COMMON CORE ESSENTIAL ELEMENTS

FOR MATHEMATICS

HIGH SCHOOL

COMMON CORE ESSENTIAL ELEMENTS FOR HIGH SCHOOL

High School Mathematics Standards: Number and Quantity - The Real Number System	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Extend the properties of exponents to rational exponents.	
N-RN.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 $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*	**EEN-RN.1.** Solve division problems with remainders using concrete objects.
N-RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.	**EEN-RN.2.** N/A
Use properties of rational and irrational numbers.	
N-RN.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.	**EEN-RN.3**. N/A

High School Mathematics Standards: Number and Quantity - Quantities	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Reason quantitatively and use units to solve problems.	
N-Q.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. **N-Q.2.** Define appropriate quantities for the purpose of descriptive modeling. **N-Q.3.** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	**EEN-Q.1-3.** Express quantities to the appropriate precision of measurement.

High School Mathematics Standards: Number and Quantity - The Complex Number System	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Perform arithmetic operations with complex numbers.	
N-CN.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.	**EEN-CN.1.** N/A

High School Mathematics Standards: Number and Quantity - The Complex Number System	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
N-CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	**EEN-CN.2.** Use the operations of addition, subtraction, and multiplication with decimals (decimal value x whole number) in real world situations using money as the standard units ($20, $10, $5, $1, $0.25, $0.10, $0.05, and $0.01).
Use complex numbers in polynomial identities and equations.	
N-CN.7. Solve quadratic equations with real coefficients that have complex solutions.	**EEN-CN.7.** N/A

High School Mathematics Standards: Algebra - Seeing Structure in Expressions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Interpret the structure of expressions.	
A-SSE.1. Interpret expressions that represent a quantity in terms of its context. ▪ Interpret parts of an expression, such as terms, factors, and coefficients. ▪ 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.*	**EEA-SSE.1.** Match an algebraic expression involving one operation to represent a given word expression with an illustration.
A-SSE.2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.*	**EEA-SSE.2.** N/A
Write expressions in equivalent forms to solve problems.	
A-SSE.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*	**EEA-SSE.3.** Solve simple one-step equations (multiplication and division) with a variable.
A-SSE.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.*	**EEA-SSE.4** Identify the missing part in any other equivalent ratio when given any ratio.

High School Mathematics Standards: Algebra - Arithmetic with Polynomials and Rational Expressions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Perform arithmetic operations on polynomials.	
A-APR.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.	**EEA-APR.1** N/A

High School Mathematics Standards: Algebra - Creating Equations	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Create equations that describe numbers or relationships.	
A-CED.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.*	**EEA-CED.1.** Solve an algebraic expression using subtraction.
A-CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A-CED.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.* **A-CED.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.*	**EEA-CED.2-4.** Solve one-step inequalities.

High School Mathematics Standards: Algebra - Reasoning with Equations and Inequalities	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand solving equations as a process of reasoning and explain the reasoning.	
A-REI.1. 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. **A-REI.2.** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	**EEA-REI.1-2.** N/A

High School Mathematics Standards: Algebra - Reasoning with Equations and Inequalities	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Solve equations and inequalities in one variable.	
A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A-REI.4.** Solve quadratic equations in one variable. ▪ 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. ▪ 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 $a \pm bi$ for real numbers a and b.	**EEA-REI.3.** N/A (See EEA-ECED.1-2.)
Solve systems of equations.	
A-REI.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.	**EEA-REI.5.** N/A
A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. **A-REI.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 $y = -3x$ and the circle $x^2 + y^2 = 3$.	**EEA-REI.6-7.** N/A (See EEA-REI.10-12.)
Represent and solve equations and inequalities graphically.	
A-REI.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). **A-REI.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. **A-REI.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.	**EEA-REI.10.-12.** Determine the two pieces of information that are plotted on a graph of an equation with two variables that form a line when plotted.

