ANKENY
COMMUNITY SCHOOL DISTRICT

Department of Academic Services

6- 12
Math
Curriculum Review

(Updated April, 2018)
Board Approved August, 2018

Math Mission Statement

The mission statement was written collaboratively by representatives of Math teachers, Instructional Coaches and Administrators. The mission statement is a commitment by teachers across the district ensuring a guaranteed and viable curriculum.

Students will gain a conceptual understanding of course prioritized standards by utilizing the mathematical practices in order to problem solve in future educational experiences, career options, and personal life endeavors.

Grade Level Standards and Components

The Grade Level Standards and Components represent the guaranteed and viable curriculum for all secondary students in Ankeny. Prioritized through a collaborative process, the Grade Level Standards and Components represent the most critical concepts and skills required to be successful learners in school and beyond high school.

The code in parenthesis represents the standards from the Iowa Core Math Standards - the original document used for the prioritization process. Any Grade Level Standard (Bold and Underlined) labeled as a "Focus" area will have evidence in Infinite Campus' gradebook and student performance will be reported on a report card. Those Grade Level Standards are the most critical to student success and, as a result, have been designated as focus areas.

Those Grade Level Standards (Bold and underlined) labeled as "Foundational" or "Introductory" have been designated as agreed upon areas for instruction, but will not have performance reported in Infinite Campus or on a report card. The difference between the levels is the amount of direct instruction and/or experiences students have with the skill during that grade or course.

Any Components (not bold or underlined) under the Grade Level Standard labeled as "Focus" are the critical formative skills required to demonstrate the Grade Level Standard and evidence of learning will be recorded in Infinite Campus. The preponderance of evidence on each Grade Level Standard will determine the performance level on each Grade Level Standard.

The prioritization process allows teachers to target instruction on the skills required for that grade or course. This allows students to focus on only a few grade level standards and dive deeper into the learning. By having multiple and varied opportunities to demonstrate their learning, reporting on the performance of grade level standards is more accurate.

6th Grade

Grade Level Standards and Components

Math.06.01 Students will apply concepts of ratios and reasoning to solve real-world problems. (Focus)

Math.06.01.01 Students will understand ratio concepts and use ratio reasoning to solve problems. (6.RP.A) (Focus)

Math.06.01.02 Students will understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship (6.RP.A.2) (Focus)

Math.06.01.03 Students will 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. (6.RP.A.3)

Math.06.01.04 Students will 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.(6.RP.A.3.a)

Math.06.01.05S students will solve unit rate problems including those involving unit pricing and constant speed. (6.RP.A.3.b)

Math.06.01.06 Students will 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 (6.RP.A.3.c) (Foundational)

Math.06.01.07 Students will understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (6.RP.A.1) (Introductory)

Math.06.01.08 Students will use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.A.3.d) (Introductory)

Math.06.02 Students will apply and extend their knowledge of rational numbers to solve real-world problems. (Focus)

Math.06.02.01 Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions (Focus) (6.NS.A)

Math.06.02.02 Students will interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (Focus) (6.NS.A.1)

Math.06.02.03 Students will fluently add, subtract, multiply, and divide multi-digit decimals. (Foundational) (6.NS.B.3)

Math.06.02.04 Students will find the greatest common factor and least common multiple of two numbers. (Foundational) (6.NS.B.4)

Math.06.02.05 Students will compute fluently with multi-digit numbers and find common factors and multiples. (Introductory) (6.NS.B.2)

Math.06.03 Students will apply and extend their knowledge of integers to solve real-world problems. (Focus)

Math.06.03.01 Students will apply and extend previous understandings of numbers to the system of rational numbers (positive, negative, number line, absolute value.) (6.NS.C) (Focus)

Math.06.03.02 Students will apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide integers (Focus).(6.NS.A)
Math.06.03.03 Students will 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. (Foundational) (6.NS.C.6.c)
Math.06.03.04 Students will 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. (Foundational) (6.NS.C.8)
Math.06.03.05 Students will solve real-world problems involving four operations with integers. (Foundational) (7.NS.A.3)
Math.06.03.06 Students will interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. (Introductory) (6.NS.C.7.a)
Math.06.03.07 Students will write, interpret, and explain statements of order for rational numbers in real world contexts. (Introductory) (6.NS.C.7.b)
Math.06.03.08 Students will distinguish comparisons of absolute value from statements about order. (Introductory) (6.NS.C.7.d)

Math.06.04 Students will write, interpret, and use expressions and equations to solve problems. (Focus)

Math.06.04.01 Students will apply and extend previous understanding of arithmetic to algebraic expressions. (Focus) (6.EE.A)
Math.06.04.02 Students will reason about and solve one variable equations and inequalities (Focus) (6.EE.B)
Math.06.04.03 Students will 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.EE.B5) (Focus)
Math.06.04.04 Students will 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. (Focus) (6.EE.B6)
Math.06.04.05 Students will 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 (Focus). (6.EE.B7)
Math.06.04.06 Students will apply properties of operations to generate equivalent expressions. (Foundational) (6.EE.A.3)
Math.06.04.07 Students will identify when two expressions are equivalent (i.e., when the two expression name the same number regardless of which value is substituted into them). (Foundational) (6.EE.A.4)
Math.06.04.08 6.EE.B- Reason about and solve one variable equations and inequalities
Math.06.04.09 Students will 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; represents solutions of such inequalities on a number line diagram. (Foundational) (6.EE.B8)
Math.06.04.10 Students will 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. (Introductory) (6.EE.C9)

Math.06.05 Students will develop an understanding of statistical thinking. (Focus)

Math.06.06.01 Students will 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. (Focus) (6.G.A1)

Math.06.06.02 Students will 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 = lwh and V = bh to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real world and mathematical problems. (Focus) (6.G.A2)

Math.06.06.03 Students will 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. (Focus) (6.G. A3)

Math.06.06.04 Students will 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. (Foundational) (6.G.A4)

7th Grade
Pre-Algebra

Grade Level Standards and Components

Math 07.01 Students will be able to add, subtract, multiply, and divide rational numbers (Focus)
Math 07.01.01 Students will apply properties of operations as strategies to add and subtract rational numbers. (Focus) (7.NS.A.1)
Math 07.01.02 Students will apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. (Focus) (7.NS.A.2)
Math 07.01.03 Students will solve real-world and mathematical problems involving the four operations with rational numbers. (Focus) (7.NS.A.3)

Math 07.02 Students will be able to use properties of operations to create equivalent expressions, as well as write and solve equations in one variable. (Focus)
Math 07.02.01 Students will apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. (Focus) (7.EE.A.1)
Math 07.02.02 Students will 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; assess the reasonableness of answers using mental computation and estimation strategies. (Focus) (7.EE.B.3)
Math 07.02.03 Students will use variables to represent quantities in a real-world or mathematical problem, and construction simple equations and inequalities to solve problems by reasoning about the quantities.(Focus) (7.EE.B.4 P)
Math 07.02.04 Students will solve linear equations in one variable. (Focus) 8.EE.C.7 P
Math.07.02.05 Students will understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities are related. (Foundational) (7.EE.A.2)
Math.07.02.06 Students will 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. (Introductory)

Math 07.03. Students will be able to analyze proportional relationships and use them to solve real world and mathematical problems (Focus)
Math 07.03.01 Students will compute unit rates associated with ratios of fractions, including ratios of lengths, area and other quantities measured in like or different units. (Focus) (7.RP.A.1 P)
Math 07.03.02 Students will recognize and represent proportional relationships between quantities.(Focus) (7.RP.A.2 P)

Math 07.03.03 Students will use proportional relationships to solve multistep ratio and percent problems (Focus) (7.RP. A 3 P)
Math.07.03.03 Students will solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scaled drawing at a different scale. (Foundational) (7.G.A.1 P)

Math 07.04 Students will be able to understand and determine probability, as well as use concepts of statistics to draw conclusions about populations (Foundational))
Math 07.04.01 Students will 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. (Foundational) (7.SP.A.1)
Math 07.04.02 Students will 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 ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. (Foundational) (7.SP.C.5 S)
Math.07.04.03 Students will 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. (Foundational) (7.SP.C.6 S)
Math.07.04.04 Students will use data from a random sample to draw inferences about a population with unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. (Introductory) (7.SP.A.2 S)
Math.07.04.05 Students will informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the differences between the centers by expressing it as a multiple of a measure of variability. (Introductory) (7.SP.B.3 S)
Math.07.04.06 Students will 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.(Introductory) (7.SP.C.7 S)
Math.07.04.07 Students will find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. (Introductory) (7.SP.C.8 S)

Math 07.05 Students will be able to understand and apply slope (Focus)
Math 07.05.01 Students will graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. (Focus) (8.EE.B.5 P)
Math 07.05.02 Students will 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. (Focus) (8.EE.B.6 P)
Math.07.05.03 Students will 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 (Introductory) (8.EE.B.6 P)

Math 07.06.Students will be able to use and apply positive exponents and scientific notation, as well as evaluate roots (Focus)
Math 07.06.01 Students will know and apply the properties of positive exponents to generate equivalent

numerical expressions. (Focus) (8.EE.A.1 P)
Math 07.06.02 Students will 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 is irrational. (Focus) (8.EE.A.2 P)
Math.07.06.03 Students will understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational. (Introductory) (8.NS.A.1)
Math.07.06.04 Students will use rational approximations of irrational numbers to compare the size of irrational numbers, locate the approximately on a number line diagram, and estimate the value of expressions. (Introductory) (8.NS.A.2)
Math.07.06.05 Students will know and apply the properties of negative exponents to generate equivalent numerical expressions. (Introductory) (8.EE.A.1 P)
Math.07.06.06 Students will use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 × 108 and the population of the world as 7 × 109, and determine that the world population is more than 20 times larger. (Introductory) (8.EE.A.3 S)

Math 07.07 Students will use formulas to find area, surface area, and volume of figures and use transformations to determine congruence or similarity. (Foundational)
Math 07.07.01 Students will 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. (Foundational) (7.G.B.6 S)
Math 07.07.02 Students will 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 between them (Foundational) (8.G.A.2 S)
Math.07.07.03 Students will know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real world and mathematical problems. (Foundational) (8.G.C.9 S)
Math.07.07.04 Students will understand that a two-dimensional figure is similar to another if second can be obtained from the first by a sequence rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. (Foundational) (8.G.A.4 S)
Math.07.07.05 Students will 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. (Introductory) (7.G.A.2 S)
Math.07.07.06 Students will describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. (Introductory) (7.G.A.3 S)
Math.07.07.07 Students will 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. (Introductory) (7.G.B.4 S)
Math.07.07.08 Students will 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. (Introductory) (7.G.B.5 S)

Math.07.07.09 Students will 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. (Introductory) (8.G.A.5 S)
Math.07.07.10 Students will verify experimentally the properties of rotations, reflections, and translations. (Introductory) (8.G.A.1 S)
Math.07.07.11 Students will describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.(Introductory) (8.G.A.3 S)

8th Grade
Algebra

Grade Level Standards and Components

Math.ALG1.01 Students will simplify expressions and solve equations and inequalities. (Focus)

Math.ALG1.01.01 Students will understand that polynomials form a system analogous to the integers. (Focus)

Math.ALG.01.02 Students will add, subtract, and multiply polynomials. (Focus) (A-APR.A.1)

Math.ALG.01.03 Students will 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 parts as a single entity (chunking). (Focus) (A-SSE.A.1)

Math.ALG1.01.05 Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (Focus) (A-SSE.B.3)

Math.ALG1.01.06 Students will solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (Focus) (A-REI.B.3)

Math.ALG1.01.07 Students will understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane (either a curve or a line is formed) (Focus) (A-REI.D.10)

Math.ALG1.01.08 Students will rearrange formulas to solve for a specific variable (Focus) (A-CED.A.4)

Math.ALG1.01.08 Students will explain each step in solving a simple equations. Construct viable arguments to justify. (Foundational) (A-REI.A.1)

Math.ALG1.01.08 Students will rewrite expressions involving radicals and rational exponents using the properties of exponents (Foundational) (N-RN.A.2)

Math.ALG1.01.08 Students will use the structure of an expression to identify ways to rewrite it. (Introductory) (A-SSE.A.2)

Math.ALG1.01.08 Students will explain why the sum or product of two rational numbers is rational; the sum of a rational and an irrational is irrational; the product of (nonzero)rational and an irrational is irrational. (Introductory) (N-RN.B.3)

Math.ALG1.01.08 Students will explain how the properties of exponents and roots can be used to evaluate/simplify rational exponents (Introductory) (N-RN.A.1)

Math.ALG1.02 Students will find solutions to systems of equations and inequalities. (Focus)

Math.ALG1.02.01 Students will solve real-world problems and interpret solutions involving systems of linear equations. Understand solutions are points of intersection. (Focus) (8.EE.C.8)

Math.ALG1.02.02 Students will 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. (Focus) (A-REI.C.5)

Math.ALG1.02.03 Students will solve systems of linear equations exactly and approximately. (Focus) (A-REI.C.6)

Math.ALG1.02.04 Students will graph the solutions to a linear inequality in two variables as a half-plane and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. (Focus) (A-REI.D.12)
Math.ALG1.02.05 Students will solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. (Foundational) (A-REI.C.7)
Math.ALG1.02.06 Students will represent the constraints using equations or inequalities(or systems of equations and inequalities) and interpret solutions as viable(possible) for a specific situation. (Introductory) (A-CED.A.3)

