NUMBER AND QUANTITY

	Grade Difference
CC.9-12.N.RN.1 Extend the properties of exponents to rational exponents. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define 5^(1/3) to be the cube root of 5 because we want [5^(1/3)]^3 = 5^[(1/3) x 3] to hold, so [5^(1/3)]^3 must equal 5.	
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions.	0
GA.9-12.M2.A.2.a (MM2A2.a.) Extend properties of exponents to include all integer exponents.	0
GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions.	0
GA.9-12.M3.A.2.b (MM3A2.b.) Extend properties of exponents to include rational exponents.	0
CC.9-12.N.RN.2 Extend the properties of exponents to rational exponents. Rewrite expressions involving radicals and rational exponents using the properties of exponents.	
GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions.	0
GA.9-12.M1.A.2.a (MM1A2.a.) Simplify algebraic and numeric expressions involving square root.	0
GA.9-12.M1.A.2.b (MM1A2.b.) Perform operations with square roots.	0
GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions.	0
GA.9-12.M3.A.2.a (MM3A2.a.) Define and understand the properties of nth roots.	0
GA.9-12.M3.A.2.b (MM3A2.b.) Extend properties of exponents to include rational exponents.	0
CC.9-12.N.RN.3 Use properties of rational and irrational numbers. Explain why the sum or product of rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	
GA.8.N.1.h Distinguish between rational and irrational numbers.	1 to 4
CC.9-12.N.Q.1 Reason quantitatively and use units to solve problems. 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.*	
GA.9-12.M1.P.5 (MM1P5.) Students will represent mathematics in multiple ways.	0
GA.9-12.M1.P.5.c (MM1P5.c.) Use representations to model and interpret physical, social, and mathematical phenomena.	0
CC.9-12.N.Q.2 Reason quantitatively and use units to solve problems. Define appropriate quantities for the purpose of descriptive modeling.*	
GA.9-12.M1.P.1 (MM1P1.) Students will solve problems (using appropriate technology).	0
GA.9-12.M1.P.1.b (MM1P1.b.) Solve problems that arise in mathematics and in other contexts.	0
CC.9-12.N.Q.3 Reason quantitatively and use units to solve problems. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.*	
GA.9-12.M1.P.1 (MM1P1.) Students will solve problems (using appropriate technology).	0
GA.9-12.M1.P.1.c (MM1P1.c.) Apply and adapt a variety of appropriate strategies to solve problems.	0
CC.9-12.N.CN.1 Perform arithmetic operations with complex numbers. Know there is a complex number i such that i^2 = −1, and every complex number has the form a + bi with a and b real.	
GA.9-12.M2.N.1 (MM2N1.) Students will represent and operate with complex numbers.	0

GA.9-12.M2.N.1.a (MM2N1.a.) Write square roots of negative numbers in imaginary form. 0
GA.9-12.M2.N.1.b (MM2N1.b.) Write complex numbers in the form a + bi. 0

CC.9-12.N.CN.2 Perform arithmetic operations with complex numbers. Use the relation i^2 = –1 and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
GA.9-12.M2.N.1 (MM2N1.) Students will represent and operate with complex numbers. 0
GA.9-12.M2.N.1.c (MM2N1.c.) Add, subtract, multiply, and divide complex numbers. 0

CC.9-12.N.CN.3 (+) Perform arithmetic operations with complex numbers. Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.
GA.9-12.M2.N.1 (MM2N1.) Students will represent and operate with complex numbers. 0
GA.9-12.M2.N.1.c (MM2N1.c.) Add, subtract, multiply, and divide complex numbers. 0
GA.9-12.M2.N.1.d (MM2N1.d.) Simplify expressions involving complex numbers. 0

CC.9-12.N.CN.4 (+) Represent complex numbers and their operations on the complex plane. Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors. 0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically. 0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction. 0

CC.9-12.N.CN.5 (+) Represent complex numbers and their operations on the complex plane. Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, (-1 + √3i)^3 = 8 because (-1 + √3i) has modulus 2 and argument 120°.
GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors. 0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically. 0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction. 0

CC.9-12.N.CN.6 (+) Represent complex numbers and their operations on the complex plane. Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.
GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors. 0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically. 0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction. 0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors. 0

CC.9-12.N.CN.7 Use complex numbers in polynomial identities and equations. Solve quadratic equations with real coefficients that have complex solutions.
GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable. 0
GA.9-12.M2.A.4.b (MM2A4.b.) Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula. 0

CC.9-12.N.CN.8 (+) Use complex numbers in polynomial identities and equations. Extend polynomial identities to the complex numbers. For example, rewrite x^2 + 4 as (x + 2i)(x – 2i).

GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable.	0
GA.9-12.M2.A.4.b (MM2A4.b.) Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.	0

CC.9-12.N.CN.9 (+) Use complex numbers in polynomial identities and equations. Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities.	0
GA.9-12.M3.A.3.a (MM3A3.a.) Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates.	0
GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable.	0
GA.9-12.M2.A.4.c (MM2A4.c.) Analyze the nature of roots using technology and using the discriminant.	0

CC.9-12.N.VM.1 (+) Represent and model with vector quantities. Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v(bold), |v|, ||v||, v(not bold)).

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.	0

CC.9-12.N.VM.2 (+) Represent and model with vector quantities. Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.3 (+) Represent and model with vector quantities. Solve problems involving velocity and other quantities that can be represented by vectors.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.d (MM4A10.d.) Use vectors to solve realistic problems.	0

CC.9-12.N.VM.4 (+) Perform operations on vectors. Add and subtract vectors.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.4a (+) Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.d (MM4A10.d.) Use vectors to solve realistic problems.	0

CC.9-12.N.VM.4b (+) Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.b (MM4A10.b.) Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.4c (+) Understand vector subtraction v – w as v + (–w), where (–w) is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.5 (+) Perform operations on vectors. Multiply a vector by a scalar.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.5a (+) Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(v(sub x), v(sub y)) = (cv(sub x), cv(sub y)).