High School Mathematics Standards: Functions - Interpreting Functions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand the concept of a function and use function notation.	
F-IF.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*). **F-IF.2**. Use function notations, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. **F-IF.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.*	**EEF-IF.1-3.** Use the concept of function to solve problems.
Interpret functions that arise in applications in terms of the context.	
F-IF.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*. **F-IF.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.* **F-IF.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.	**EEF-IF.4-6.** Interpret rate of change (e.g., higher/lower, faster/slower).
Analyze functions using different representations.	
F-IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**EEF-IF.7.** N/A (See EEF-IF.1-3)

High School Mathematics Standards: Functions - Interpreting Functions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
F-IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. ▪ 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. ▪ 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.	**EEF-IF.8.** N/A
F-IF.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.*	**EEF-IF.9.** N/A

High School Mathematics Standards: Functions - Building Functions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Build a function that models a relationship between two quantities.	
F-BF.1. Write a function that describes a relationship between two quantities. ▪ 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.*	**EEF-BF.1.** Select the appropriate graphical representation (first quadrant) given a situation involving constant rate of change.
F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	**EEF-BF.2.** Build an arithmetic sequence when provided a recursive rule with whole numbers.
Build new functions from existing functions.	
F-BF.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. **F-BF.4**. Find inverse functions. 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, $f(x) = 2x^3$ or $f(x) = (x+1)/(x–1)$ for $x \neq 1$.*	**EEF-BF.3-4.** N/A

High School Mathematics Standards: Functions - Linear, Quadratic, and Exponential Models	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Construct and compare linear, quadratic, and exponential models and solve problems.	
F-LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. ▪ Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. ▪ Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. ▪ Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **F-LE.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). **F-LE.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. **F-LE.4**. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	**EEF-LE.1.** Model a simple linear function such as y=mx to show functions grow by equal factors over equal intervals.
Interpret expressions for functions in terms of the situation they model.	
F-LE.5. Interpret the parameters in a linear or exponential function in terms of a context.	**EEF-LE.5.** N/A

High School Mathematics Standards: Functions - Trigonometric Functions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Extend the domain of trigonometric functions using the unit circle.	
F-TF.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. **F-TF.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.	**EEF-TF.1-2.** N/A
Model periodic phenomena with trigonometric functions.	
F-TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	**EEF-TF.5.** N/A

High School Mathematics Standards: Functions - Trigonometric Functions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Prove and apply trigonometric identities.	
F-TF.8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ 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.	**EEF-TF.8**. N/A

High School Mathematics Standards: Geometry - Congruence	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Experiment with transformations in the plane.	
G.CO.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.	**EEG-CO.1.** Know the attributes of perpendicular lines, parallel lines, and line segments, angles, and circles.
G-CO.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).	**EEG-CO.2.** N/A
G-CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	**EEG-CO.3.** N/A
G-CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. **G-CO.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.	**EEG-CO.4-5.** Identify rotations, reflections, and slides.
Understand congruence in terms of rigid motions.	
G-CO.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.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.8**. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	**EEG-CO.6-8.** Identify corresponding congruent (the same) parts of shapes.

High School Mathematics Standards: Geometry - Congruence	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Prove geometric theorems	
G-CO.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.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.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.*	**EEG-CO.9-11.** N/A
Make geometric constructions.	
G-CO.12. 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.* **G-CO.13.** Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	**EEG-CO.12-13.** N/A

High School Mathematics Standards: Geometry - Similarity, Right Triangles, and Trigonometry	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand similarity in terms of similarity transformations.	
G-SRT.1. Verify experimentally the properties of dilations given by a center and a scale factor: ▪ A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. ▪ The dilation of a line segment is longer or shorter in the ratio given by the scale factor. **G-SRT.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.3.** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	**EEG-SRT.1-3.** N/A (See EEG-CO.6-8.)