Math.ALG1.03 Students will interpret, factor, solve and graph quadratic functions. (Focus)
Math.ALG1.03.01 Students will create equations and inequalities in one variable (Focus) (A-CED.A.1)
Math.ALG1.03.02 Students will create equations in two or more variables to represent relationships and graph using appropriate axes, labels, scale.(Focus) (A-CED.A.2)
Math.ALG1.03.03 Students will solve quadratic equations in one variable by completing the square.(Focus)
Math.ALG1.03.04 Students will solve quadratic equations by inspection, square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. (Focus)
Math.ALG1.03.05 Students will factor a quadratic expression to reveal the zeros of the function.
Math.ALG1.03.06 Students will complete the square in a quadratic expression to reveal the maximum or minimum value of the function.(Focus) (A-SSE.B.3)
Math.ALG1.03.07 Students will compare properties of 2 functions using a graph, a table, ordered pairs, equation, and/or situation. (Focus)(8.F.A.2)
Math.ALG1.03.08 Students will describe the qualities of a graph of a function (e.g. increasing, decreasing, linear vs nonlinear). Sketch the graph of a function when given the specific qualities. (Focus)(8.F.B.5)
Math.ALG1.03.09 Students will understand the components of a function including domain and range and the notation to represent the function, where f(x) denotes the output. The graph of f is represented by y = f(x). (Focus)(F-IF.A.1)
Math.ALG1.03.10 Students will evaluate and interpret functions explicitly using function notation in context. (Focus)(F-IF.A.2)
Math.ALG1.03.11 Students will, when given a function, interpret the key features of the graph and table in terms of the quantities. Sketch the graph given the key features (intercepts, vertex, maximum, minimum, symmetry, positive, negative, increasing, decreasing) (Focus)(F-IF.B.4)
Compare properties of two functions potentially represented in a different way. (F-IF.C.9)
Math.ALG1.03.12 Students will construct linear functions, including arithmetic sequences, given a graph, a description of a relationship, or two I-O pairs. (Focus) (F-LE.A.2)
Math.ALG1.01.13 Students will recognize when there are complex solutions and write them in a + bi form. (Foundational) (A-REI.B.4)
Math.ALG1.01.14 Students represent the constraints using equations or inequalities(or systems of equations and inequalities) and interpret solutions as viable(possible) for a specific situation. (Introductory) (A-CED.A.3)
Math.ALG1.01.15 Students identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and

f(x+k). Identify k given a graph and explain effects on a graph using technology. (Introductory) (F-BF.B.3)
Math.ALG1.01.16 Students calculate the slope/ average rate of change of a function from an equation, a table and a graph. (Introductory) (F-IF.B.6)

Math.ALG1.04 Students will create, interpret and graph exponential functions. (Focus)

Math.ALG1.04.01 Students will create equations in two or more variables to represent relationships and graph using appropriate axes, labels, scale. (Focus) (A-CED.A.2)
Math.ALG1.04.02 Students will use the properties of exponents to transform expressions for exponential functions. (Focus) (A-SSE.B.3)
Math.ALG1.04.03 Students will recognize situations in which a quantity grows or decays at a constant percent. (Focus)
Math.ALG1.04.04 Students will recognize that exponential functions grow by equal factors. (Focus) (F-LE.A.1)
Math.ALG1.04.05 Students will interpret the parameters in an exponential functions in terms of a context. (Focus) (F-LE.B.5)
Math.ALG1.04.06 Students will compare properties of 2 functions using a graph, a table, ordered pairs, equation, and/or situation. (Focus) (8.F.A.2)
Math.ALG1.04.07 Students will describe the qualities of a graph of a function (e.g. increasing, decreasing, linear vs nonlinear). Sketch the graph of a function when given the specific qualities. (Focus) (8.F.B.5)
Math.ALG1.04.08 Students will understand the components of a function including domain and range and the notation to represent the function, where f(x) denotes the output. The graph of f is represented by y = f(x).(Focus) (F-IF.A.1)
Math.ALG1.04.09 Students will evaluate and interpret functions explicitly using function notation in context. (Focus) (F-IF.A.2)
Math.ALG1.04.010 Students will, when given a function, interpret the key features of the graph and table in terms of the quantities. Sketch the graph given the key features (intercepts, vertex, maximum, minimum, symmetry, positive, negative, increasing, decreasing) (Focus) (F-IF.B.4)
Math.ALG1.04.011 Students will compare properties of two functions potentially represented in a different way. (Focus) (F-IF.C.9)
Math.ALG1.04.012 Students will Use properties of exponents to interpret expressions for exponential functions. (Focus) (F-IF.C.8)
Math.ALG1.04.013 Students will construct exponential functions, including geometric sequences, given a graph, a description of a relationship, or two I-O pairs.(Focus) (F-LE.A.2)
Math.ALG1.04.014 Students will observe that a quantity increasing exponentially exponentially eventually exceeds a quantity increasing linearly or quadratically. (Foundational) (F-LE.A.3)
Math.ALG1.04.015 Students will represent the constraints using equations or inequalities(or systems of equations and inequalities) and interpret solutions as viable(possible) for a specific situation. (Introductory)(A-CED.A.3)
Math.ALG1.04.016 Students will identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x+k). Identify k given a graph and explain effects on a graph using technology. (Introductory) (F-BF.B.3)

Math.ALG1.04.017 Students will calculate the slope/ average rate of change of a function from an equation, a table and a graph. (Introductory) (F-IF.B.6)
Math.ALG1.04.018 Students will represent the constraints using equations or inequalities(or systems of equations and inequalities) and interpret solutions as viable(possible) for a specific situation. (Introductory) (A-CED.A.3)
Math.ALG1.04.019 Students will identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x+k). Identify k given a graph and explain effects on a graph using technology. (Introductory) (F-BF.B.3)
Math.ALG1.04.20 Students will calculate the slope/ average rate of change of a function from an equation, a table and a graph. (Introductory) (F-IF.B.6)

Math.ALG1.05 Students will create, interpret, solve, and graph linear functions.(Focus)
Math.ALG1.05.01 Students will create equations and inequalities in one variable (A-CED.A.1) (Focus)
Math.ALG1.05.02 Students will create equations in two or more variables to represent relationships and graph using appropriate axes, labels, scale. (A-CED.A.2) (Focus)
Math.ALG1.05.03 Students will recognize situations in which a quantity changes at a constant rate.
Math.ALG1.05.04 Students will recognize that linear functions grow by equal differences. (F-LE.A.1) (Focus)
Math.ALG1.05.05 Students will interpret the parameters in a linear function in terms of a context. (F-LE.B.5) (Focus)
Math.ALG1.05.06 Students will interpret the slope and the intercept of a linear model in the context of data. (S-ID.C.7)(Focus)
Math.ALG1.05.07 Students will compare properties of 2 functions using a graph, a table, ordered pairs, equation, and/or situation. (8.F.A.2) (Focus)
Math.ALG1.05.08 Students will recognizing linear vs non-linear graphs and knowing that an equation in the form y = mx + b is linear and the graph is a line. (8.F.A.3)(Focus)
Math.ALG1.05.09 Students will construct a linear equation from any representation of the function (graph, table, situation, ordered pairs). Interpret the slope as rate of change and identify the y-intercept as the initial value from the description of the situation. (8.F.B.4) (Focus)
Math.ALG1.05.10 Students will describe the qualities of a graph of a function (e.g. increasing, decreasing, linear vs nonlinear). Sketch the graph of a function when given the specific qualities. (8.F.B.5) (Focus)
Math.ALG1.05.11 Students will construct informal line of best fit by sight (8.SP.A.2)(Focus)
Interpret slope and y-intercept in the context of a real-world problem given an equation of a linear model. (8.SP.A.3)(Focus)
Math.ALG1.05.012 Students will understand the components of a function including domain and range and the notation to represent the function, where f(x) denotes the output. The graph of f is represented by y = f(x). (F-IF.A.1) (Focus)
Math.ALG1.05.13 Students will evaluate and interpret functions explicitly using function notation in context. (F-IF.A.2) (Focus)
Math.ALG1.05.14 Students will given a function, interpret the key features of the graph and table in terms of the quantities. Sketch the graph given the key features (intercepts, vertex, maximum, minimum, symmetry, positive, negative, increasing, decreasing) (F-IF.B.4) (Focus)

Math.ALG1.05.15 Students will compare properties of two functions potentially represented in a different way. (F-IF.C.9) (Focus)
Math.ALG1.05.16 Students will construct linear functions, including arithmetic sequences, given a graph, a description of a relationship, or two I-O pairs. (F-LE.A.2) (Focus)
Math.ALG1.05.17 Students will represent the constraints using equations or inequalities(or systems of equations and inequalities) and interpret solutions as viable(possible) for a specific situation. (A-CED.A.3) (Introductory)
Math.ALG1.05.18 Students will identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x+k). Identify k given a graph and explain effects on a graph using technology. (F-BF.B.3)
Math.ALG1.05.19 Students will calculate the slope/ average rate of change of a function from an equation, a table and a graph. (F-IF.B.6) (Introductory)

Math.ALG1.06 Students will apply their knowledge of algebraic concepts to sequences, Pythagorean Theorem, and two-variable data (Focus)

Math.ALG1.06.01 Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (F-IF.A.3) (Focus)
Math.ALG1.06.02 Students will write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. (F-FB.A.2)(Focus)
Math.ALG1.06.03 Students will represent data on two quantitative variables on a scatter plot, and describe how the variables are related. Fit a function to the data and use the function to solve problems in the context. Informally assess the fit of the function by plotting and analyzing residuals. (S-ID.B.6) (Focus)
Math.ALG1.06.04 Students will determine whether a relation is a function given a graph, table, or set of ordered pairs and is defined by the rule that for every input there is exactly one output. (8.F.A.1) (Focus)
Math.ALG1.06.05 Students will finding unknown side lengths of a right triangle in 2 and 3 dimensions (8.G.B.6) (Focus)
Math.ALG1.06.06 Students will describe clustering, strong or weak association, outliers, positive & negative association, linear & nonlinear of a student-constructed scatter plot given the data (8.SP.A.1) (Focus)
Math.ALG1.06.07 Students will recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (F-IF.A.3) (Focus)
Math.ALG1.06.08 Students will construct arithmetic and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two I-O pairs. (F-LE.A.2) (Focus)
Math.ALG1.06.09 Students will determine an explicit expression, a recursive process, or steps for calculation from a context. (F-FB.A.1) (Focus)
Math.ALG1.06.10 Students will represent data with plots (dot plots, histograms, box plots) (S-ID.A.1)(Foundational)
Math.ALG1.06.11 Students will use statistics to compare center and spread (median, mean, IQR, SD) of two or more data sets. (S-ID.A.2)(Foundational)
Math.ALG1.06.12 Students will interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers. (S-ID.A.3)(Foundational)
Math.ALG1.06.13 Students will use units as a way to understand problem 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.A.1) (Foundational)
Math.ALG1.06.14 Students will define appropriate quantities for the purpose of descriptive modeling (N-Q.A.2) (Foundational)
Math.ALG1.06.15 Students will choose an appropriate level of accuracy based on limitations of measurement. (N-Q.A.3) (Foundational)
Math.ALG1.06.16 Students will using pythagorean theorem on the coordinate plane to find missing side lengths. (8.G.B.8) (Foundational)
Math.ALG1.06.17 Students will compute (using technology) and interpret the correlation coefficient of a linear fit. (S-ID.C.8) ((Introductory)
Math.ALG1.06.18 Students will distinguish between correlation and causation. (S-ID.C.9) (Introductory)
Math.ALG1.04.04 Students will construct and interpret two-way frequency tables of data with two categories and use a two-way table to decide if events are independent and to approximate conditional probabilities. (S-CP.A.4) (Introductory)
Math.ALG1.06.19 Students will a proof of the pythagorean theorem to show the properties of a right triangle and to show that a triangle is right. (8.G.B.6) (Introductory)
Math.ALG1.06.20 Students will construct and interpret a two-way table to describe a possible association between the two variables. (8.SP.A.4) (Introductory)

Algebra II

Grade Level Standards and Components

Math.ALG2.01 Students will relate multiple representations of functions to identify key features of functions and analyze functions. (Focus)

Math.ALG2.01.01 Students will 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; relative maximums and minimums; symmetries; end behavior. (HSF.IF.B.4) (Focus)

Math.ALG2.01.02 Students will 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. (HSF.IF.B.5) (Focus))

Math.ALG2.01.03 Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Focus)

Math.ALG2.01.04 Students will 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. (HSF.IF.B.6) (Foundational)

Math.ALG2.01.05 Students will create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (HSA.CED.A.2) (Foundational)

Math.ALG2.02 Students will manipulate algebraic expressions to re-write in different, but equivalent forms. (Focus)

Math.ALG2.02.01 Students will interpret expressions that represent a quantity in terms of its context. (Focus)

Math.ALG2.02.02 Students will use the structure of an expression to identify ways to rewrite it. For example, see $16x^2 – 9$ as $(4x)^2 – (3)^2$, thus recognizing it as a difference of squares that can be factored as $(4x –3)(4x + 3)$. (HSA.SSE.A.2) (Focus)

Math.ALG2.02.03 Students will write expressions in equivalent forms to solve problems (HSA.SSE.B) (Focus)

Math.ALG2.02.04 Students will choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (Focus)

Math.ALG2.02.05 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Focus)

Math.ALG2.02.06 Students will extend the properties of exponents to rational exponents.