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.5b (+) Compute the magnitude of a scalar multiple cv using ||cv|| = |c|v. Compute the direction of cv knowing that when |c|v = 0, the direction of cv is either along v (for c > 0) or against v (for c < 0).

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.6 (+) Perform operations on matrices and use matrices in applications. Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

GA.9-12.M3.A.7 (MM3A7.) Students will understand and apply matrix representations of vertex-edge graphs.	0
GA.9-12.M3.A.7.a (MM3A7.a.) Use graphs to represent realistic situations.	0
GA.9-12.M3.A.7.b (MM3A7.b.) Use matrices to represent graphs, and solve problems that can be represented by graphs.	0

CC.9-12.N.VM.7 (+) Perform operations on matrices and use matrices in applications. Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.

GA.9-12.M3.A.5 (MM3A5.) Students will use matrices to formulate and solve problems.	0
GA.9-12.M3.A.5.c (MM3A5.c.) Represent and solve realistic problems using systems of linear equations.	0
GA.9-12.M3.A.4 (MM3A4.) Students will perform basic operations with matrices.	0
GA.9-12.M3.A.4.a (MM3A4.a.) Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.	0

CC.9-12.N.VM.8 (+) Perform operations on matrices and use matrices in applications. Add, subtract, and multiply matrices of appropriate dimensions.

GA.9-12.M3.A.4 (MM3A4.) Students will perform basic operations with matrices.	0
GA.9-12.M3.A.4.a (MM3A4.a.) Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.	0

CC.9-12.N.VM.9 (+) Perform operations on matrices and use matrices in applications. Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

GA.9-12.M3.A.4 (MM3A4.) Students will perform basic operations with matrices.	0
GA.9-12.M3.A.4.c (MM3A4.c.) Examine the properties of matrices, contrasting them with properties of real numbers.	0

CC.9-12.N.VM.10 (+) Perform operations on matrices and use matrices in applications. 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.

GA.9-12.M3.A.4 (MM3A4.) Students will perform basic operations with matrices.	0
GA.9-12.M3.A.4.b (MM3A4.b.) Find the inverses of two-by-two matrices using pencil and paper, and find inverses of larger matrices using technology.	0
GA.9-12.M3.A.4.c (MM3A4.c.) Examine the properties of matrices, contrasting them with properties of real numbers.	0

CC.9-12.N.VM.11 (+) Perform operations on matrices and use matrices in applications. Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.

GA.9-12.M4.A.10 (MM4A10.) Students will understand and use vectors.	0
GA.9-12.M4.A.10.a (MM4A10.a.) Represent vectors algebraically and geometrically.	0
GA.9-12.M4.A.10.c (MM4A10.c.) Add, subtract, and compute scalar multiples of vectors.	0

CC.9-12.N.VM.12 (+) Perform operations on matrices and use matrices in applications. Work with 2 X 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area.

GA.9-12.M3.A.4 (MM3A4.) Students will perform basic operations with matrices.	0
GA.9-12.M3.A.4.a (MM3A4.a.) Add, subtract, multiply, and invert matrices, when possible, choosing appropriate methods, including technology.	0
GA.9-12.M3.A.4.b (MM3A4.b.) Find the inverses of two-by-two matrices using pencil and paper, and find inverses of larger matrices using technology.	0
GA.9-12.M3.A.4.c (MM3A4.c.) Examine the properties of matrices, contrasting them with properties of real numbers.	0

ALGEBRA

CC.9-12.A.SSE.1 Interpret the structure of expressions. Interpret expressions that represent a quantity in terms of its context.*

GA.8.A.1. Students will use algebra to represent, analyze, and solve problems.	1 to 4
GA.8.A.1.a Represent a given situation using algebraic expressions or equations in one variable.	1 to 4

CC.9-12.A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.*

GA.8.A.1 Students will use algebra to represent, analyze, and solve problems.	1 to 4
GA.8.A.1.b Simplify and evaluate algebraic expressions.	1 to 4

CC.9-12.A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)^n as the product of P and a factor not depending on P.*

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0

GA.9-12.M1.A.2.d (MM1A2.d.) Expand binomials using the Binomial Theorem. 0

CC.9-12.A.SSE.2 Interpret the structure of expressions. Use the structure of an expression to identify ways to rewrite it. For example, see x^4 – y^4 as (x^2)^2 – (y^2)^2, thus recognizing it as a difference of squares that can be factored as (x^2 – y^2)(x^2 + y^2).

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0

GA.9-12.M1.A.2.f (MM1A2.f.) Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below: 0

-- (x + y)^2 = x^2 + 2xy + y^2,
-- (x - y)^2 = x^2 - 2xy + y^2,
-- (x + y)(x - y) = x^2 - y^2,
-- (x + a)(x + b) = x^2 + (a + b)x + ab ,
-- (x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3,
-- (x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3.