High School Mathematics Standards: Geometry - Similarity, Right Triangles, and Trigonometry	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Prove theorems involving similarity.	
G-SRT.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.5.** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.	**EEG-SRT.4-5.** N/A
Define trigonometric ratios and solve problems involving right triangles.	
G-SRT.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.7.** Explain and use the relationship between the sine and cosine of complementary angles. **G-SRT.8.** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	**EEG-SRT.6-8.** N/A

High School Mathematics Standards: Geometry - Circles	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand and apply theorems about circles.	
G-C.1. Prove that all circles are similar. **G-C.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.3.** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	**EEG-C.1-3.** N/A
Find arc lengths and areas of sectors of circles.	
G-C.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 the constant of proportionality; derive the formula for the area of a sector.	**EEG-C.5.** N/A

High School Mathematics Standards: Geometry - Expressing Geometric Properties with Equations	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Translate between the geometric description and the equation for a conic section.	
G-GPE.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.	**EEG-GPE.1.** N/A
G-GPE.2. Derive the equation of a parabola given a focus and directrix.	**EEG-GPE.2-4.** N/A
Use coordinates to prove simple geometric theorems algebraically.	
G-GPE.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).*	**EEG-GPE.4.** N/A (See EEG-GPE)
G-GPE.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.6.** Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	**EEG-GPE.5-6.** N/A (See EEG.CO.1)
G-GPE.7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	**EEG-GPE.7.** Find perimeter and area of squares and rectangles to solve real-world problems.

High School Mathematics Standards: Geometry - Geometric Measurement and Dimension	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Explain volume formulas and use them to solve problems.	
G-GMD.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.3.** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**EEG-GMD.1-3.** Make a prediction based on knowledge of volume to identify volume of common containers (cups, pints, gallons, etc.).
Visualize relationships between two-dimensional and three-dimensional objects.	
G-GMD.4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	**EEG-GMD.4.** Distinguish between two-dimensional and three-dimensional objects to solve real-world problems.

High School Mathematics Standards: Geometry - Modeling with Geometry	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Apply geometric concepts in modeling situations.	
G-MG.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.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.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).	**EEG-MG.1-3**. Use properties of geometric shapes to describe real-life objects.

High School Mathematics Standards: Statistics and Probability - Interpreting Categorical and Quantitative Data	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Summarize, represent, and interpret data on a single count or measurement variable.	
S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots). **S-ID.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.	**EES-ID.1-2**. Given data, construct a simple graph (table, line, pie, bar, or picture) and answer questions about the data.
S-ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	**EES-ID.3.** Indicate general trends on a graph or chart.
S-ID.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.	**EES-ID.4.** Calculate the mean of a given data set (limit data points to less than five).

High School Mathematics Standards: Statistics and Probability - Interpreting Categorical and Quantitative Data	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Summarize, represent, and interpret data on two categorical and quantitative variables.	
S-ID.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. **S-ID.6.** Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association.	**EES-ID.5.** N/A (See EEF-IF.1. and EEA-REI.6-7)
Interpret linear models.	
S-ID.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.	**EES-ID.7.** N/A (See EEF.IF.4-6)
S-ID.8. Compute (using technology) and interpret the correlation coefficient of a linear fit. **S-ID.9.** Distinguish between correlation and causation.	**EES-ID.8-9.** N/A

High School Mathematics Standards: Statistics and Probability - Making Inferences and Justifying Conclusions	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand and evaluate random processes underlying statistical experiments.	
S-IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **S-IC.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?*	**EES-IC.1-2.** Determine the likelihood of an event occurring when the outcomes are equally likely to occur.
Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	
S-IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. **S-IC.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. **S-IC.5.** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. **S-IC.6.** Evaluate reports based on data.	**EES-IC.3-6.** N/A (See EES-ID.1-2)

High School Mathematics Standards: Statistics and Probability - Conditional Probability and the Rules of Probability	
CCSS Grade-Level Clusters	**Common Core Essential Elements**
Understand independence and conditional probability and use them to interpret data.	
S-CP.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"). **S-CP.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. **S-CP.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*. **S-CP.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.* **S-CP.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.*	**EES-CP.1-4.** Identify when events are independent or dependent.
Use the rules of probability to compute probabilities of compound events in a uniform probability model.	
S-CP.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. **S-CP.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.	**EES-CP.6-7.** N/A (See EES-IC.1-2)