Math.ALG2.02.07 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (HSF.IF.A.2)
(Example: f(x)=2x+3, evaluate f(2)) (Focus)

Math.ALG2.02.08 Students will perform composition of functions from tables, graphs, and equation

Math.ALG2.02.09 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Foundational)

Math.ALG2.03 Students will solve a variety of equations and systems of equations through multiple methods. (Focus)

Math.ALG2.03.01 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (HSF.IF.A.2) (Focus)
(Example: f(x)=2x+3,find x when f(x)=17) (Focus(
Math.ALG2.03.02 Students will understand solving equations as a process of reasoning and explain the reasoning (HSA.REI.A) (Focus)
Math.ALG2.03.03 Students will solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. (HSA.REI.A.2) (Focus)
Students will solve equations and inequalities in one variable (HSA.REI.B) (Focus)
Math.ALG2.03.04 Students will represent and solve equations and inequalities graphically (HSA.REI.D) (Foundational)
Math.ALG2.03.05 Students will solve equations and inequalities in one variable (HSA.REI.B) (Foundational)
Math.ALG2.03.06 Students will solve systems of equations (HSA.REI.C) (Foundational)
Math.ALG2.03.07 Students will represent and solve equations and inequalities graphically (Foundational and Introductory)

Math.ALG2.04 Students will perform arithmetic operations on and develop an understanding of key components of polynomials and rational expressions. (Focus)

Math.ALG2.04.01 Students will perform arithmetic operations with complex numbers. (N-CN.A) (Focus)
Math.ALG2.04.02 Students will use complex numbers in polynomial identities and equations. (HSN.CN.C) (Focus)
Math.ALG2.04.03 Students will perform arithmetic operations on polynomials (HSA.APR.A) (Focus)
Math.ALG2.04.04 Students will understand the relationship between zeros and factors of polynomials (HSA.APR.B) (Focus)
Math.ALG2.04.05 Students will perform arithmetic operations with complex numbers. (N-CN.A) (Introductory)
Math.ALG2.04.06 Students will use complex numbers in polynomial identities and equations. (HSN.CN.C) (Introductory)

Math.ALG2.05 Students will create functions, transform functions, and find inverses of functions. (Focus)

Math.ALG2.05.01 Students will identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. (HSF.BF.B.3) (Focus)
Math.ALG2.05.02 Students will solve exponential equations with logarithms.
Math.ALG2.05.03 Students will Solve logarithmic equations. (Focus)
Math.ALG2.05.04 Students will 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. (Focus)
Math.ALG2.05.05 Students will 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. (HSA.CED.A.1) (Foundational)

Honors Algebra II

Grade Level Standards and Components

Math.HALG2.01 Students will relate multiple representations of functions to identify key features of functions and analyze functions. (Focus)

Math.HALG2.01.01 Students will 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; relative maximums and minimums; symmetries; end behavior. (HSF.IF.B.4) (Focus)

Math.HALG2.01.02 Students will 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. (HSF.IF.B.5) (Focus)

Math.HALG2.01.03 Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Focus)

Math.HALG2.01.04 Students will 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. (HSF.IF.B.6) (Foundational)

Math.HALG2.01.05 Students will create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (HSA.CED.A.2) (Foundational)

Math.HALG2.01.06 Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Foundational)

Math.HALG2.01.07 Students will i 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: intervals where the function is increasing, decreasing, positive, or negative; periodicity. (HSF.IF.B.4) (Introductory)

Math.HALG2.01.08 Students will graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (Introductory)

MATH.HALG2.02 Students will manipulate algebraic expressions to re-write in different, but equivalent forms. (Focus)

MATH.HALG2.02.01 Students will interpret expressions that represent a quantity in terms of its context. (Focus)

MATH.HALG2.02.02 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

MATH.HALG2.02.03 Students will write expressions in equivalent forms to solve problems (HSA.SSE.B) (Focus)

MATH.HALG2.02.04 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Focus)

MATH.HALG2.02.5 Students will extend the properties of exponents to rational exponents. (HSN.RN.A) (Introductory)

MATH.HALG2.02.07 Students will perform composition of functions from tables, graphs, and equations. (Focus)
MATH.HALG2.02.08 Students will write expressions in equivalent forms to solve problems (HSA.SSE.B) (Foundational)
MATH.HALG2.02.09 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Foundational)
MATH.HALG2.02.10 Students will interpret expressions that represent a quantity in terms of its context. (Introductory)

MATH.HALG2.03 Students will solve a variety of equations and systems of equations through multiple methods. (Focus)

MATH.HALG2.03.01 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (HSF.IF.A.2) (Focus) (Example: f(x)=2x+3,find x when f(x)=17)
MATH.HALG2.03.02 Students will understand solving equations as a process of reasoning and explain the reasoning (HSA.REI.A) (Focus)
MATH.HALG2.03.03 Students will solve equations and inequalities in one variable (HSA.REI.B) (Focus)
MATH.HALG2.03.04 Students will solve systems of equations (HSA.REI.C) (Focus)
MATH.HALG2.03.05 Students will represent and solve equations and inequalities graphically (HSA.REI.D) (Focus)
MATH.HALG2.03.06 Students will 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. (HSA.REI.D.11) (Focus)
MATH.HALG2.03.07 Students will solve equations and inequalities in one variable (HSA.REI.B)
MATH.HALG2.03.08 Students will solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. (HSA.REI.B.3) (Foundational)
MATH.HALG2.03.09 Students will solve systems of equations (HSA.REI.C)
MATH.HALG2.03.10 Students will 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. (HSA.REI.C.5) (Foundational)
MATH.HALG2.03.11 Students will solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. (HSA.REI.C.6) (Foundational)
MATH.HALG2.03.12 Students will represent and solve equations and inequalities graphically (HSA.REI.D) (Introductory)
MATH.HALG2.03.13 Students will understand solving equations as a process of reasoning and explain the reasoning (HSA.REI.A) (Introductory)
MATH.HALG2.03.15 Students will solve quadratic equations in one variable. (Introductory)

MATH.HALG2.04 Students will perform arithmetic operations on and develop an understanding of key components of polynomials and rational expressions. (Focus)

Math.HALG2.04.01 Students will perform arithmetic operations with complex numbers. (N-CN.A) (Focus)

Math.HALG2.04.02 Students will use complex numbers in polynomial identities and equations. (HSN.CN.C) (Focus)

Math.HALG2.04.03 Students will perform arithmetic operations on polynomials (HSA.APR.A) (Focus)

Math.HALG2.04.04 Students will understand the relationship between zeros and factors of polynomials (HSA.APR.B) (Focus)

Math.HALG2.04.05 Students will rewrite rational expressions (HSA.APR.D) (Focus)

Math.HALG2.04.06 Students will perform arithmetic operations with complex numbers. (N-CN.A) (Introductory)

MATH.HALG2.05 Students will create functions, transform functions, and find inverses of functions. (Focus)

MATH.HALG2.05.01 Students will identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. (HSF.FB.B.3) (Focus)

MATH.HALG2.05.02. Students will find inverse functions. (Focus)

MATH.HALG2.05.03 (+) Students will understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. (HSF.FB.B.5) (Focus)

MATH.HALG2.05.04 Students will 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. (HSA.CED.A.1) (Foundational)

MATH.HALG2.05.05 Students will find inverse functions. (Introductory)

MATH.HALG2.06 Students will evaluate trigonometric functions using right triangles, in both radians and degrees. (Focus)

MATH.HALG2.06.01 Students will use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$ (and/or 30°, 60°, 45°) and multiples of those.) (HSF.TF.A.3) (Focus)

MATH.HALG2.06.02 Students will understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. (HSF.TF.A.1) (Introductory)

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. (F-TF.A.2) (Introductory)

MATH.HALG2.06.03 Students will use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number. (HSF.TF.A.3) (Introductory)

Geometry

Grade Level Standards and Components

Math.Geo.01 Students will apply and prove concepts of congruence. (Focus)

Math.Geo.01.01 Students will 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). (Focus) G.CO.2

Math.Geo.01.02 Students will 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 (Focus) G.CO.5

(Math.Geo.01.03 Students will 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. (Focus) G.CO.6

Math.Geo.01.04 Students will 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. (Focus) G.CO.7

Math.Geo.01.05 Students will use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures (Focus) G.SRT.5

Math.Geo.01.06 Students will, given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. G-CO.3 (Foundational)

Math.Geo.01.07 Students will develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.G-CO.4 (Introductory)

(Math.Geo.01.08) Students will explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.G-CO.8 (Introductory)

Math.Geo.01.09 Students will 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.12 (Introductory)

Math.Geo.02 Students will apply and prove concepts of similarity. (Focus)

Math.Geo.02.01 Students will, 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 pair. G-SRT.2 (Focus)

Math.Geo.02.02 Students will use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. G.SRT.5 (Focus)

Math.Geo.02.04 Students will verify experimentally the properties of dilations given by a center and a scale factor: a. 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. G-SRT.1 (Foundational)

Math.Geo.02.04 Students will 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.4 (Foundational)
Math.Geo.02.05 Students will use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.G.SRT.3 (Introductory)
Math.Geo.02.06 Students will find the point on a directed line segment between two given points that partitions the segment in a given ratio. G.GPE.6 (Introductory)

Math.Geo.03 Students will apply trigonometric principles to solve problems. (Focus)
Math.Geo.03.01 Students will 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.6 (Focus)
Math.Geo.03.02 Students will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.G.SRT.8 (Focus)
Math.Geo.03.03 Students will explain and use the relationship between the sine and cosine of complementary angles.G.SRT.7 (Foundational)
Math.Geo.03.04 Students will derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. G.SRT.9 (+) (Introductory)
(Math.Geo.03.05 Students will prove the Laws of Sines and Cosines and use them to solve problems.G.SRT.10 (+) (Introductory)
Math.Geo.03.06 Students will understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). G.SRT.11 (+) (Introductory)
Math.Geo.03.07 Students will use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi-x$, $\pi+x$, and $2\pi-x$ in terms of their values for x, where x is any real number. F.TF.3 (+) (Introductory)
Math.Geo.03.08 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.
Math.Geo.03.09 G-GPE.2 Students will derive the equation of a parabola given a focus and directrix. G-GPE.1 (Introductory)
Math.Geo.03.10 Students will derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. G-GPE.3(+) (Introductory)

Math.Geo.04 Students will identify, describe, and utilize properties of circles to find various measurements. (Focus)
Math.Geo.04.01 Students will 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.2 (Focus)
Math.Geo.04.02 Students will 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. G.C.5 (Focus)
Math.Geo.04.03 Students will prove that all circles are similar.G.C.1 (Foundational)
Math.Geo.04.04 Students will 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.1 (Foundational)
Math.Geo.04.05 Students will construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.G-CO.13 (Foundational)
Math.Geo.04.06 Students will construct the inscribed and circumscribed circles of a triangle, and prove

properties of angles for a quadrilateral inscribed in a circle.G-C.3 (Introductory)
Math.Geo.04.07 Students will 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.1 (Introductory)

Math.Geo.05 Students will apply area and volume formulas to two and three-dimensional figures. (Focus)

Math.Geo.05.01 Students will use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. G.GMD.3 (Focus)
Math.Geo.05.02 Students will 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.1 (Focus)
Math.Geo.05.03 Students will 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.A.1 (Foundational)
Math.Geo.05.04 Students will give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. G-GMD.2 (+) (Foundational)
Math.Geo.05.05 Students will identify the shapes of two-dimensional cross-sections of three dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.G.GMD.4 (Foundational)
Math.Geo.05.06 Students will 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.1(Foundational)
Math.Geo.05.07 Students will apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). G.MG.2 (Introductory)

Math.Geo.06 Students will be able to prove geometric relationships algebraically. (Focus)

Math.Geo.06.01 Students will 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.9 (Focus)
Math.Geo.06.02 Students will 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.10 (Focus)
Math.Geo.06.03 Students will 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. G.CO.11 (Foundational)
Math.Geo.06.04 Students will 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.4 (Focus)
Math.Geo.06.05 Students will use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. G.GPE.7 (Foundational)
Math.Geo.06.06 Students will 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.5 (Foundational)
Math.Geo.06.07 Students will 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.1(Introductory)
Math.Geo.06.08 Students will 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.12(Introductory)
Math.Geo.06.09 Students will construct a tangent line from a point outside a given circle to the circle.G-C.4 (+) (Introductory)
Math.Geo.06.10 Students will 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.1 (Introductory)
Math.Geo.06.11 Students will 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.2(Introductory)
Math.Geo.06.12 Students will 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.3(Introductory)
Math.Geo.06.13 Students will 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.4(Introductory)
Math.Geo.06.14 Students will 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. S.CP.5(Introductory)
Math.Geo.06.15 Students will 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.6 (Introductory)
Math.Geo.06.16 Students will 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.S.CP.7 (Introductory)
Math.Geo.06.17 Students will apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.S.CP.8 (+) (Introductory)
Math.Geo.06.18 Students will use permutations and combinations to compute probabilities of compound events.S.CP.9(+) (Introductory)
Math.Geo.06.19 Students will understand statistics as a process for making inferences about population

parameters based on a random sample from that population.S-IC.1 (Introductory)
Math.Geo.06.20 Students will decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. S-IC.2 (Introductory)
Math.Geo.06.21 Students will 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. S-IC.4 (Introductory)
Math.Geo.06.22 Students will recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.S-IC.B.3 (Introductory)
Math.Geo.06.23 Students will 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.B.4 (Introductory)
Math.Geo.06.24 Students will use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S-IC.B.5(Introductory)
Math.Geo.06.25 Students will evaluate reports based on data.S-IC.B.6(Introductory)
Math.Geo.06.26 Students will 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). Students will recognize possible associations and trends in the data. S-ID.B.5 (Introductory)
Math.Geo.06.27 Students will weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. S-MD.B.5(+)(Introductory)
Math.Geo.06.28 Students will analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game). S-MD.B.7 (Introductory)
Math.Geo.06.29 Students will understand, analyze, apply, and evaluate some common voting and analysis methods in addition to majority and plurality, such as runoff, approval, the so-called instant-runoff voting (IRV) method, the Borda method and the Condorcet method. N-Q.B.IA.3 (Introductory)

Discrete Math

Grade Level Standards and Components

Math.DM.01 Students will learn a variety of strategies to solve problems. (Focus)
Math.DM.01.01 Students will demonstrate inductive and Deductive Reasoning (Focus)
Math.DM.01.02 Students will use patterns to predict next term of a sequence. (Focus)
Math.DM.01.03 Students will use patterns to develop a nth term formula and use the formula to predict. (Focus)
Math.DM.01.04 Students will use a variety of methods (graphs, tables, pictures) to solve any mathematical application problem. (Focus)

Math.DM.02 Students will learn, perform, and apply operations using set notation. (Focus)
Math.DM.02.01 Students will understand Basic Property of Sets (defined, equal, equivalent, sets of numbers, etc). (Focus)
Math.DM.02.02 Students will understand properties of subsets and complements. (Focus)
Math.DM.02.03 Students will use Venn Diagrams(two-set and three-set) to draw sets and assist with the Intersection and Union of sets. (Focus)
Math.DM.02.04 Students will use Venn Diagrams and Set operations to solve applications involving sets Infinite Sets (Foundational).