CC.9-12.A.SSE.3 Write expressions in equivalent forms to solve problems. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*

GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx + c and f(x) = a(x - h)^2 + k. 0

GA.9-12.M2.A.3.b (MM2A3.b.) Graph quadratic functions as transformations of the function f(x) = x^2. 0

CC.9-12.A.SSE.3a Factor a quadratic expression to reveal the zeros of the function it defines.*

GA.9-12.M1.A.3 (MM1A3.) Students will solve simple equations. 0

GA.9-12.M1.A.3.a (MM1A3.a.) Solve quadratic equations in the form ax^2 + bx + c = 0, where a = 1, by using factorization and finding square roots where applicable. 0

CC.9-12.A.SSE.3b Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.*

GA.9-12.M3.G.2 (MM3G2.) Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas). 0

GA.9-12.M3.G.2.a (MM3G2.a.) Convert equations of conics by completing the square. 0

CC.9-12.A.SSE.3c Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15^t can be rewritten as [1.15^(1/12)]^(12t) ≈ 1.012^(12t) to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0

GA.9-12.M2.A.2.a (MM2A2.a.) Extend properties of exponents to include all integer exponents. 0

GA.9-12.M2.A.2.e (MM2A2.e.) Understand and use basic exponential functions as models of real phenomena. 0

CC.9-12.A.SSE.4 Write expressions in equivalent forms to solve problems. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.*

GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions. 0

GA.9-12.M3.A.2.g (MM3A2.g.) Explore real phenomena related to exponential and logarithmic functions including half-life and doubling time. 0

CC.9-12.A.APR.1 Perform arithmetic operations on polynomials. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0

GA.9-12.M1.A.2.c (MM1A2.c.) Add, subtract, multiply, and divide polynomials. 0

CC.9-12.A.APR.2 Understand the relationship between zeros and factors of polynomial. Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x).

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities. 0

GA.9-12.M3.A.3.a (MM3A3.a.) Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates. 0

CC.9-12.A.APR.3 Understand the relationship between zeros and factors of polynomials. 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.

GA.9-12.M1.A.3 (MM1A3.) Students will solve simple equations. 0

GA.9-12.M1.A.3.c (MM1A3.c.) Use a variety of techniques, including technology, tables, and graphs to solve equations resulting from the investigation of x^2 + bx + c = 0. 0

GA.9-12.M3.A.1 (MM3A1.) Students will analyze graphs of polynomial functions of higher degree. 0

GA.9-12.M3.A.1.a (MM3A1.a.) Graph simple polynomial functions as translations of the function f(x) = ax^n. 0

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities. 0

GA.9-12.M3.A.3.a (MM3A3.a.) Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates. 0

CC.9-12.A.APR.4 Use polynomial identities to solve problems. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity (x^2 + y^2)^2 = (x^2 – y^2)^2 + (2xy)^2 can be used to generate Pythagorean triples.

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0

GA.9-12.M1.A.2.f (MM1A2.f.) Factor expressions by greatest common factor, grouping, trial and error, and special products limited to the formulas below: 0

-- (x + y)^2 = x^2 + 2xy + y^2,
-- (x - y)^2 = x^2 - 2xy + y^2,
-- (x + y)(x - y) = x^2 - y^2,
-- (x + a)(x + b) = x^2 + (a + b)x + ab ,
-- (x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3,
-- (x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3.

CC.9-12.A.APR.5 (+) Use polynomial identities to solve problems. Know and apply that the Binomial Theorem gives the expansion of (x + y)^n in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. (The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.)

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0
GA.9-12.M1.A.2.d (MM1A2.d.) Expand binomials using the Binomial Theorem. 0

CC.9-12.A.APR.6 Rewrite rational expressions. Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system.
GA.9-12.M4.A.1 (MM4A1.) Students will explore rational functions. 0
GA.9-12.M4.A.1.a (MM4A1.a.) Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior. 0

CC.9-12.A.APR.7 (+) Rewrite rational expressions. 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.
GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions. 0
GA.9-12.M1.A.2.e (MM1A2.e.) Add, subtract, multiply, and divide rational expressions. 0

CC.9-12.A.CED.1 Create equations that describe numbers or relationship. 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.*
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0
GA.9-12.M2.A.2.d (MM2A2.d.) Solve simple exponential equations and inequalities analytically, graphically, and by using appropriate technology. 0

GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable. 0
GA.9-12.M2.A.4.a (MM2A4.a.) Solve equations graphically using appropriate technology. 0
GA.9-12.M2.A.4.d (MM2A4.d.) Solve quadratic inequalities both graphically and algebraically, and describe the solutions using linear inequalities. 0

CC.9-12.A.CED.2 Create equations that describe numbers or relationship. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.*
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n, where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x. 0
GA.9-12.M1.A.1.c (MM1A1.c.) Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes. 0

CC.9-12.A.CED.3 Create equations that describe numbers or relationship. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*
GA.9-12.M3.A.6 (MM3A6.) Students will solve linear programming problems in two variables. 0
GA.9-12.M3.A.6.a (MM3A6.a.) Solve systems of inequalities in two variables, showing the solutions graphically. 0
GA.9-12.M3.A.6.b (MM3A6.b.) Represent and solve realistic problems using linear programming. 0

CC.9-12.A.CED.4 Create equations that describe numbers or relationship. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.*

GA.8.A.1 Students will use algebra to represent, analyze, and solve problems.	1 to 4
GA.8.A.1.d Solve equations involving several variables for one variable in terms of the others.	1 to 4

CC.9-12.A.REI.1 Understand solving equations as a process of reasoning and explain the reasoning. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

GA.9-12.M1.P.1 (MM1P1.) Students will solve problems (using appropriate technology).	0
GA.9-12.M1.P.1.c (MM1P1.c.) Apply and adapt a variety of appropriate strategies to solve problems.	0
GA.9-12.M1.P.2 (MM1P2.) Students will reason and evaluate mathematical arguments.	0
GA.9-12.M1.P.2.c (MM1P2.c.) Develop and evaluate mathematical arguments and proofs.	0

CC.9-12.A.REI.2 Understand solving equations as a process of reasoning and explain the reasoning. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

