.  (Algebra I Standard)  Rewrite simple 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. |
| A2.NQ.A.3 | Add, subtract, multiply and divide radical expressions. When necessary, rationalize denominators using conjugates. | HSA-APR.A.1  HSN-CN.A.3 | 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.  Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.(Plus Standard) |
| A2.NQ.A.4 | Solve equations involving rational exponents and/or radicals and manage appropriately the situations where extraneous solutions may result. | HSA-REI.A.2 | Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |
| 1. **Use complex numbers** | |  |  |
| A2.NQ.B.5 | Represent complex numbers in the form a + bi, where a and b are real numbers, and i is defined to be the square root of -1. | HSN-CN.A.1 | Know there is a complex number *i* such that *i*2 = -1, and every complex number has the form *a + bi* with *a* and *b* real. |
| A2.NQ.B.6 | Add, subtract, multiply, and divide complex numbers. Leave all answers in the form a + bi. | HSN-CN.A.2 | Use the relation *i*2 = -1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. |
| **Algebra – Arithmetic with Polynomials and Rationals** | |  | |
| 1. **Perform operations on polynomials and rational expressions.** | |  | |
| A2.APR.A.1 | Extend the knowledge of factoring to completely factor general polynomial expressions. | HSA-APR.B.2 | 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. |
| A2.APR.A.2 | Use factoring techniques to solve general polynomial equations, which could include complex solutions. | HSN-CN.C.7 | Solve quadratic equations with real coefficients that have complex solutions. |
| A2.APR.A.3 | Extend operations on polynomial expressions to include long division of a polynomial of degree 2 or higher by a binomial. Express the result as a quotient with a remainder. |  | Implied in HSA-APR.B.2 |
| A2.APR.A.4 | Understand the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division of p(x) by (x-a) is p(a), so p(a) = 0 if and only if (x-a) is a factor of p(x). | HSA-APR.B.2 | Know and apply the Remainder 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.APR.A.5 | Find the least common multiple of two or more polynomials. | HSA-APR.A.1 | 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.  (Implied as part of HSA-APR.A.1) |
| A2.APR.A.6 | Add, subtract, multiply and divide rational expressions. | HSA-APR.D.7 | Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.(Plus standard) |
| A2.APR.A.7 | Identify zeros of polynomials when suitable factorizations are available, and use the zeros to sketch the function defined by the polynomial. | HSA-APR.B.3 | 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. |
| **Algebra – Reasoning with Equations and Inequalities** | |  |  |
| 1. **Solve equations and inequalities.** | |  |  |
| A2.REI.B.8 | Solve exponential equations that do not require the use of logarithms. | HSA-CED.A.1 | Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*. |
| A2.REI.B.9 | Solve single variable, linear absolute value equations and inequalities. | HSA-REI.B.3 | Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. |
| A2.REI.B.10 | Solve rational equations, where numerators and denominators are polynomials and where extraneous solutions may result. | HSA-REI.A.2 | Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. |
| 1. **Solve general systems of equations and inequalities.** | |  |  |
| A2.REI.C.11 | Extend solving systems of equations to finding solutions of systems with two unknowns that include non-linear equations or inequalities. Students should use graphical methods in most cases but could use algebraic methods in simple cases. | HSA-REI.C.6  HSA-REI.D.11 | Solve a simple 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* = -3*x* and the circle *x*2+ *y*2 = 3.  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 cases where *f*(*x*) and/or *g*(*x*) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. |
| **Algebra – Seeing Structure in Expressions** | |  |  |
| 1. **Define and use logarithms.** | |  |  |
| A2SSE.D.12 | Define a logarithm of a given base b of a quantity to be the exponent to which you raise the base to get that quantity, i.e., logb(x) = y if and only if by = x. | HSF-LE.A.4 | For exponential models, express as a logarithm the solution to *abct* = *d* where *a*, *c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology. |
| A2SSE.D.13 | Use the inverse relationship between exponents and logarithms to solve simple exponential and logarithmic equations. | HSF-BF.B.5 | (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. (Plus Standard) |
| A2SSE.D.14 | Use properties of logarithms to do the following: a. Convert an exponent into a multiplier (factor). b. Convert between a logarithm of factors and the sum of the logarithms of the individual factors. c. Convert between a logarithm of a quotient and the difference of the logarithms of the dividend and divisor. |
| A2SSE.D.15 | Use logarithmic scales to compare quantities and solve problems involving logarithms. e.g., pH scale, earthquake intensity, and sound intensity |
| **Functions – Interpreting Functions** | |  |  |
| 1. **Create new functions from existing functions.** | |  |  |