Math.DM.03 Students will use logic to analyze statements, determine the validity of arguments and determine valid conclusions based on assumptions. (Focus)
Math.DM.03.01 Students will identify statements, connectives, and their symbolic form. (Focus)
Math.DM.03.02 Students will create and use truth tables to assess the truth value of a given statement (create truth tables for all five connectives). (Focus)
State equivalent forms of a conditional statement and the statements related to a conditional (converse, inverse, and contrapositive). (Focus)
Math.DM.03.03 Students will state equivalent forms of a conditional statement and the statements related to conditional (converse, inverse, and contrapositive). (Focus)
Math.DM.03.04 Students will use truth tables to assess the validity of an argument. (Focus)
Math.DM.03.05 Students will use Euler diagrams to assess the validity of an argument. (Focus)
Math.DM.03.06 Students will understand and apply elementary set theory and logic as used in simple Internet searches. (N-Q.C.IA.5)IA.5.(+) (Focus)

Math.DM.04 Students will learn about other numeration systems and how to convert numbers to and from base 10 and other bases. (Focus)
Math.DM.04.01 Students will identify the differences in Early Numeration systems and how they contributed to the system that we use today.(Focus)
Math.DM.04.02 Students will convert numbers in base 10 to other bases and vice versa.(Focus)
Math.DM.04.03 Students will perform arithmetic in different bases.(Focus)
Math.DM.04.04 Students will recognize number theory topics. (Introductory)

Math.DM.05 Students will learn modular arithmetic to solve equations and application problems. (Focus)

Math.DM.05.01 Students will determine if numbers are congruent to each in a modulus. (Focus)
Math.DM.05.02 Students will perform modular arithmetic.(Focus)
Math.DM.05.03 Students will solve a modulus congruence equation.(Focus)
Math.DM.05.04 Students will use modulus numbers to solve application problems. (Verify ISBN, UPC, cryptology) (Focus)
Math.DM.05.05 Students will describe the role of mathematics in information processing, particularly with respect to the Internet. (N-Q.C.IA.4) IA.4.(+) (Focus)
Math.DM.05.06 Students will understand and apply basic number theory, including modular arithmetic, for example, as used in keeping information secure through public-key cryptography. (N-Q.C.IA.6) IA. 6.(+) (Focus)
Math.DM.05.07 Students will recognize group theory. (Introductory)

Math.DM.06 Students will learn basic elements of graph theory and how they are used to solve application problems. (Focus)
Math.DM.06.01 Students will create a graph that models a table and use the graph to determine if there is a Euler Circuit, Euler path, Hamiltonian circuit, circuit, path, or none of the above listed. (Focus)
Math.DM.06.02 Students will use the Greedy Algorithm and the Edge picking Algorithm to determine the most efficient way through a graph. (Focus)
Math.DM.06.03 Students will find a planar drawing for a graph, if possible, or show why a graph can't have a planar representation. (Focus)
Math.DM.06.04 Students will use Euler's Formula to solve for a missing value. (Focus)
Math.DM.06.05 Students will use map coloring to find the chromatic number to answer application problems. (Focus)

Math.DM.07 Students will learn about the apportionment process and different voting methods to determine a winner. (Focus)
Math.DM.07.01 Students will use Hamilton and Jefferson methods to determine how representatives should be apportioned.(Focus)
Math.DM.07.02 Students will use Apportionment Principle and/or Huntington Hill number to determine who should get a representative fairly.(Focus)
Math.DM.07.03 Students will analyze results of a preference schedule with any of the four different voting methods to determine the winner (Plurality, Borda Count, Plurality with elimination,Pairwise-comparison) (Focus)
Math.DM.07.04 Students will use weighted voting system to determine possible winning coalitions and critical voters.
Math.DM.07.05 Students will calculate the Banzhaf Power Index to determine which voter has the power.(Focus)

Math.DM.08 Students will learn how to compute monthly payments and gains/losses within the context of credit card bills, consumer loans, stocks, bonds, and mortgages. (Focus)
Math.DM.08.01 Students will compute Simple Interest.(Focus)
Math.DM.08.02 Students will compute Compound Interest.(Focus)
Math.DM.08.03 Students will calculate interest, monthly payment, payoffs on credit cards and consumer loans. (Focus)
Math.DM.08.04 Students will calculate dividend yield and profit/loss in selling stock. (Focus)
Math.DM.08.05 Students will calculate interest on a bond. (Focus)
Math.DM.08.06 Students will calculate Net asset value and number of shares purchased in a Mutual

Fund. (Focus)
Math.DM.08.07 Students will calculate a down payment, mortgage payment, or loan payoff for a Home Loan. (Focus)

Math.DM.09 Students will learn how to calculate the number of ways in which certain events can occur, and the probability of those events occuring. (Focus)

Math.DM.09.01 Students will 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.A.1 (Focus)
Math.DM.09.02 Students will 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.A.3 (Focus)
Math.DM.09.03 Students will 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. S.CP.B.7 (Focus)
Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model. S.CP.B.8(+) (Focus)
Math.DM.09.04 Students will use permutations and combinations to compute probabilities of compound events and solve problems (Focus) S.CP.B.9(+)
Math.DM.09.05 Students will recognize and explain the concepts of conditional probability and
Math.DM.09.06 Students will demonstrate independence in everyday language and everyday situations (Foundational) S.CP.A.5
Math.DM.09.07 Students will weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values. (Introductory) S.MD.B.5(+)

Math.DM.10 Students will learn basic measures of central tendency, spread, and position. (Focus)

Math.DM.10.01 Students will 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. S.ID.A.2 (Focus)
Math.DM.10.02 Students will interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). S.ID.A.3 (Focus)
not appropriate.
Math.DM.10.03 Students will 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. (Focus) S.ID.A.4
Math.DM.10.04 Students will represent data on two quantitative variables on a scatter plot, and describe how the variables are related. (Introductory) S.ID.B.6
Math.DM.10.05 Students will compute (using technology) and interpret the correlation coefficient of a linear fit. (Introductory),. S.ID.C.8

Probability and Statistics

Grade Level Standards and Components

Math.PS.01 Students will Interpret Categorical and Quantitative Data (Focus)

Math.PS.01.01 Students will summarize, represent, and interpret data on a single count or measurement variable.

Math.PS.01.02 Students will summarize, represent, and interpret data on two categorical and quantitative variables.

Math.PS.01.03 Students will interpret linear models.

Math.PS.02 Students will make Inferences and justifying conclusions. (Focus)

Math.PS.02.01 Students will understand and evaluate random processes underlying statistical experiments.

Math.PS.02.02 Students will take inferences and justify conclusions from sample surveys, experiments and observational studies.

Math.PS.03 Students will demonstrate an understanding of conditional probability and the rules of probability and use probability to make decisions. (Focus)

Math.PS.03.01 Students will understand independence and conditional probability and use them to interpret data.

Math.PS.03.02 Students will use the rules of probability to compute probabilities of compound events in a uniform probability model.

Math.PS.03.03 Students will calculate expected values and use them to solve problems

Math.PS.03.04 Students will use probability to evaluate outcomes of decisions.

AP Calculus AB

Grade Level Standards and Components

Math.CalcAB.01 Students will use limits to understand the behavior of functions and apply this concept to derivatives and integrals (Focus)

Math.CalcAB.01.02 Students will, when, given a function f, the limit of f(x) as x approaches c is a real number R if f(x) can be made arbitrarily close to R by taking x sufficiently close to c (but not equal to c).

If the limit exists and is a real number, then the common notation is $\lim_{x \to c} f(x) = R$. EK 1.1A1 (Focus)

Math.CalcAB.01.03 Students will demonstrate understanding that the concept of a limit can be extended to include one-sided limits, limits at infinity, and infinite limits.EK 1.1A2 (Focus)

Math.CalcAB.01.04 Students will demonstrate that a limit might not exist for some functions at particular values of x. Some ways that the limit might not exist are if the function is unbounded, if the function is oscillating near this value, or if the limit from the left does not equal the limit from the right.EK 1.1A3 (Focus)

Math.CalcAB.01.05 tudents will demontrate that asymptotic and unbounded behavior of functions can be explained and described using limits.EK 1.1D1 (Focus)

Math.CalcAB.01.06 Students will demonstrate that limits of sums, differences, products, quotients, and composite functions can be found using the basic theorems of limits and algebraic rules.EK 1.1C1 (Focus)

Math.CalcAB.01.07 Students will demonstrate that the limit of a function may be found by using algebraic manipulation, alternate forms of trigonometric functions, or the squeeze theorem. EK 1.1C2 (Focus)

Math.CalcAB.01.08 Students will demonstrate that limits of the indeterminate forms $\frac{0}{0}$ and $\frac{\infty}{\infty}$ may be evaluated using L'Hospital's Rule.EK 1.1C3 (Focus)

Math.CalcAB.01.09 Students will demontrate that asymptotic and unbounded behavior of functions can be explained and described using limits.EK 1.1D1 (Focus)

Math.CalcAB.01.10 Students will demonstrate relative magnitudes of functions and their rates of change can be compared using limits.EK 1.1D2 (Focus)

A function f is continuous at x=c provided that f(c) exists, $\lim_{x \to c} f(x)$ exists, and $\lim_{x \to c} f(x) = f(c)$. EK 1.2A1 (Focus)

Math.CalcAB.01.11 Students will demonstrate polynomial, rational, power, exponential, logarithmic, and trigonometric functions are continuous at all points in their domains.EK 1.2A2 (Focus)

Math.CalcAB.01.12 Students will demonstrate types of discontinuities include removable discontinuities, jump discontinuities, and discontinuities due to vertical asymptotes.EK 1.2A3 (Focus)

Math.CalcAB.01.13 Students will demonstrate that continuity is an essential condition for theorems such as the Intermediate Value Theorem, the Extreme Value Theorem, and the Mean Value Theorem .EK 1.2B1(Focus)

Math.CalcAB.02 Students will demonstrate conceptual understanding of the derivative in multiple ways and use notation accurately. (Focus)

Math.Calc.AB.02.01 Students will demonstrate understanding that difference quotients $\frac{f(a+h)-f(a)}{h}$ and $\frac{f(x)-f(a)}{x-a}$ express the average rate of change of a function over an interval. EK 2.1A1 (Focus)

Math.Calc.AB.02.02 Students will demonstrate understanding the instantaneous rate of change of a function at a point can be expressed by $\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}$ or $\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$, provided that the limit exists. These are common forms of the definition of the derivative and are denoted f'(a).EK 2.1A2 (Focus)

Math.Calc.AB.02.03 Students will demonstrate understanding the derivative of f is the function whose value at x is $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ provided this limit exists.EK 2.1A3 (Focus)

Math.Calc.AB.02.04 Students will demonstrate understanding for y=f(x), notations for the derivative include $\frac{dy}{dx}$, f'(x), and y'.EK 2.1A4 (Focus)

Math.Calc.AB.02.05 Students will demonstrate understanding of the derivative can be represented graphically, numerically, analytically, and verbally.EK 2.1A5 (Focus)

Math.Calc.AB.02.06 Students will demonstrate understanding the derivative at a point can be estimated from information given in tables or graphs.EK 2.1B1 (Focus)

Math.Calc.AB.02.07 Students will demonstrate understanding of direct application of the definition of the derivative can be used to find the derivative for selected functions, including polynomial, power, sine, cosine, exponential, and logarithmic functions.EK 2.1C1 (Focus)

Math.Calc.AB.02.08 Students will demonstrate understanding that higher order derivatives are represented with a variety of notations. For y=f(x), notations for the second derivative include $\frac{d^2y}{dx^2}$, f''(x) and y''. Higher order derivatives can be denoted $\frac{d^ny}{dx^n}$ or $f^{(n)}(x)$ .EK 2.1D2 (Focus)

Math.Calc.AB.02.09 Students will demonstrate understanding that key features of functions and their derivatives can be identified and related to their graphical, numerical, and analytical representations.EK 2.2A2 (Focus)

Math.Calc.AB.02.10 Students will demonstrate understanding that key features of the graphs of f, f', and f'' are related to one another.EK 2.2A3 (Focus)

Math.Calc.AB.02.11 Students will demonstrate understanding that a continuous function may fail to be differentiable at a point in its domain.EK 2.2B1 (Focus)

Math.Calc.AB.02.12 Students will demonstrate understanding that iIf a function is differentiable at a point, then it is continuous at that point.EK 2.2B2 (Focus)

Math.Calc.AB.02.13 Students will demonstrate understanding that the unit for f'(x) is the unit for f divided by the unit for x. EK 2.3A1 (Focus)

Math.CalcAB.03 Students will calculate derivatives using multiple strategies. (Focus)

Math.CalcAB.03.01 Students will demonstrate understanding that specific rules can be used to calculate derivatives for classes of functions, including polynomial, rational, power, exponential, logarithmic, trigonometric, and inverse trigonometric. EK 2.1C2: (Focus)

Math.CalcAB.03.02 Students will demonstrate that sums, differences, products, and quotients of functions can be differentiated using derivative rules. EK 2.1C3 (Focus)

Math.CalcAB.03.03 Students will demonstrate that the chain rule provides a way to differentiate composite functions.EK 2.1C4 (Focus)

Math.CalcAB.03.04 Students will demonstrate that the chain rule is the basis for implicit differentiation. (EK 2.1C5 (Focus)

Math.CalcAB.03.05 Students will demonstrate that the chain rule can be used to find the derivative of an inverse function, provided the derivative of that function exists. EK 2.1C6 (Focus)

Math.CalcAB.03.06 Students will demonstrate understanding that differentiating f′ produces the second derivative f'', provided the derivative of f' exists; repeating this process produces higher order derivatives of f. EK 2.1D1 (Focus)

Math.CalcAB.03.07 Students will calculate the hyperbolic trigonometric functions 1. Define the hyperbolic trigonometric functions 2. State the geometrical interpretation of the hyperbolic functions 3. Calculate derivatives and anti-derivatives of the hyperbolic functions 4. Calculate derivatives and anti-derivatives of the inverse hyperbolic functions (Introductory)

Math.CalcAB.04 Students will apply the concept and computation of the derivative to problem situations and connect those applications to limits and integrals. (Focus)