GA.9-12.M1.A.3 (MM1A3.) Students will solve simple equations.	0
GA.9-12.M1.A.3.b (MM1A3.b.) Solve equations involving radicals such as $\sqrt{x} + b = c$, using algebraic techniques.	0
GA.9-12.M1.A.3.d (MM1A3.d.) Solve simple rational equations that result in linear equations or quadratic equations with leading coefficient of 1.	0

CC.9-12.A.REI.3 Solve equations and inequalities in one variable. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

GA.8.A.4 Students will graph and analyze graphs of linear equations and inequalitites.	1 to 4
GA.8.A.4.f Determine the equation of a line given a graph, numerical information that defines the line or a context involving a linear relationship.	1 to 4
GA.8.A.5 Students will understand systems of linear equations and inequalities and use them to solve problems.	1 to 4
GA.8.A.5.b Solve systems of equations graphically and algebraically, using technology as appropriate.	1 to 4

CC.9-12.A.REI.4 Solve equations and inequalities in one variable. Solve quadratic equations in one variable.

GA.9-12.M1.A.3 (MM1A3.) Students will solve simple equations.	0
GA.9-12.M1.A.3.a (MM1A3.a.) Solve quadratic equations in the form ax^2 + bx + c = 0, where a = 1, by using factorization and finding square roots where applicable.	0

CC.9-12.A.REI.4a Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – p)^2 = q that has the same solutions. Derive the quadratic formula from this form.

GA.9-12.M3.G.2 (MM3G2.) Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas).	0
GA.9-12.M3.G.2.a (MM3G2.a.) Convert equations of conics by completing the square.	0
GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx + c and f(x) = a(x - h)^2 + k.	0
GA.9-12.M2.A.3.a (MM2A3.a.) Convert between standard and vertex form.	0

CC.9-12.A.REI.4b Solve quadratic equations by inspection (e.g., for x^2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable.	0
GA.9-12.M2.A.4.b (MM2A4.b.) Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula.	0
GA.9-12.M1.A.3 (MM1A3.) Students will solve simple equations.	0
GA.9-12.M1.A.3.a (MM1A3.a.) Solve quadratic equations in the form ax^2 + bx + c = 0, where a = 1, by using factorization and finding square roots where applicable.	0
GA.9-12.M1.A.3.c (MM1A3.c.) Use a variety of techniques, including technology, tables, and graphs to solve equations resulting from the investigation of x^2 + bx + c = 0.	0

CC.9-12.A.REI.5 Solve systems of equations. 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.

GA.8.A.5 Students will understand systems of linear equations and inequalities and use them to solve problems.	1 to 4
GA.8.A.5.b Solve systems of equations graphically and algebraically, using technology as appropriate.	1 to 4

CC.9-12.A.REI.6 Solve systems of equations. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

GA.8.A.5 Students will understand systems of linear equations and inequalities and use them to solve problems.	1 to 4
GA.8.A.5.b Solve systems of equations graphically and algebraically, using technology as appropriate.	1 to 4

CC.9-12.A.REI.7 Solve systems of equations. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = –3x and the circle x^2 + y^2 = 3.

GA.9-12.M3.G.1 (MM3G1.) Students will investigate the relationships between lines and circles.	0
GA.9-12.M3.G.1.d (MM3G1.d.) Solve a system of equations involving a circle and a line.	0

CC.9-12.A.REI.8 (+) Solve systems of equations. Represent a system of linear equations as a single matrix equation in a vector variable.

GA.9-12.M3.A.5 (MM3A5.) Students will use matrices to formulate and solve problems.	0
GA.9-12.M3.A.5.a (MM3A5.a.) Represent a system of linear equations as a matrix equation.	0

CC.9-12.A.REI.9 (+) Solve systems of equations. 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).

GA.9-12.M3.A.5 (MM3A5.) Students will use matrices to formulate and solve problems.	0
GA.9-12.M3.A.5.b (MM3A5.b.) Solve matrix equations using inverse matrices.	0

CC.9-12.A.REI.10 Represent and solve equations and inequalities graphically. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities.	0

GA.9-12.M3.A.3.d (MM3A3.d.) Solve a variety of types of equations by appropriate means choosing among mental calculation, pencil and paper, or appropriate technology.	0

CC.9-12.A.REI.11 Represent and solve equations and inequalities graphically. 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.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.i (MM1A1.i.) Understand that any equation in x can be interpreted as the equation f(x) = g(x), and interpret the solutions of the equation as the x-value(s) of the intersection point(s) of the graphs of y = f(x) and y = g(x).	0

CC.9-12.A.REI.12 Represent and solve equations and inequalities graphically. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

GA.8.A.4 Students will graph and analyze graphs of linear equations and inequalitites.	1 to 4
GA.8.A.4.e Graph the solution set of a linear inequality, identifying whether the solution set is an open or a closed half-plane.	1 to 4
GA.8.A.5 Students will understand systems of linear equations and inequalities and use them to solve problems.	1 to 4
GA.8.A.5.c Graph the solution set of a system of linear inequalities in two variables.	1 to 4

FUNCTIONS

CC.9-12.F.IF.1 Understand the concept of a function and use function notation. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.a (MM1A1.a.) Represent functions using function notation.	0

CC.9-12.F.IF.2 Understand the concept of a function and use function notation. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.a (MM1A1.a.) Represent functions using function notation.	0
GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.	0

CC.9-12.F.IF.3 Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1 (n is greater than or equal to 1).