| A2.IF.A.1 | Identify domain and range of functions, and identify unique characteristics of functions represented graphically, with tables, and with algebraic symbolism and translate between these representations. Function types include general polynomials, square roots, cube roots, absolute value of linear functions, simple piecewise defined functions, step functions, exponential and logarithmic functions. These unique characteristics include the following:   1. x- and y-intercepts, if any 2. end behavior 3. limited domains / ranges 4. local maxima or minima values 5. symmetries 6. points of discontinuity 7. vertical asymptotes | HSF-IF.B.5  HSF-IF.B.4  HSF-IF.C.7  HSF-IF.C.9 | Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*\*  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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.  Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.\*   1. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. 2. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.   Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*. |
| **Functions – Building Functions** | |  |  |
| 1. **Create new functions from existing functions.** | |  |  |
| A2.BF.B.2 | Create functions by performing operations on functions, including addition, subtraction, multiplication, division, and composition of functions. Modify the domain and range if necessary, e.g., to restrict a domain in order to avoid a zero denominator in a quotient of functions. | HSF-BF.A.1b  HSF-BF.A.1c | Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model*.  Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time*. (Plus Standard) |
| A2.BF.B.3 | Derive inverses of simple functions, and compose the inverse with the original function to show that the functions are inverses. | HSF-BF.B.4 | Find Inverse Functions.   1. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, f(x) =2 x3 or f(x) = (x+1)/(x-1) for x ≠ 1*. 2. (+) Verify by composition that one function is the inverse of another. |
| A2.BF.B.4 | Describe the effects of transformations algebraically and graphically, creating vertical and horizontal translations, vertical and horizontal reflections, and dilations (expansions/compressions) for linear, quadratic, cubic, square and cube root, absolute value, exponential, and logarithmic functions. | HSF-BF.B.3 | Identify the effect on the graph of replacing *f*(*x*) by *f*(*x*) + *k*,*k* *f*(*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 - Modeling** | |  |  |
| 1. **Use functions to model real-world problems.** | |  |  |
| A2.FM.C.5 | Create functions and use them to solve simple applications of quadratic and exponential function models, e.g. price-demand cost-revenue-profit situations, compound interest problems, and exponential growth or decay problems. | HSF-BF.A.1 | Write a function that describes a relationship between two quantities.   1. Determine an explicit expression, a recursive process, or steps for calculation from a context.   (Algebra I Standard) |
| **Data and Statistical Analysis** | | **Statistics and Probability** | |
| 1. **Make inferences and justify conclusions** | |  | |
| A2.DS.A.1 | Explain how random sampling could be used to make inferences about population parameters. | HSS-IC.A.1 | Understand statistics as a process for making inferences about population parameters based on a random sample from that population. |
| A2.DS.A.2 | Determine whether a specified model is consistent with a given data set. e.g., A model says a spinning coin falls heads up with probability 0.5. Would an experimental result of 5 tails in a row cause you to question the model? | HSS-IC.A.2 | Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model*? |
| A2.DS.A.3 | Describe and explain the purposes, relationship to randomization, and differences among sample surveys, experiments, and observational studies. | HSS-IC.B.3 | Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. |
| A2.DS.A.4 | Use data from a sample survey to estimate a population mean or proportion and the meaning of the margin of error in these estimates. | HSS-IC.B.4 | Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. |
| A2.DS.A.5 | Describe and explain how the relative sizes of a sample and the population affect the margin of error of predictions and thus the validity of these predictions. | HSS-IC.B.4  HSS-IC.B.5 | Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.  Evaluate reports based on data. |
| 1. **Fit a data set to a normal distribution.** | |  |  |
| A2.DS.B.6 | Given a data set that is known to be normally distributed, predict what percentage of the data will be above or below a given value that is a multiple of standard deviations above or below the mean. | HSS-ID.A.4 | Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. |
| A2.DS.B.7 | Fit a data set to a distribution using its mean and standard deviation to determine whether the data is approximately normally distributed. | HSS-ID.A.4 | Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. |
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|  | Not in Proposed Standards | HSA-SSE.A.1 | Interpret expressions that represent a quantity in terms of its context.   1. Interpret parts of an expression, such as terms, factors, and coefficients. 2. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1+r)n as the product of P and a factor not depending on P*. |
|  | Not in Proposed Standards | HSA-SSE.B.4 | 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.* |
|  | Not in Proposed Standards | HSA-APR.C.4 | Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity (x2 + y2)2 = (x2 - y2)2 + (2xy)2 can be used to generate Pythagorean triples.* |
|  | Not in Proposed Standards | HSF-IF.B.6 | Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. |
|  | Not in Proposed Standards | HSF-IF.C.8 | Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. |
|  | Not in Proposed Standards | HSF-TF.A.1 | Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. |
|  | Not in Proposed Standards | HSF-TF.A.2 | Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. |
|  | Not in Proposed Standards | HSF-TF.B.5 | Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. |
|  | Not in Proposed Standards | HSF-TF.C.8 | Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. |