Math.CalcAB.04.01 Students will demonstrate that the first and second derivatives of a function can provide information about the function and its graph including intervals of increase or decrease, local (relative) and global (absolute) extrema, intervals of upward or downward concavity, and points of inflection.EK 2.2A1 (Focus)

Math.CalcAB.04.02 Students will demonstrate an understanding that the derivative of a function can be interpreted as the instantaneous rate of change with respect to its independent variable.EK 2.3A2 (Focus)

Math.CalcAB.04.03 Students will demonstrate that the derivative at a point is the slope of the line tangent to a graph at that point on the graph.EK 2.3B1 (Focus)

Math.CalcAB.04.04 Students will know the tangent line is the graph of a locally linear approximation of the function near the point of tangency.EK 2.3B2 (Focus)

Math.CalcAB.04.05 Students will demonstrate the derivative can be used to solve rectilinear motion problems involving position, speed, velocity, and acceleration.EK 2.3C1 (Focus)

Math.CalcAB.04.06 Students will demonstrate the derivative can be used to solve related rates problems, that is, finding a rate at which one quantity is changing by relating it to other quantities whose rates of change are known.EK 2.3C2 (Focus)

Math.CalcAB.04.07 Students will demonstrate the derivative can be used to solve optimization problems, that is, finding a maximum or minimum value of a function over a given interval.EK 2.3C3 (Focus)

Math.CalcAB.04.08 Students will demonstrate the derivative can be used to express information about rates of change in applied contexts.EK 2.3D1 (Focus)

Math.CalcAB.04.09 Students will If know a function f is continuous over the interval [a,b] and differentiable over the interval (a,b), the Mean Value Theorem guarantees a point within that open interval where the instantaneous rate of change equals the average rate of change over the interval.EK

2.4A1 (Focus)

Math.CalcAB.05 Students will demonstrate a conceptual understanding of integrals using a variety of strategies and contexts and appropriately use notation. (Focus)

Math.CalcAB.05.01 Students will demonstrate an antiderivative of a function EK 3.1A1 (Focus)
F is a function g whose derivative is f. A Riemann sum, which requires a partition of an interval I, is the sum of products, each of which is the value of the function at a point in a subinterval multiplied by the length of that subinterval of the partition.EK 3.2A1 (Focus)

Math.CalcAB.05.02 Students will demonstrate the definite integral of a continuous function f over the interval [a,b], denoted by $\int_a^b f(x)dx$, is the limit of Riemann sums as the widths of the subintervals approach 0. That is,

$$\int_a^b f(x)dx = \lim_{\max \Delta x_i \to 0} \sum_{i=1}^{n} f\left(x_i^*\right)\Delta x_i$$

where x_i^* is a value in the i th subinterval, Δx_i is the width of the ith subinterval, n is the number of subintervals, and $\max \Delta x_i$ is the width of the largest subinterval. Another form of the definition is

$$\int_a^b f(x)dx = \lim_{n\to\infty} \sum_{i=1}^{n} f\left(x_i^*\right)\Delta x_i,$$

Math.CalcAB.05.03 Students will demonstrate $\Delta x_i = \frac{b-a}{n}$ and x_i^* is a value in the ith subinterval.EK 3.2A2 (Focus)

Math.CalcAB.05.04 Students will demonstrate the information in a definite integral can be translated into the limit of a related Riemann sum, and the limit of a Riemann sum can be written as a definite integral.EK 3.2A3 (Focus)

Math.CalcAB.05.05 Students will demonstrate definite integrals can be approximated for functions that are represented graphically, numerically, algebraically, and verbally.EK 3.2B1 (Focus)

Math.CalcAB.05.06 Students will demonstrate definite integrals can be approximated using a left Riemann sum, a right Riemann sum, a midpoint Riemann sum, or a trapezoidal sum; approximations can be computed using either uniform or nonuniform partitions.EK 3.2B2 (Focus)

Math.CalcAB.05.07 Students will demonstrate in some cases, a definite integral can be evaluated by using geometry and the connection between the definite integral and area.EK 3.2C1 (Focus)

Math.CalcAB.05.08 Students will demonstrate properties of definite integrals include the integral of a constant times a function, the integral of the sum of two functions, reversal of limits of integration, and the integral of a function over adjacent intervals.EK 3.2C2 (Focus)

Math.CalcAB.05.09 Students will demonstrate the definition of the definite integral may be extended to functions with removable or jump discontinuities.EK 3.2C3 (Focus)

The definite integral can be used to define new functions; for example, $f(x)=\int_0^x e^{-t^2}dt$ .EK 3.3A1

Math.CalcAB.05.10 Students will demonstrate if it is a continuous function on the interval [a,b], then $\frac{d}{dx}\left(\int_a^x f(t)dt\right)=f(x)$, where x is between a and b. EK 3.3A2(Focus)

Math.CalcAB.05.11 Students will demonstrate graphical, numerical, analytical, and verbal representations of a function f provide information about the function g defined as $g(x)=\int_a^x f(t)dt$ .EK 3.3A3 (Focus)

Math.CalcAB.05.12 Students will demonstrate the function defined by $F(x)=\int_a^x f(t)dt$ is an antiderivative of f.K 3.3B1 (Focus)
Math.CalcAB.05.13 Students will demonstrate if f is continuous on the interval [a,b] and F is an antiderivative of f, then $\int_a^b f(x)dx = F(b)-F(a)$.EK 3.3B2 (Focus)

Math.CalcAB.05.14 Students will demonstrate the notation $\int f(x)dx = F(x)+C$ means that $F'(x)=f(x)$, and $\int f(x)dx$ is called an indefinite integral of the function f.EK 3.3B3 (Focus)
The limit of an approximating Riemann sum can be interpreted as a definite integral.EK 3.4A3 (Focus)

Math.CalcAB.05.15 Students will demonstrate the function F defined by $F(x)=c+\int_a^x f(t)dt$ is a general solution to the differential equation $\frac{dy}{dx}=f(x)$ and $F(x)=y_0+\int_a^x f(t)dt$ is a particular solution to the differential equation $\frac{dy}{dx}=f(x)$ satisfying $F(a)=y_0$.,EK 3.5A4 (Focus)

Math.CalcAB.06 Students will calculate integrals using a variety of strategies, and use the Fundamental Theorem of Calculus to make connections between differentiation and integration. (Focus)

Math.CalcAB.06.01 Students will demonstrate differentiation rules provide the foundation for finding antiderivatives. EK 3.1A2 (Focus)
Solutions to differential equations are functions or families of functions. EK 2.3E1 (Focus)
Math.CalcAB.06.02 Students will demonstrate understanding that derivatives can be used to verify that a function is a solution to a given differential equation. EK 2.3E2(Focus)
Math.CalcAB.06.03 Students will know many functions do not have closed form antiderivatives.EK 3.3B4 (Focus)
Math.CalcAB.06.04 Students will demonstrate techniques for finding antiderivatives include algebraic manipulation such as long division and completing the square, and substitution of variables. EK 3.3B5 (Focus)
Math.CalcAB.06.05 Students will demonstrate that antidifferentiation can be used to find specific solutions to differential equations with given initial conditions, including applications to motion along a line, and exponential growth and decay.EK 3.5A1 (Focus)
Math.CalcAB.06.06 Students will demonstrate that some differential equations can be solved by separation of variables.EK 3.5A2: (Focus)
Math.CalcAB.06.07 Students will know that solutions to differential equations may be subject to domain restrictions.
Math.CalcAB.06.08 Students will calculate the hyperbolic trigonometric functions 1. Define the hyperbolic trigonometric functions 2. State the geometrical interpretation of the hyperbolic functions 3. Calculate derivatives and anti-derivatives of the hyperbolic functions 4. Calculate derivatives and anti-derivatives of the inverse hyperbolic functions. EK 3.5A3 (Introductory)

Math.CalcAB.07 Students will use integrals to solve application problems, and use the Fundamental Theorem of Calculus to make connections between differentiation and integration. (Focus)

Math.CalcAB.07.01 Students will demonstrate that a function defined as an integral represents an accumulation of a rate of change.EK 3.4A1 (Focus)

Math.CalcAB.07.02 Students will demonstrate the definite integral of the rate of change of a quantity over an interval gives the net change of that quantity over that interval.EK 3.4A2 (Focus)

Math.CalcAB.07.03 Students will demonstrate antidifferentiation can be used to find specific solutions to differential equations with given initial conditions, including applications to motion along a line, and exponential growth and decay.EK 3.5A1 (Focus)

Math.CalcAB.07.04 Students will demonstrate areas of certain regions in the plane can be calculated with definite integrals.EK 3.4D1 (Focus)

Math.CalcAB.07.05 Students will demonstrate slope fields provide visual clues to the behavior of solutions to first order differential equations. EK 2.3F1 (Focus)

Math.CalcAB.07.06 Students will demonstrate volumes of solids with known cross sections, including discs and washers, can be calculated with definite integrals.EK 3.4D2 (Focus)

Math.CalcAB.07.07 Students will demonstrate the definite integral can be used to express information about accumulation and net change in many applied contexts.EK 3.4E1 (Focus)

Math.CalcAB.07.08 Students will demonstrate the average value of a function f over an interval [a,b] is $\frac{1}{b-a}\int_a^b f(x)dx$ .EK 3.4B1 (Focus)

Math.CalcAB.07.09 Students will demonstrate that for a particle in rectilinear motion over an interval of time, the definite integral of velocity represents the particle's displacement over the interval of time, and the definite integral of speed represents the particle's total distance traveled over the interval of time.EK 3.4C1 (Focus)

Math.CalcAB.07.10 Students will demonstrate the model for exponential growth and decay that arises from the statement "The rate of change of a quantity is proportional to the size of the quantity" is $\frac{dy}{dt} = ky$ .EK 3.5B1 (Focus)

AP Calculus BC

Grade Level Standards and Components

Math.CalcBC.01 Students will use limits to understand the behavior of functions and apply this concept to derivatives and integrals (Focus)

Math.CalcBC.01.01 Students will, when given a function f, the limit of f(x) as x approaches c is a real number R if f(x) can be made arbitrarily close to R by taking x sufficiently close to c (but not equal to c).

If the limit exists and is a real number, then the common notation is $\lim_{x \to c} f(x) = R$ (Focus).

Math.CalcBC.01.01 Students will demonstrate the concept of a limit can be extended to include one-sided limits, limits at infinity, and infinite limits. (Focus).

Math.CalcBC.01.02 Students will know that a limit might not exist for some functions at particular values of x. Some ways that the limit might not exist are if the function is unbounded, if the function is oscillating near this value, or if the limit from the left does not equal the limit from the right. (Focus).

Math.CalcBC.01.03 Students will know numerical and graphical information can be used to estimate limits

Limits of sums, differences, products, quotients, and composite functions can be found using the basic theorems of limits and algebraic rules. (Focus).

Math.CalcBC01.04 Students will demonstrate that the limit of a function may be found by using algebraic manipulation, alternate forms of trigonometric functions, or the squeeze theorem. (Focus).

Math.CalcBC.01.05 Students will demonstrate limits of the indeterminate forms $\frac{0}{0}$ and $\frac{\infty}{\infty}$ may be evaluated using L'Hospital's Rule. (Focus).

Math.CalcBC.01.06 Students will demonstrate an understanding that symptotic and unbounded behavior of functions can be explained and described using limits. (Focus).

MathCalcBC.01.07 Students will know relative magnitudes of functions and their rates of change can be compared using limits. (Focus).

Math.CalcBC.01.08 Students will describe that the function f is continuous at x=c provided that f(c) exists, $\lim_{x \to c} f(x)$ exists, and $\lim_{x \to c} f(x) = f(c)$. (Focus).

Math.CalcBC.01.09 Students will know that Polynomial, rational, power, exponential, logarithmic, and trigonometric functions are continuous at all points in their domain. (Focus).

Math.CalcBC.01.10 Students will demonstrate that types of discontinuities include removable discontinuities, jump discontinuities, and discontinuities due to vertical asymptotes. (Focus).

Math.CalcBC.01.11 Students will know that continuity is an essential condition for theorems such as the ,Intermediate Value Theorem, the Extreme Value Theorem, and the Mean Value Theorem. (Focus).

Math.CalcBC.02 Students will demonstrate conceptual understanding of the derivative in multiple ways and use notation accurately. (Focus).