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.f (MM1A1.f.) Recognize sequences as functions with domains that are whole numbers.	0

CC.9-12.F.IF.4 Interpret functions that arise in applications in terms of the context. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.d (MM1A1.d.) Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior. 0

GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior. 0

CC.9-12.F.IF.5 Interpret functions that arise in applications in terms of the context. 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.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.d (MM1A1.d.) Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior. 0

GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior. 0

CC.9-12.F.IF.6 Interpret functions that arise in applications in terms of the context. 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.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.g (MM1A1.g.) Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families. 0

CC.9-12.F.IF.7 Analyze functions using different representations. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n, where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x. 0

GA.9-12.M1.A.1.c (MM1A1.c.) Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes. 0

CC.9-12.F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.d (MM1A1.d.) Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior. 0

GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx 0

+ c and f(x) = a(x - h)^2 + k.
GA.9-12.M2.A.3.c (MM2A3.c.) Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change. 0

CC.9-12.F.IF.7b Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.*
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n,where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x. 0

GA.9-12.M2.A.1 (MM2A1.) Students will investigate step and piecewise functions, including greatest integer and absolute value functions. 0
GA.9-12.M2.A.1.a (MM2A1.a.) Write absolute value functions as piecewise functions. 0
GA.9-12.M2.A.1.b (MM2A1.b.) Investigate and explain characteristics of a variety of piecewise functions including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, points of discontinuity, intervals over which the function is constant, intervals of increase and decrease, and rates of change. 0
GA.9-12.M2.A.1.c (MM2A1.c.) Solve absolute value equations and inequalities analytically, graphically, and by using appropriate technology. 0

CC.9-12.F.IF.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.*
GA.9-12.M3.A.1 (MM3A1.) Students will analyze graphs of polynomial functions of higher degree. 0
GA.9-12.M3.A.1.a (MM3A1.a.) Graph simple polynomial functions as translations of the function f(x) = ax^n. 0
GA.9-12.M3.A.1.b (MM3A1.b.) Understand the effects of the following on the graph of a polynomial function: degree, lead coefficient, and multiplicity of real zeros. 0
GA.9-12.M3.A.1.d (MM3A1.d.) Investigate and explain characteristics of polynomial functions, including domain and range, intercepts, zeros, relative and absolute extrema, intervals of increase and decrease, and end behavior. 0

CC.9-12.F.IF.7d (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.*
GA.9-12.M4.A.1 (MM4A1.) Students will explore rational functions. 0
GA.9-12.M4.A.1.a (MM4A1.a.) Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior. 0

CC.9-12.F.IF.7e Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.*
GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions. 0
GA.9-12.M3.A.2.e (MM3A2.e.) Investigate and explain characteristics of exponential and logarithmic functions including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, and rate of change. 0
GA.9-12.M3.A.2.f (MM3A2.f.) Graph functions as transformations of f(x) = a^x, f(x) = logax, f(x) = e^x, f(x) = ln x. 0

GA.9-12.M4.A.3 (MM4A3.) Students will investigate and use the graphs of the six trigonometric functions. 0
GA.9-12.M4.A.3.a (MM4A3.a.) Understand and apply the six basic trigonometric functions as functions of real numbers. 0
GA.9-12.M4.A.3.b (MM4A3.b.) Determine the characteristics of the graphs of the six basic 0

trigonometric functions.
GA.9-12.M4.A.3.c (MM4A3.c.) Graph transformations of trigonometric functions including changing period, amplitude, phase shift, and vertical shift. 0
GA.9-12.M4.A.3.d (MM4A3.d.) Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena. 0

CC.9-12.F.IF.8 Analyze functions using different representations. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.d (MM1A1.d.) Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior. 0

GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx + c and f(x) = a(x - h)^2 + k. 0
GA.9-12.M2.A.3.a (MM2A3.a.) Convert between standard and vertex form. 0

CC.9-12.F.IF.8a 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.
GA.9-12.M2.A.4 (MM2A4.) Students will solve quadratic equations and inequalities in one variable. 0
GA.9-12.M2.A.4.b (MM2A4.b.) Find real and complex solutions of equations by factoring, taking square roots, and applying the quadratic formula. 0

GA.9-12.M3.G.2 (MM3G2.) Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas). 0
GA.9-12.M3.G.2.a (MM3G2.a.) Convert equations of conics by completing the square. 0

GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx + c and f(x) = a(x - h)^2 + k. 0
GA.9-12.M2.A.3.c (MM2A3.c.) Investigate and explain characteristics of quadratic functions, including domain, range, vertex, axis of symmetry, zeros, intercepts, extrema, intervals of increase and decrease, and rates of change. 0

CC.9-12.F.IF.8b Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)^t, y = (0.97)^t, y = (1.01)^(12t), y = (1.2)^(t/10), and classify them as representing exponential growth and decay.
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0
GA.9-12.M2.A.2.e (MM2A2.e.) Understand and use basic exponential functions as models of real phenomena. 0

CC.9-12.F.IF.9 Analyze functions using different representations. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior. 0