Math.CalcBC.02.01 Students will know the difference quotients $\frac{f(a+h)-f(a)}{h}$ and $\frac{f(x)-f(a)}{x-a}$ express the average rate of change of a function over an interval. (Focus)

Math. CalcBC.02.02 Students will know the instantaneous rate of change of a function at a point can be expressed by $\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}$ or $\lim_{x\to a}\frac{f(x)-f(a)}{x-a}$, provided that the limit exists. These are common forms of the definition of the derivative and are denoted f'(a) (Focus)

Math. CalcBC.02.03 Students will calculate the hyperbolic trigonometric functions 1. Define the hyperbolic trigonometric functions 2. State the geometrical interpretation of the hyperbolic functions 3. Calculate derivatives and antiderivatives of the hyperbolic functions 4. Calculate derivatives and antiderivatives of the inverse hyperbolic functions. (Introductory)

Math.CalcBC.03 Students will calculate derivatives using multiple strategies. (Focus)

Math. Calc.AB.03.01 Students will demonstrate the derivative of f is the function whose value at x is $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ provided this limit exists. For y=f(x), notations for the derivative include $\frac{dy}{dx}$, f'(x), and y'. (Focus)

Math. CalcBC.03.02 Students will know the derivative can be represented graphically, numerically, analytically, and verbally. (Focus)

Math. CalcBC.03.03 Students will know the derivative at a point can be estimated from information given in tables or graphs. (Focus)

Math. CalcBC.03.04 Students will know the direct application of the definition of the derivative can be used to find the derivative for selected functions, including polynomial, power, sine, cosine, exponential, and logarithmic functions. (Focus)

Math. CalcBC.03.05 Students will know the higher order derivatives are represented with a variety of notations. For y=f(x), notations for the second derivative include $\frac{d^2y}{dx^2}$, f''(x) and y''. Higher order derivatives can be denoted $\frac{d^ny}{dx^n}$ or $f^{(n)}(x)$.(Focus)

Math. CalcBC.03.06 Students will know the key features of functions and their derivatives can be identified and related to their graphical, numerical, and analytical representations. (Focus)

Math. CalcBC.03.07 Students will know the key features of the graphs of f, f', and f'' are related to one another.(Focus)

Math. CalcBC.03.08 Students will know the the chain rule provides a way to differentiate composite functions.(Focus)

Math. CalcBC.03.09 Students will know the the chain rule is the basis for implicit differentiation.(Focus)

Math. CalcBC.03.10 Students will know the the chain rule can be used to find the derivative of an inverse function, provided the derivative of that function exists.(Focus)

Math. CalcBC.03.11 Students will know the methods for calculating derivatives of real-valued functions

can be extended to vector-valued functions, parametric functions, and functions in polar coordinates.(Focus)
Math. CalcBC.03.12 Students will know the differentiating f′ produces the second derivative f'', provided the derivative of f' exists; repeating this process produces higher order derivatives of f.(Focus)

Math.CalcBC.04 Students will apply the concept and computation of the derivative to problem situations and connect those applications to limits and integrals. (Focus)

Math.CalcBC.04.01 Students will demonstrate first and second derivatives of a function can provide information about the function and its graph including intervals of increase or decrease, local (relative) and global (absolute) extrema, intervals of upward or downward concavity, and points of inflection. (Focus)
Math.CalcBC.04.02 Students will demonstrate the derivative of a function can be interpreted as the instantaneous rate of change with respect to its independent variable. (Focus)
Math.CalcBC.04.03 Students will demonstrate the derivative at a point is the slope of the line tangent to a graph at that point on the graph.(Focus)
Math.CalcBC.04.04 Students will demonstrate the tangent line is the graph of a locally linear approximation of the function near the point of tangency.(Focus)
Math.CalcBC.04.05 Students will demonstrate the derivative can be used to solve rectilinear motion problems involving position, speed, velocity, and acceleration.(Focus)
Math.CalcBC.04.06 Students will demonstrate the derivative can be used to solve related rates problems, that is, finding a rate at which one quantity is changing by relating it to other quantities whose rates of change are known.(Focus)
Math.CalcBC.04.07 Students will demonstrate the derivative can be used to solve optimization problems, that is, finding a maximum or minimum value of a function over a given interval.(Focus)
Math.CalcBC.04.08 Students will demonstrate derivatives can be used to determine velocity, speed, and acceleration for a particle moving along curves given by parametric or vector-valued functions.(Focus)
Math.CalcBC.04.09 Students will demonstrate derivatives can be used to express information about rates of change in applied contexts.(Focus)
Math.CalcBC.04.10 Students will demonstrate for differential equations, Euler's method provides a procedure for approximating a solution or a point on a solution curve.(Focus)
Math.CalcBC.04.11 Students will demonstrate if a function f is continuous over the interval [a,b] and differentiable over the interval (a,b), the Mean Value Theorem guarantees a point within that open interval where the instantaneous rate of change equals the average rate of change over the interval. (Focus)

Math.CalcBC.05 Students will demonstrate a conceptual understanding of integrals using a variety of strategies and contexts and appropriately use notation. (Focus)

Math.CalcBC.05.01 Students will know an antiderivative of a function F is a function g whose derivative is f. (Focus)
Math.CalcBC.05.02 Students will know a Riemann sum, which requires a partition of an interval I, is the sum of products, each of which is the value of the function at a point in a subinterval multiplied by the length of that subinterval of the partition.(Focus)
Math.CalcBC.05.03 Students will know the definite integral of a continuous function f over the interval [a,b], denoted by $\int_a^b f(x)dx$, is the limit of Riemann sums as the widths of the subintervals approach 0. That is,

where x_i^* is a value in the i th subinterval, Δx_i is the width of the ith subinterval, n is the number of subintervals, and $\max \Delta x_i$ is the width of the largest subinterval. Another form of the definition is

$$\int_a^b f(x)dx = \lim_{n\to\infty} \sum_{i=1}^{n} f\left(x_i^*\right)\Delta x_i,$$ (Focus)

Where $\Delta x_i = \frac{b-a}{n}$ and x_i^* is a value in the ith subinterval. (Focus)

Math.CalcBC.05.04 Students will know the information in a definite integral can be translated into the limit of a related Riemann sum, and the limit of a Riemann sum can be written as a definite integral. (Focus)

Math.CalcBC.05.05 Students will know definite integrals can be approximated for functions that are represented graphically, numerically, algebraically, and verbally. (Focus)

Math.CalcBC.05.06 Students will know definite integrals can be approximated using a left Riemann sum, a right Riemann sum, a midpoint Riemann sum, or a trapezoidal sum; approximations can be computed using either uniform or nonuniform partitions. (Focus)

Math.CalcBC.05.07 Students will know in some cases, a definite integral can be evaluated by using geometry and the connection between the definite integral and area.(Focus)

Math.CalcBC.05.08 Students will know properties of definite integrals include the integral of a constant times a function, the integral of the sum of two functions, reversal of limits of integration, and the integral of a function over adjacent intervals.(Focus)

Math.CalcBC.05.09 Students will know

Math.CalcBC.05.10 Students will know the definition of the definite integral may be extended to functions with removable or jump discontinuities.(Focus)

Math.CalcBC05.11 Students will know an improper integral is an integral that has one or both limits infinite or has an integrand that is unbounded in the interval of integration.(Focus)

Math.CalcBC.05.12 Students will know the definite integral can be used to define new functions; for example, $f(x)=\int_0^x e^{-t^2}dt$.(Focus)

Math.CalcBC.05.13 Students will know if is a continuous function on the interval [a,b], then $\frac{d}{dx}\left(\int_a^x f(t)dt\right)=f(x)$, where x is between a and b. (Focus)

Math.CalcBC.05.14 Students will know graphical, numerical, analytical, and verbal representations of a function f provide information about the function g defined as $g(x)=\int_a^x f(t)dt$.(Focus)

Math.CalcBC.05.15 Students will know the function defined by $F(x)=\int_a^x f(t)dt$ is an antiderivative of f. (Focus)

Math.CalcBC.05.16 Students will know if f is continuous on the interval [a,b] and F is an antiderivative of f, then $\int_a^b f(x)dx = F(b)-F(a)$. (Focus)

Math.CalcBC.05.17 Students will know the notation $\int f(x)dx = F(x)+C$ means that $F'(x)=f(x)$, and $\int f(x)dx$ is called an indefinite integral of the function f. (Focus)

Math.CalcBC.05.18 Students will know the limit of an approximating Riemann sum can be interpreted as

a definite integral. (Focus)**EK 3.5A4**: The function F defined by $F(x) = c + \int_a^x f(t)dt$ is a general solution to the differential equation $F(x) = y_0 + \int_a^x f(t)dt$ is a particular solution to the differential equation $\frac{dy}{dx} = f(x)$ satisfying $F(a) = y_0$.(Focus)

Math.CalcBC.06 Students will calculate integrals using a variety of strategies, and use the Fundamental Theorem of Calculus to make connections between differentiation and integration.

Math.CalcBC.06.01 Students will know differentiation rules provide the foundation for finding antiderivatives. (Focus)
Math.CalcBC.06.02 Students will know solutions to differential equations are functions or families of functions.(Focus)
Math.CalcBC.06.03 Students will know derivatives can be used to verify that a function is a solution to a given differential equation.(Focus)
Math.CalcBC.06.04 Students will know improper integrals can be determined using limits of definite integrals.(Focus)
Math.CalcBC.06.05 Students will know many functions do not have closed form antiderivatives.(Focus)
Math.CalcBC.06.06 Students will know techniques for finding antiderivatives include algebraic manipulation such as long division and completing the square, substitution of variables, (BC) integration by parts, and non-repeating linear partial fractions.(Focus)
Math.CalcBC06.07 Students will know more techniques for finding antiderivatives: powers of sine and cosine, powers of secant and tangent, Trigonometric substitution. (Focus)
Math.CalcBC.06.08 Students will know given initial conditions, including applications to motion along a line, and exponential growth and decay. (Focus)
Math.CalcBC.06.09 Students will know some differential equations can be solved by separation of variables. (Focus)
Math.CalcBC.06.10 Students will know solutions to differential equations may be subject to domain restrictions.
Math.CalcBC.06.11 Students will calculate the hyperbolic trigonometric functions (Introductory)
1. Define the hyperbolic trigonometric functions
2. State the geometrical interpretation of the hyperbolic functions
3. Calculate derivatives and anti-derivatives of the hyperbolic functions
4. Calculate derivatives and anti-derivatives of the inverse hyperbolic functions
Math.CalcBC.06.12 Students will know techniques for finding antiderivatives: using all partial fractions, using tables and other miscellaneous techniques. (Introductory)

Math.CalcBC.07 Students will use integrals to solve application problems, and use the Fundamental Theorem of Calculus to make connections between differentiation and integration. (Focus)

Math.CalcBC.07.01 Students will know a function defined as an integral represents an accumulation of a rate of change.(Focus)

Math.CalcBC.07.02 Students will know the definite integral of the rate of change of a quantity over an interval gives the net change of that quantity over that interval.(Focus)
Math.CalcBC.07.03 Students will know the definite integral can be used to determine displacement, distance, and position of a particle moving along a curve given by parametric or vector-valued functions.(Focus)
Math.CalcBC.07.04 Students will know antidifferentiation can be used to find specific solutions to differential equations with given initial conditions, including applications to motion along a line, exponential growth and decay, (BC) and logistic growth.(Focus)
Math.CalcBC07.05 Students will know areas of certain regions in the plane can be calculated with definite integrals. (BC) Areas bounded by polar curves can be calculated with definite integrals.(Focus)
Math.CalcBC.07.06 Students will know volumes of solids with known cross sections, including discs and washers, can be calculated with definite integrals. (Focus)
Math.CalcBC.07.07 Students will know the length of a planar curve defined by a function or by a parametrically defined curve can be calculated using a definite integral. (Focus)
Math.CalcBC.07.08 Students will know slope fields provide visual clues to the behavior of solutions to first order differential equations. (Focus)
Math.CalcBC07.09 Students will know the definite integral can be used to express information about accumulation and net change in many applied contexts.(Focus)
Math.CalcBC.07.10 Students will know the average value of a function f over an interval [a,b] is $\frac{1}{b-a}\int_a^b f(x)dx$. (Focus)
Math.CalcBC.07.11 Students will know for a particle in rectilinear motion over an interval of time, the definite integral of velocity represents the particle's displacement over the interval of time, and the definite integral of speed represents the particle's total distance traveled over the interval of time. (Focus)
Math.CalcBC.07.12 Students will know the model for exponential growth and decay that arises from the statement "The rate of change of a quantity is proportional to the size of the quantity" is $\frac{dy}{dt} = ky$. (Focus)
Math.CalcBC.07.13 Students will know the model for logistic growth that arises from the statement "The rate of change of a quantity is jointly proportional to the size of the quantity and the difference between the quantity and the carrying capacity" is $\frac{dy}{dt} = ky(a-y)$. (Focus)
Math.CalcBC.07.14 Students will know volumes of solids with known cross sections, including shells, can be calculated with definite integrals.(Introductory)
Math.CalcBC.07.15 Students will know use an integral to calculate work done by a variable force.(Introductory)
Math.CalcBC.07.16 Students will know use integrals to calculate moments and center of mass of a planar lamina. (Introductory)

Math.CalcBC.08 Students will determine the convergence or divergence of infinite series, and use the interval of convergence of power series to represent functions. (Focus)

Math.CalcBC.08.01 Students will know an infinite series of numbers converges to a real number S (or has sum S), if and only if the limit of its sequence of partial sums exists and equals S. (Focus)
Math.CalcBC.08.02 Students will know a common series of numbers include geometric series, the harmonic series, and p-series. (Focus)
MathCalcBC.08.03 Students will know a series may be absolutely convergent, conditionally convergent, or divergent. (Focus)
Math.CalcBC.08.04 Students will know if a series converges absolutely, then it converges.(Focus)
Math.CalcBC.08.05 Students will know in addition to examining the limit of the sequence of partial sums

of the series, methods for determining whether a series of numbers converges or diverges are the nth term test, the comparison test, the limit comparison test, the integral test, the ratio test, and the alternating series test.(Focus)
Math.CalcBC.08.06 Students will know if a is a real number and r is a real number such that $|r| < 1$, then the geometric series. (Focus)
Math.CalcBC.08.07 Students will know if an alternating series converges by the alternating series test, then the alternating series error bound can be used to estimate how close a partial sum is to the value of the infinite series. (Focus)
Math.CalcBC.08.08 Students will know iIf a series converges absolutely, then any series obtained from it by regrouping or rearranging the terms has the same value. (Focus)
Math.CalcBC.08.09 Students will know the coefficient of the nth-degree term in a Taylor polynomial centered at x=a for the function f is $\frac{f^{(n)}(a)}{n!}$. (Focus)
Math.CalcBC.08.10 Students will know taylor polynomials for a function f centered at x=a can be used to approximate function values of f near x=a. (Focus)
Math.CalcBC.08.11 Students will know in many cases, as the degree of a Taylor polynomial increases, the nth-degree polynomial will converge to the original function over some interval. (Focus)
Math.CalcBC.08.12 Students will know the Lagrange error bound can be used to bound the error of a Taylor polynomial approximation to a function. (Focus)
Math.CalcBC.08.13 Students will know in some situations where the signs of a Taylor polynomial are alternating, the alternating series error bound can be used to bound the error of a Taylor polynomial approximation to the function. (Focus)
Math.CalcBC.08.14 Students will know a power series is a series of the form where n is a non-negative integer, $\{a_n\}$ is a sequence of real numbers, and r is a real number. (Focus)
Math.CalcBC.08.15 Students will know the Maclaurin series for sin(x), cos(x), and e^x provide the foundation for constructing the Maclaurin series for other functions. (Focus)
Math.CalcBC.08.16 Students will know the Maclaurin series for $\frac{1}{1-x}$ is a geometric series. (Focus)
Math.CalcBC.08.17 Students will know a Taylor polynomial for f(x) is a partial sum of the Taylor series for f(x). (Focus)
Math.CalcBC.08.18 Students will know a power series for a given function can be derived by various methods (e.g., algebraic processes,substitutions, using properties of geometric series, and operations on nown series such as term-by-term integration or term-by-term differentiation). (Focus)
Math.CalcBC.08.19 Students will know if a power series converges, it either converges at a single point or has an interval of convergence. (Focus)
Math.CalcBC.08.20 Students will know the ratio test can be used to determine the radius of convergence of a power series.(Focus)
Math.CalcBC.08.21 Students will know if a power series has a positive radius of convergence, then the power series is the Taylor series of the function to which it converges over the open interval. (Focus)
Math.CalcBC.08.22 Students will know the radius of convergence of a power series obtained by term-by-term differentiation or term-by-term integration is the same as the radius of convergence of the original power series. (Focus)