GA.9-12.M1.P.5 (MM1P5.) Students will represent mathematics in multiple ways. 0

GA.9-12.M1.P.5.b (MM1P5.b.) Select, apply, and translate among mathematical representations to solve problems.	0
GA.8.A.3 Students will understand relations and linear functions.	1 to 4
GA.8.A.3.i Translate among verbal, tabular, graphic, and algebraic representations of functions.	1 to 4
CC.9-12.F.BF.1 Build a function that models a relationship between two quantities. Write a function that describes a relationship between two quantities.*	
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.	0
CC.9-12.F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context.	
GA.8.A.3 Students will understand relations and linear functions.	1 to 4
GA.8.A.3.e Use tables to describe sequences recursively and with a formula in closed form.	1 to 4
CC.9-12.F.BF.1b Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.	
GA.9-12.M4.A.4 (MM4A4.) Students will investigate functions.	0
GA.9-12.M4.A.4.c (MM4A4.c.) Investigate characteristics of functions built through sum, difference, product, quotient, and composition.	0
CC.9-12.F.BF.1c (+) Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.	
GA.9-12.M4.A.4 (MM4A4.) Students will investigate functions.	0
GA.9-12.M4.A.4.c (MM4A4.c.) Investigate characteristics of functions built through sum, difference, product, quotient, and composition.	0
CC.9-12.F.BF.2 Build a function that models a relationship between two quantities. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*	
GA.8.A.3 Students will understand relations and linear functions.	1 to 4
GA.8.A.3.e Use tables to describe sequences recursively and with a formula in closed form.	1 to 4
GA.8.A.3.f Understand and recognize arithmetic sequences as linear functions with whole number input values.	1 to 4
GA.8.A.3.g Interpret the constant difference in an arithmetic sequence as the slope of the associated linear function.	1 to 4
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.g (MM1A1.g.) Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.	0
GA.9-12.M2.A.3 (MM2A3.) Students will analyze quadratic functions in the forms f(x) = ax^2 + bx + c and f(x) = a(x - h)^2 + k.	0
GA.9-12.M2.A.3.d (MM2A3.d.) Explore arithmetic series and various ways of computing their sums.	0
GA.9-12.M2.A.3.e (MM2A3.e.) Explore sequences of partial sums of arithmetic series as	0

examples of quadratic functions.

GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0
GA.9-12.M2.A.2.f (MM2A2.f.) Understand and recognize geometric sequences as exponential functions with domains that are whole numbers. 0

GA.9-12.M4.A.9 (MM4A9.) Students will use sequences and series. 0
GA.9-12.M4.A.9.a (MM4A9.a.) Use and find recursive and explicit formulas for the terms of sequences. 0
GA.9-12.M4.A.9.b (MM4A9.b.) Recognize and use simple arithmetic and geometric sequences. 0

CC.9-12.F.BF.3 Build new functions from existing functions. 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.
GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.c (MM1A1.c.) Graph transformations of basic functions including vertical shifts, stretches, and shrinks, as well as reflections across the x- and y-axes. 0

GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0
GA.9-12.M2.A.2.c (MM2A2.c.) Graph functions as transformations of f(x) = a^x. 0

CC.9-12.F.BF.4 Build new functions from existing functions. Find inverse functions.
GA.9-12.M2.A.5 (MM2A5.) Students will explore inverses of functions. 0
GA.9-12.M2.A.5.a (MM2A5.a.) Discuss the characteristics of functions and their inverses, including one-to- oneness, domain, and range. 0
GA.9-12.M2.A.5.b (MM2A5.b.) Determine inverses of linear, quadratic, and power functions and functions of the form f(x) = a/x , including the use of restricted domains. 0
GA.9-12.M2.A.5.c (MM2A5.c.) Explore the graphs of functions and their inverses. 0

CC.9-12.F.BF.4a Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, f(x) =2(x^3) or f(x) = (x+1)/(x-1) for x ≠ 1 (x not equal to 1).
GA.9-12.M2.A.5 (MM2A5.) Students will explore inverses of functions. 0
GA.9-12.M2.A.5.a (MM2A5.a.) Discuss the characteristics of functions and their inverses, including one-to- oneness, domain, and range. 0
GA.9-12.M2.A.5.b (MM2A5.b.) Determine inverses of linear, quadratic, and power functions and functions of the form f(x) = a/x , including the use of restricted domains. 0
GA.9-12.M2.A.5.c (MM2A5.c.) Explore the graphs of functions and their inverses. 0

CC.9-12.F.BF.4b (+) Verify by composition that one function is the inverse of another.
GA.9-12.M2.A.5 (MM2A5.) Students will explore inverses of functions. 0
GA.9-12.M2.A.5.d (MM2A5.d.) Use composition to verify that functions are inverses of each other. 0

CC.9-12.F.BF.4c (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
GA.9-12.M2.A.5 (MM2A5.) Students will explore inverses of functions. 0
GA.9-12.M2.A.5.c (MM2A5.c.) Explore the graphs of functions and their inverses. 0

CC.9-12.F.BF.4d (+) Produce an invertible function from a non-invertible function by restricting the domain.

GA.9-12.M2.A.5 (MM2A5.) Students will explore inverses of functions. 0

GA.9-12.M2.A.5.b (MM2A5.b.) Determine inverses of linear, quadratic, and power functions and functions of the form f(x) = a/x , including the use of restricted domains. 0

CC.9-12.F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions. 0

GA.9-12.M3.A.2.c (MM3A2.c.) Define logarithmic functions as inverses of exponential functions. 0

GA.9-12.M3.A.2.d (MM3A2.d.) Understand and use properties of logarithms by extending laws of exponents. 0

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities. 0

GA.9-12.M3.A.3.a (MM3A3.a.) Find real and complex roots of higher degree polynomial equations using the factor theorem, remainder theorem, rational root theorem, and fundamental theorem of algebra, incorporating complex and radical conjugates. 0

GA.9-12.M3.A.3.b (MM3A3.b.) Solve polynomial, exponential, and logarithmic equations analytically, graphically, and using appropriate technology. 0

GA.9-12.M3.A.3.c (MM3A3.c.) Solve polynomial, exponential, and logarithmic inequalities analytically, graphically, and using appropriate technology. Represent solution sets of inequalities using interval notation. 0

CC.9-12.F.LE.1 Construct and compare linear, quadratic, and exponential models and solve problems. Distinguish between situations that can be modeled with linear functions and with exponential functions.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n,where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x. 0

GA.9-12.M1.A.1.d (MM1A1.d.) Investigate and explain the characteristics of a function: domain, range, zeros, intercepts, intervals of increase and decrease, maximum and minimum values, and end behavior. 0

GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions. 0

GA.9-12.M2.A.2.b (MM2A2.b.) Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior. 0

GA.9-12.M2.A.2.c (MM2A2.c.) Graph functions as transformations of f(x) = a^x. 0

CC.9-12.F.LE.1a Prove that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.g (MM1A1.g.) Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families. 0

CC.9-12.F.LE.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0

GA.9-12.M1.A.1.g (MM1A1.g.) Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families. 0

CC.9-12.F.LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.*

GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions.	0
GA.9-12.M2.A.2.b (MM2A2.b.) Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.	0
GA.9-12.M2.A.2.e (MM2A2.e.) Understand and use basic exponential functions as models of real phenomena.	0
GA.9-12.M2.A.2.f (MM2A2.f.) Understand and recognize geometric sequences as exponential functions with domains that are whole numbers.	0

CC.9-12.F.LE.2 Construct and compare linear, quadratic, and exponential models and solve problems. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.f (MM1A1.f.) Recognize sequences as functions with domains that are whole numbers.	0
GA.9-12.M1.A.1.g (MM1A1.g.) Explore rates of change, comparing constant rates of change (i.e., slope) versus variable rates of change. Compare rates of change of linear, quadratic, square root, and other function families.	0
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions.	0
GA.9-12.M2.A.2.g (MM2A2.g.) Interpret the constant ratio in a geometric sequence as the base of the associated exponential function.	0

CC.9-12.F.LE.3 Construct and compare linear, quadratic, and exponential models and solve problems. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.*

GA.9-12.M3.A.3 (MM3A3.) Students will solve a variety of equations and inequalities.	0
GA.9-12.M3.A.3.b (MM3A3.b.) Solve polynomial, exponential, and logarithmic equations analytically, graphically, and using appropriate technology.	0
GA.9-12.M3.A.3.d (MM3A3.d.) Solve a variety of types of equations by appropriate means choosing among mental calculation, pencil and paper, or appropriate technology.	0

CC.9-12.F.LE.4 Construct and compare linear, quadratic, and exponential models and solve problems. For exponential models, express as a logarithm the solution to ab^(ct) = d where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n,where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x.	0
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions.	0
GA.9-12.M2.A.2.b (MM2A2.b.) Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.	0
GA.9-12.M3.A.1 (MM3A1.) Students will analyze graphs of polynomial functions of higher degree.	0
GA.9-12.M3.A.1.d (MM3A1.d.) Investigate and explain characteristics of polynomial functions, including domain and range, intercepts, zeros, relative and absolute extrema, intervals of increase and decrease, and end behavior.	0

GA.9-12.M3.A.2 (MM3A2.) Students will explore logarithmic functions as inverses of exponential functions.	0
GA.9-12.M3.A.2.g (MM3A2.g.) Explore real phenomena related to exponential and logarithmic functions including half-life and doubling time.	0

CC.9-12.F.LE.5 Construct and compare linear, quadratic, and exponential models and solve problems. Interpret the parameters in a linear or exponential function in terms of a context.*

GA.9-12.M1.A.1 (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.	0
GA.9-12.M1.A.1.b (MM1A1.b.) Graph the basic functions f(x) = x^n,where n = 1 to 3, f(x) = √x, f(x) =|x|, and f(x) = 1/x.	0
GA.9-12.M1.A.1.e (MM1A1.e.) Relate to a given context the characteristics of a function, and use graphs and tables to investigate its behavior.	0
GA.9-12.M2.A.2 (MM2A2.) Students will explore exponential functions.	0
GA.9-12.M2.A.2.b (MM2A2.b.) Investigate and explain characteristics of exponential functions, including domain and range, asymptotes, zeros, intercepts, intervals of increase and decrease, rates of change, and end behavior.	0

CC.9-12.F.TF.1 Extend the domain of trigonometric functions using the unit circle. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

GA.9-12.M4.A.2 (MM4A2.) Students will use the circle to define the trigonometric functions.	0
GA.9-12.M4.A.2.a (MM4A2.a.) Define and understand angles measured in degrees and radians, including but not limited to 0°, 30°, 45°, 60°, 90°, their multiples, and equivalences.	0

CC.9-12.F.TF.2 Extend the domain of trigonometric functions using the unit circle. 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.

GA.9-12.M4.A.2 (MM4A2.) Students will use the circle to define the trigonometric functions.	0
GA.9-12.M4.A.2.b (MM4A2.b.) Understand and apply the six trigonometric functions as functions of general angles in standard position.	0
GA.9-12.M4.A.2.c (MM4A2.c.) Find values of trigonometric functions using points on the terminal sides of angles in the standard position.	0
GA.9-12.M4.A.2.d (MM4A2.d.) Understand and apply the six trigonometric functions as functions of arc length on the unit circle.	0

CC.9-12.F.TF.3 (+) Extend the domain of trigonometric functions using the unit circle. Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π - x, π + x, and 2π - x in terms of their values for x, where x is any real number.