Functions with Analysis

Grade Level Standards and Components

Math.Func.01 Students will evaluate trigonometric functions using right triangles, in both radians and degrees. (Focus)

Math.Func.01.01 Students will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G.SRT.C.8 (Focus)

Math.Func.01.02 Students will explain and use the relationship between the sine and cosine of complementary angles. G.SRT.C.7 (Focus)

Math.Func.01.03 Students will use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.* F.TF.B.7 (Focus)

Math.Func.01.04 Students will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. G.SRT.C.8 (Foundational)

Math.Func.02 Students will extend the domain of trigonometric functions using the unit circle. (Focus)

Math.Func.02.01 Students will understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. F.TF.A.1 (Focus)

Math.Func.02.02 Students will 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. F.TF.A.2 (Focus)

Math.Func.02.03 Students will use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context. F.TF.B.7 (Focus)

Math.Func.03 Students will demonstrate factoring. (Focus)

Math.Func.03.01 Students will solve quadratic equations with real coefficients that have complex solutions N.CN.C.7 (Focus)

Math.Func.03.02 Students will factor a quadratic expression to reveal the zeros of the function it defines. A.SSE.B.3.A (Focus)

Math.Func.03.03 Students will 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. A.APR.B.3 (Focus)

Math.Func.04 Students will demonstrate an understanding of rational expressions. (Focus)

Math.Func.04.01 Students will 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.A.APR.D.7 (Focus)

Math.Func.04.02 Students will solve simple rational and radical equations in one variable, and

give examples showing how extraneous solutions may arise.A.REI.A.2 (Focus)

Math.Func.05 Students will use linear and quadratic graphing to solve problems. (Focus)

Math.Func.05.01 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.F.IF.A.2 (Focus)

Math.Func.05.02 Students will 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.F.IF.C.8.A (Focus)

Math.Func.05.03 Students will know there is a complex number i such that $i2 = -1$, and every complex number has the form $a + bi$ with a and b real. N.CN.A.1(Focus)

Math.Func.05.04 Students will use the relation $i2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. N.CN.A.2(Focus)

Math.Func.05.05 Students will find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. N.CN.A.3(Focus)

Math.Func.05.05 Students will solve quadratic equations with real coefficients that have complex solutions.N.CN.C.7 (Focus)

Math.Func.05.06 Students will solve quadratic equations in one variable.A.REI.B.4 (Focus)

Math.Func.05.07 Students will use the method of completing the square to transform any quadratic equation in into an equation of the form $(x - p)2 = q$ that has the same solutions. Derive the quadratic formula from this form.A.REI.B.4.A (Focus)

Math.Func.05.08 Students will solve quadratic equations by inspection (e.g., for $x2 = 49$), 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. A.REI.B.4.B (Focus)

Math.Func.05.09 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.F.IF.A.2 (Focus)

Math.Func.05.10 Students will 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 corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$ F.IF.A.1(Foundational)

Math.Func.05.11 Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. F.IF.B.5(Foundational)

Math.Func.05.11 Students will graph linear and quadratic functions and show intercepts, maxima, and minima F.IF.C.7.A(Foundational)

Math.Func.05.12 Students will 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.B.3 (Foundational)

Math.Func.05.13 Students will compose functions. (Algebraic emphasis) F.BF.A.1.C (Foundational)

Math.Func.05.14 Students will graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions
(Piecewise ONLY) F.IF.C.7.B (Introductory)

Math.Func.06 Students will solve problems involving logarithms and exponents. (Focus)

Math.Func.06.01 Students will understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. F.BF.B.5 (Focus)

Math.Func.06.02 Students will, 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 F.LE.A.4 (Focus)
Math.Func.06.03 Students will distinguish between situations that can be modeled with linear functions and with exponential functions. F.LE.A.1(Foundational)

Math.Func.07 Students will solve problems using matrices. (Focus)

Math.Func.07.01 Students will add, subtract, and multiply matrices of appropriate dimensions. N.VM.C.8 (Focus)
Math.Func.07.02 Students will multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled N.VM.C.7 (Focus)
Math.Func.07.03 Students will find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater) REI.C.9 (Foundational)
Math.Func.07.04 Students will use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network N.VM.C.6 (Foundational)
Math.Func.07.05 Students will understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.N.VM.C.10 (Introductory)

Math.Func.08 Students will use properties of rational exponents to simplify radical expressions and solve radical equations. (Focus)

Math.Func.08.01 Students will rewrite expressions involving radicals and rational exponents using the properties of exponents (Focus) RN.A.2
Math.Func.08.02 Students will solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. (Focus) *REI.A.2*
Math.Func.08.03 Students will 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* (Foundational) RN.A.1

AP Statistics

Grade Level Standards and Components

Math.APS.01 Students will explore Univariate Quantitative Data: Describing patterns and departures from patterns. (Focus)

Math.APS.01.01 Students will construct and interpret graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot) (Focus)

Math.APS.01.02 Students will summarize distributions of univariate data. (Focus)

Math.APS.01.03 Students will compare distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots) (Focus)

Math.APS.02 Students will explore Univariate Categorical Data: Describing patterns and departures from patterns. (Focus)

Math.APS.02.01 Students will explore categorical data (Focus)

1.Frequency tables and bar charts

2. Marginal and joint frequencies for two-way tables

3. Conditional relative frequencies and association

4. Comparing distributions using bar charts

Math.APS.03 Students will explore Bivariate Data: Describing patterns and departures from patterns. (Focus)

Math.APS.03.01 Students will explore bivariate data

1. Analyzing patterns in scatterplots

2. Correlation and linearity

3. Least-squares regression line

4. Residual plots, outliers and influential points 5. Transformations to achieve linearity: logarithmic and power transformations

Math.APS.04 Students will demonstrate an understanding that data must be collected according to a well-developed plan if valid information is to be obtained. (Focus)

Math.APS.04.01 Students will demonstrate the overview of methods of data collection (Focus)

Math.APS.04.02 Students will plan and conduct surveys (Focus)

Math.APS.04.03 Students will plan and conduct experiments (Focus)

Math.APS.04.04 Students will determine the Generalizability of results and types of conclusion (Focus)

Math.APS.05 Students will demonstrate statistical inference producing an interval for a population proportion. (Focus)

Math.APS.05.01 Students will demonstrate estimation (point estimators and confidence intervals) (Focus)

1. Estimating population parameters and margins of error

2. Properties of point estimators, including unbiasedness and variability

3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of

confidence intervals
4. Large sample confidence interval for a proportion
5. Large sample confidence interval for a difference between two proportion

Math.APS.06 Students will demonstrate statistical inference producing an interval for a population mean. (Focus)

Math.APS.06.01 Students will demonstrate estimation (point estimators and confidence intervals) (Focus)
1. Estimating population parameters and margins of error
2. Properties of point estimators, including unbiasedness and variability
3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals
4. Confidence interval for a mean
5. Confidence interval for a difference between two means (unpaired and paired)
6. Confidence interval for the slope of a least-squares regression line

Math.APS.07 Students will demonstrate statistical inference testing a claim for a population proportion. (Focus)

Math.APS.07.01 Students will conduct tests of significance
1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
2. Large sample test for a proportion
3. Large sample test for a difference between two proportions
4. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)

Math.APS.08 Students will demonstrate statistical inference testing a claim for a population mean. (Focus)

Math.APS.08.01 Students will conduct tests of significance (Focus)
1. Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power
3. Test for a mean
4. Test for a difference between two means (unpaired and paired)
5. Test for the slope of a least-squares regression line

Math.APS.09 Students will know random phenomena are not haphazard: they display an order that emerges only in the long run (Focus)

Math.APS.09.01 Students will demonstrate probability (Focus)
1. Interpreting probability, including long-run relative frequency interpretation
2. "Law of Large Numbers" concept
3. Addition rule, multiplication rule, conditional probability and independence
4. Discrete random variables and their probability distributions, including binomial and geometric

Math.APS.10 Students will demonstrate that probability is the tool used for anticipating what the distribution of data should look like under a given mode

Math.APS.10.01 Students will demonstrate their understanding of the normal distribution (Focus)
Math.APS.10.02 Students will demonstrate sampling distributions. (Focus)

Trig/PreCalculus

Grade Level Standards and Components

Math.TPC.01 Students will be able to evaluate trig functions and use them to solve equations. (Focus)

Math.TPC.01.01 Students will extend the domain of trig functions using the using the unit circle (F-TF.A) (Focus)
Math.TPC.01.02 Students will 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 (Focus)
Math.TPC.01.03 Students will solve trigonometric equations (Focus)
Math.TPC.01.04 Students will use angle and degree measure. (Foundational)
Math.TPC.01.05 Students will draw angles whose measures are given in degrees (Foundational)

Math.TPC.02 Students will be able to graph trig functions. (Focus)

Math.TPC.02.01 Students will model/Graph Periodic Phenomena (Focus)

Math.TPC.03 Students will be able to use trig identities and apply trig to real world situations. (Focus)

Math.TPC.03.01 Students will prove and Apply Trigonometric Identities (Focus)
Math.TPC.03.02 Students will investigate trigonometric identities. (Focus)
Math.TPC.03.03 Students will use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems (Foundational)

Math.TPC.04 Students analyze functions using different representations and apply them to a real world applications. (Focus)

Math.TPC.04.01 Students will analyze functions using different representations (Focus)
Math.TPC.04.02 Students will 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. (Foundational)
Math.TPC.04.03 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (Foundational)
Math.TPC.04.04 Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (Foundational)
Math.TPC.04.05 Students will write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (Foundational)
Math.TPC.04.06 Students will use the structure of an expression to identify ways to rewrite it. (Foundational)
Math.TPC.04.07 Students will interpret expressions that represent a quantity in terms of its context. (Foundational)

Math.TPC.05 Students will analyze functions using different representations and apply them to a real world applications (Focus)

Math.TPC.05.01 Students will understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.(Focus)
Math.TPC.05.02 Students will 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 (Focus)
Math.TPC.05.03 Students will use exponential functions (Focus)
Math.TPC.05.04 Students will define logarithmic functions (Focus)
Math.TPC.05.05 Students will 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. (Foundational)
Math.TPC.05.06 Students will use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. (Foundational)
Math.TPC.05.07 Students will relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (Foundational)

Math.TPC.06 Students will gain essential skills in order to prepare them for calculus.(Focus)

Math.TPC.06.01 Students will find limits-- first part of unit on piecewise functions (Focus)
Math.TPC.06.02 Students will demonstrate understanding of number sense with matrices (Focus)
Math.TPC.06.03 Students will solve a system of equations using the inverse matrix (Focus)
Math.TPC.06.04 Students will analyze conic sections using rectangular coordinates (Focus)
Math.TPC.06.05 Students will find slopes by use of tangents lines, the limit definition of slope, and derivatives. (Introductory)

Financial Literacy

Math.FL.01 Students will use simple, compound, and continuous interest and compute future value. (Focus)

Math.FL.01.01 Student will change decimals to Percents and put interest rates in order (Focus)

Math.FL.01.02 Student will use simple interest formula to calculate interest paid (Focus)

Math.FL.01.03 Student will solving for principal, rate, or time using the simple interest formula (Focus)

Math.FL.01.04 Student will perform analysis of situations with simple interest (Focus)

Math.FL.01.05 Student will create formulas for spreadsheets to compute interest (Focus)

Math.FL.01.06 Student will use spreadsheet to determine future value (Focus)

Math.FL.01.07 Student will use compound interest formula to determine future value of an investment (Focus)

Math.FL.02 Students will examine and calculate situations involving loans. (Focus)

Math.FL.02.01 Students will determine finance charge given down payment, loan payment, length of loan. (Focus)

Math.FL.02.02 Students willExplain the relationship between credit score and interest charged. Discusses variables that affect credit score. (Focus)

Math.FL.02.03 Students willUse loan payment table to determine key features of a debt (total payoff amount, original amount borrowed, etc.) and uses average daily balance to compute finance charges on credit card balances. (Focus)

Math.FL.02.04 Students willUse algebraic formula to determine key features of a debt (total payoff amount, original amount borrowed, etc.) (Focus)

Math.FL.02.05 Students willAnalyzes the effects of making extra payments on payoff time for a loan.(Focus)

Math.FL.03 Students will examine tax tables, model tax schedules, and examine income statements. (Focus)

Math.FL.03.01 Students will use a tax table to determine the amount of tax owed on income. (Focus)

Math.FL.03.02 Students will use a tax worksheet (software) to determine the tax owed and compares this to the amount determined using a tax table. (Focus)

Math.FL.03.03 Students will determine take home pay given gross pay and relevant taxable amounts/percentages, (Focus)

Math.FL.03.04 Students will determine annual taxes and take-home pay from a given weekly or bi-weekly pay amount. (Focus)

Math.FL.04 Students will examine depreciation and future and present value of an investment. (Focus)

Math.FL.04.01 Students will determine a future value in a linear depreciation model. (Focus)

Math.FL.04.02 Students will determine a time that an item will be worth a given value in a linear depreciation model. (Focus)

Math.FL.04.03 Students will determine a depreciation percentage in an exponential depreciation model. (Focus)

Math.FL.04.04 Students will solve for unknown times or values in an exponential depreciation model. (Focus)

Determines future value of a periodic deposit investment using a spreadsheet. (Focus)

Math.FL.04.05 Students will determine the future value, B, of a periodic deposit investment using the formula (B= $\frac{P((1+\frac{r}{n})^{nt}-1)}{\frac{r}{n}}$) when iven P, r, n and t. (Focus)

Math.FL.04.06 Students will determine the present value P of a periodic deposit investment using the formula (B= $\frac{P((1+\frac{r}{n})^{nt}-1)}{\frac{r}{n}}$), when given B, r, n and t. (Focus)

Math.FL.04.07 Students will use logarithms to determine the time required for a periodic deposit investment to reach a given value. (Or develop the formula for the sum of a geometric series (Focus)

Computer Science Principles

Grade Level Standards and Components

Math.CSP.01 Students will learn introductory coding concepts components of a computing environment and will recognize elements of structured program design. (Focus)

Math.CSP.01.01 Students will explain the internal and external architecture of a computer as well as the user environment. (Focus)
Math.CSP.01.02 Students will recognize and apply elements of high quality program design. (Focus)
Math.CSP.01.03 Students will define and use primitive data types (Focus)
Math.CSP.01.04 Students will describe the difference between secondary and primary storage. (Foundational)
Math.CSP.01.05 Students will differentiate between hardware vs. software. (Foundational)
Math.CSP.01.01 Students will differentiate between high level-languages and low-level languages. (Foundational)
Math.CSP.01.06 Students will recognize a compiler is needed to translate high – level language to machine language. (Foundational)
Math.CSP.01.07 Students will describe the steps in the programming development cycle. (Foundational)
Math.CSP.01.08 Students will recognize the features of good program design (clarity, self-documenting, user-friendly, maintainable, modular) (Foundational)
Math.CSP.01.09 Students will apply common naming conventions to identifiers, variable and constants. (Foundational)
Math.CSP.01.10 Students will discuss the advantages of modularization. (Foundational)
Math.CSP.01.11 Students will apply good program design to a variety of problems. (Foundational)
Math.CSP.01.12 Students will apply mathematical operations appropriately. (Foundational)
Math.CSP.01.13 Students will apply relational operators appropriately. (Foundational)
Math.CSP.01.14 Students will apply the rules of precedence to various data. (Foundational)
Math.CSP.01.15 Students will apply the assignment statement appropriately. (Foundational)
IMath.CSP.01.16 Students will initialize and declare variables with the correct data type. (Foundational)
Math.CSP.01.17 Students will identify the basic components of a computer's internal architecture (CPU, Memory, I/O devices) (Introductory)
Math.CSP.01.18 Students will identify the major advancements in the development of the computer (speed, reliability, accuracy, storage, communication) (Introductory)
Math.CSP.01.19 Students will discuss the advantages and disadvantages computing technology brings to the modern day world. (Introductory)

Math.CSP.02 Students will design code that applies common coding structures such as loops, decision structures and processing data structures. (Focus)

Math.CSP.02.01 Students will create algorithms and programs using structured program design (Focus)
Math.CSP.02.02 Students will create algorithms that demonstrate appropriate use of the selection control structures. (Focus)
Math.CSP.02.03 Students will create algorithms that demonstrate appropriate use of the repetition control

structures. (Focus)
Math.CSP.02.04 Students will create algorithms that demonstrate processing arrays, structures and/or collections. (Focus)
Math.CSP.02.05 Students will understand basic procedures/algorithms for working with data files, databases and data structures. (Focus)
Math.CSP.02.06 Students will describe the characteristics of a structured program (Foundational)
Math.CSP.02.07 Students will summarize the need for structure (clarity, professionalism, efficiency, maintenance, modularity) (Foundational)
Math.CSP.02.08 Students will apply structured design to solving several problems (Foundational)
Math.CSP.02.09 Students will recognize the need for refinement and apply refinement to improve a programs design and /or efficiency (Foundational)
Math.CSP.02.10 Students will recognize the relational operators and evaluate Boolean expressions accurately. (Foundational)
Math.CSP.02.11 Students will create and apply compound Boolean expressions using AND logic, OR logic, NOT operators and short circuit evaluation. (Foundational)
Math.CSP.02.12 Students will apply the precedence of operators when using multiple operators and conditions.
Math.CSP.02.13 Students will recognize common errors when creating compound conditions (Foundational)
Math.CSP.02.14 Students will apply relational operators to designing selection statements. (Foundational)
Math.CSP.02.15 Students will write structured it-then and if- then-else statements in a program. (Foundational)
Math.CSP.02.16 Students will apply nested if statements in a program. (Foundational)
Math.CSP.01.17 Students will understand the components of every loop: (initialization, guard, update). (Foundational)
Math.CSP.02.18 Students will identify the loop guard condition. (Foundational)
Math.CSP.02.19 Students will recognize the structure of a while loop, a for loop and a do..while loop. (Foundational)
Math.CSP.02.20 Students will differentiate between a pre-test loop and a post-test loop. (Foundational)
Math.CSP.02.21 Students will determine when a pre-test loop should be used vs. a post-test loop. (Foundational)
Math.CSP.02.22 Students will identify common loop tasks (accumulating, validation, reprompting, …) (Foundational)
Math.CSP.02.23 Students will apply nested loops in a program. (Foundational)
Math.CSP.02.24 Students will identify and fix common errors with looping tasks. (Foundational)
Math.CSP.02.25 Students will declare and initialize arrays using primitive data types. (Foundational)
Math.CSP.02.26 Students will explain how an array is stored in memory using one name but different storage boxes. (Foundational)
Math.CSP.02.27 Students will use subscript notation and indexes to access array values. (Foundational)
Math.CSP.02.28 Students will apply a for loop to initializing an entire array. (Foundational)
Math.CSP.02.29 Students will create code to accumulate array values. (Foundational)
Math.CSP.02.30 Students will identify and fix common errors when working with arrays (out of bounds,

off by one, etc.) (Foundational)
Math.CSP.02.31 Students will recognize spaghetti code in a flowchart or pseudocode (Introductory)
Math.CSP.02.32 Students will apply range checking as a form of validation. (Introductory)
Math.CSP.02.33 Students will apply a case statement vs. nested if statements when appropriate. (Introductory)
Math.CSP.02.34 Students will read and write loop guard conditions for a variety of scenarios. (Introductory)
Math.CSP.02.35 Students will determine whether a definite loop or an indefinite loop would be better for a specified tasks. (Introductory)
Math.CSP.02.36 Students will be exposed to declaring arrays of structures. (Introductory)
Math.CSP.02.37 Students will use the convention of a constant for the SIZE of the array when declaring an array. (Introductory)
Math.CSP.02.38 Students will declare and initialize a two dimensional array. (Introductory)
Math.CSP.02.39 Students will identify elements in a two dimensional array by row and column indices. (Introductory)
Math.CSP.02.40 Students will be exposed to a user defined structure. (Introductory)
Math.CSP.02.41 Students will be exposed to an array of structures. (Introductory)
Math.CSP.02.42 Students will compare parallel arrays to the use of structures and collections. (Introductory)
Math.CSP.02.43 Students will differentiate between characters, fields, records, and files within the data hierarchy.(Introductory)

Math.CSP.03 Students will recognize and apply object oriented programming concepts emphasizing the development of code modules. (Focus)

Math.CSP.03.01 Students will recognize and apply modular programming techniques(Focus)
Math.CSP.03.02 Students will recognize and apply Object Oriented techniques (Focus)
Math.CSP.03.03 Students will describe modularity and describe the advantages of modularization. (Foundational)
Math.CSP.03.04 Students will define a method header given specifications. (Foundational)
Math.CSP.03.05 Students will create methods for an existing program. (Foundational)
Math.CSP.03.06 Students will create methods without parameters. (Foundational)
Math.CSP.03.07 Students will create a method that returns a value. (Foundational)
Math.CSP.03.08 Students will write a parameterized method for an existing program. (Foundational)
Math.CSP.03.09 Students will differentiate between pass by value and pass by reference. (Foundational)
Math.CSP.03.10 Students will predict the output from a program using parameterized methods.(Foundational)
Math.CSP.03.11 Students will apply a predefined method (like math methods)(Foundational)
Math.CSP.03.12 Students will investigate what happens when an array is passed into a method. (Foundational)
Math.CSP.03.13 Students will recognize overloaded methods. (Foundational)
Math.CSP.03.14 Students will be exposed to polymorphism and abstraction and implementation hiding. (Foundational)
Math.CSP.03.15 Students will recognize the need for high cohesion and low coupling. (Foundational)

Math.CSP.03.16 Students will identify the important features of Object-oriented languages. (classes, objects, polymorphism, inheritance, encapsulation)(Foundational)
Math.CSP.03.17 Students will illustrate inheritance with a class diagram. (Foundational)Math.CSP.01.01
Math.CSP.03.18Students will differentiate between procedural programming and Object Oriented programming. (Foundational)
Math.CSP.03.19 Students will apply naming conventions to creating a class name (starts with capital). (Foundational)
Math.CSP.03.20 Students will recognize and create examples of instance fields given the object. (Foundational)
Math.CSP.03.21 Students will differentiate between getter and mutator methods. (Foundational)
Math.CSP.03.22 Students will create a class diagram given pseudocode. (Foundational)
Math.CSP.03.23 Students will explain the difference between private and public access. (Foundational)
Math.CSP.03.24 Students will add methods to an existing class. (Foundational)
Math.CSP.03.25 Students will recognize a default constructor. (Foundational)
Math.CSP.03.26 Students will recognize a parameterized constructor. (Foundational)
Math.CSP.03.27 Students will recognize the need for a destructor. (Foundational)
Math.CSP.03.28 Students will be exposed to user-defined structures. (Foundational)
Math.CSP.03.29 Students will be exposed to a collection. (Foundational)
Math.CSP.03.30 Students will be exposed to common commands in a collection such as add, remove and set. (Foundational)
Math.CSP.03.31 Students will use a class diagram to show composition of class. (Foundational)
Math.CSP.03.32 Students will use a class diagram to show multiple inheritance. (Foundational)
Math.CSP.03.33 Students will be exposed to parent and child class concepts. (Foundational)
Math.CSP.03.34 Students will be exposed to the protected class specifier. (Foundational)

Math.CSP.04 Students will apply concepts of ratios and reasoning to solve real world problems. (Focus)

Math.CSP.04.01 Students will understand ratio concepts and use ratio reasoning to solve problems. (6.RP.A) (Focus)
Math.CSP.04.02 Students will understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship 6.RP.A.2) (Focus)
Math.CSP.04.03 Students will 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. (Focus)
Math.CSP.04.04 Students will use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.A.3) (Focus)
Math.CSP.04.05 Students will 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.(6.RP.A.3) (Foundational)
Math.CSP.04.06 Students will 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 (6.RP.A.3) (Foundational)
Math.CSP.04.07 Students will solve unit rate problems including those involving unit pricing and

constant speed (6.RP.A.3) (Introductory)

Math.CSP.04.08 Students will compute fluently with multi-digit numbers and find common factors and multiples. (6.NS.B) (Foundational)

Math.CSP.04.09 Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions. (Introductory)

Math.CSP.04.10 Students will interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (6.NS.A.1) (Introductory)

AP JAVA

Grade Level Standards and Components

Math.APJ.01 Students will apply concepts of ratios and reasoning to solve real world problems. (Focus)

Math.APJ.01.01 Students will understand ratio concepts and use ratio reasoning to solve problems. (6.RP.A) (Focus)

Math.APJ.01.02 Students will understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship 6.RP.A.2) (Focus)

Math.APJ.01.03 Students will 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. (Focus)

Math.APJ.01.04 Students will use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.A.3) (Focus)

Math.APJ.01.05 Students will 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.(6.RP.A.3) (Foundational)

Math.APJ.01.06 Students will 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 (6.RP.A.3) (Foundational)

Math.APJ.01.07 Students will solve unit rate problems including those involving unit pricing and constant speed (6.RP.A.3) (Introductory)

Math.APJ.02 Students will compute fluently with multi-digit numbers and find common factors and multiples. (6.NS.B) (Foundational)

Math.APJ.02.01 Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions

Math.APJ.02.02 Students will interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (6.NS.A.1) (Introductory)

C++

Grade Level Standards and Components

MathC++.01 Students will apply concepts of ratios and reasoning to solve real world problems. (Focus)

Math.C++.01.01 Students will understand ratio concepts and use ratio reasoning to solve problems. (6.RP.A) (Focus)

Math.C++.01.02 Students will understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship 6.RP.A.2) (DOK1, 2) (Focus)

Math.C++.01.03 Students will 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. (Focus)

Math.C++.01.04 Students will use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.A.3) (Focus) (Foundational)

Math.C++.01.05 Students will 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.(6.RP.A.3) (Foundational)

Math.C++.01.06 Students will 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 (6.RP.A.3) (Foundational)

Math.C++.01.07 Students will solve unit rate problems including those involving unit pricing and constant speed (6.RP.A.3) (Introductory)

MathC++.02 Students will compute fluently with multi-digit numbers and find common factors and multiples. (6.NS.B) (Foundational)

Math.C++.02.01 Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions. (Introductory)

Math.C++.02.02 Students will interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (6.NS.A.1) (Introductory)

Visual C#

Grade Level Standards and Components

Math.VC#.01 Students will apply concepts of ratios and reasoning to solve real world problems. (Focus)

Math.VC#.01.01 Students will understand ratio concepts and use ratio reasoning to solve problems. (6.RP.A) (Focus)

Math.VC#.01.01 Students will understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship 6.RP.A.2) (Focus)

Math.VC#.01.02 Students will 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. (Focus)

Math.VC#.01.03 Students will use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. (6.RP.A.3) (Focus)

Math.VC#.01.04 Students will 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.(6.RP.A.3) (Foundational)

Math.VC#.01.05 Students will 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 (6.RP.A.3) (Foundational)

Math.VC#.02 Students will compute fluently with multi-digit numbers and find common factors and multiples. (6.NS.B) (Foundational)

Math.VC#.02.01 Students will apply and extend previous understandings of multiplication and division to divide fractions by fractions. (Introductory)

Math.VC#.02.02 Students will interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (6.NS.A.1) (Introductory)