GA.9-12.M4.A.2 (MM4A2.) Students will use the circle to define the trigonometric functions.	0
GA.9-12.M4.A.2.a (MM4A2.a.) Define and understand angles measured in degrees and radians, including but not limited to 0°, 30°, 45°, 60°, 90°, their multiples, and equivalences.	0

CC.9-12.F.TF.4 (+) Extend the domain of trigonometric functions using the unit circle. Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

GA.9-12.M4.A.3 (MM4A3.) Students will investigate and use the graphs of the six trigonometric functions.	0
GA.9-12.M4.A.3.a (MM4A3.a.) Understand and apply the six basic trigonometric functions as functions of real numbers.	0

GA.9-12.M4.A.3.b (MM4A3.b.) Determine the characteristics of the graphs of the six basic trigonometric functions. 0

CC.9-12.F.TF.5 Model periodic phenomena with trigonometric functions. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*

GA.9-12.M4.A.3 (MM4A3.) Students will investigate and use the graphs of the six trigonometric functions. 0

GA.9-12.M4.A.3.b (MM4A3.b.) Determine the characteristics of the graphs of the six basic trigonometric functions. 0

GA.9-12.M4.A.3.d (MM4A3.d.) Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena. 0

CC.9-12.F.TF.6 (+) Model periodic phenomena with trigonometric functions. Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

GA.9-12.M4.A.8 (MM4A8.) Students will investigate and use inverse sine, inverse cosine, and inverse tangent functions. 0

GA.9-12.M4.A.8.b (MM4A8.b.) Determine characteristics of the above functions and their graphs. 0

CC.9-12.F.TF.7 (+) Model periodic phenomena with trigonometric functions. 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.*

GA.9-12.M4.A.6 (MM4A6.) Students will solve trigonometric equations both graphically and algebraically. 0

GA.9-12.M4.A.6.a (MM4A6.a.) Solve trigonometric equations over a variety of domains, using technology as appropriate. 0

CC.9-12.F.TF.8 Prove and apply trigonometric identities. Prove the Pythagorean identity (sin A)^2 + (cos A)^2 = 1 and use it to find sin A, cos A, or tan A, given sin A, cos A, or tan A, and the quadrant of the angle.

GA.9-12.M4.A.5 (MM4A5.) Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements: 0

- -- tanθ = sinθ/cosθ,
- -- cotθ = cosθ/sinθ,
- -- secθ = 1/cosθ,
- -- cscθ = 1/sinθ,
- -- (sin θ)^2 + (cos θ)^2 = 1,
- -- 1 + (tan θ)^2 = (sec θ)^2,
- -- 1 + (cot θ)^2 = (csc θ)^2,
- -- sin(α ± β) = sinα cosβ ± cosα sinβ,
- -- cos(α ± β) = cosα cos β ± sinα sinβ,
- -- sin(2θ) = 2sinθ cosθ,
- -- cos(2θ) = (cos θ)^2 − (sin θ)^2.

CC.9-12.F.TF.9 (+) Prove and apply trigonometric identities. Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

GA.9-12.M4.A.5 (MM4A5.) Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements: 0

- -- tanθ = sinθ/cosθ,
- -- cotθ = cosθ/sinθ,
- -- secθ = 1/cosθ,
- -- cscθ = 1/sinθ,
- -- (sin θ)^2 + (cos θ)^2 = 1,
- -- 1 + (tan θ)^2 = (sec θ)^2,
- -- 1 + (cot θ)^2 = (csc θ)^2,

-- sin(α ± β) = sinα cosβ ± cosα sinβ,
-- cos(α ± β) = cosα cos β ± sinα sinβ,
-- sin(2θ) = 2sinθ cosθ,
-- cos(2θ) = (cos θ)^2 − (sin θ)^2.

GEOMETRY

CC.9-12.G.CO.1 Experiment with transformations in the plane. 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.

GA.8.G.1 Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.	1 to 4
GA.8.G.1.a Investigate characteristics of parallel and perpendicular lines both algebraically and geometrically.	1 to 4
GA.8.G.1.d Understand the meaning of congruence: that all corresponding angles are congruent and all corresponding sides are congruent.	1 to 4
GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.2 Students will demonstrate understanding of transformations.	2 to 5

CC.9-12.G.CO.2 Experiment with transformations in the plane. 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).

GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.2 Students will demonstrate understanding of transformations.	2 to 5
GA.7.G.2.a Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations.	2 to 5

CC.9-12.G.CO.3 Experiment with transformations in the plane. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

GA.7.G.2 Students will demonstrate understanding of transformations.	2 to 5
GA.7.G.2.a Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations.	2 to 5

CC.9-12.G.CO.4 Experiment with transformations in the plane. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.2.a Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations.	2 to 5

CC.9-12.G.CO.5 Experiment with transformations in the plane. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

GA.7.G.2 Students will demonstrate understanding of transformations.	2 to 5
GA.7.G.2.a Demonstrate understanding of translations, dilations, rotations, reflections, and relate symmetry to appropriate transformations.	2 to 5

CC.9-12.G.CO.6 Understand congruence in terms of rigid motions. 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.

GA.8.G.1 Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.	1 to 4
GA.8.G.1.d Understand the meaning of congruence: that all corresponding angles are congruent and all corresponding sides are congruent.	1 to 4

CC.9-12.G.CO.7 Understand congruence in terms of rigid motions. 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.

GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.1.b Recognize that many constructions are based on the creation of congruent triangles.	2 to 5

CC.9-12.G.CO.8 Understand congruence in terms of rigid motions. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

GA.9-12.M1.G.3 (MM1G3.) Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.	0
GA.9-12.M1.G.3.c (MM1G3.c.) Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).	0

CC.9-12.G.CO.9 Prove geometric theorems. 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.

GA.8.G.1 Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.	1 to 4
GA.8.G.1.a Investigate characteristics of parallel and perpendicular lines both algebraically and geometrically.	1 to 4
GA.8.G.1.b Apply properties of angle pairs formed by parallel lines cut by a transversal.	1 to 4
GA.8.G.1.c Understand the properties of the ratio of segments of parallel lines cut by one or more transversals.	1 to 4
GA.9-12.M1.G.2 (MM1G2.) Students will understand and use the language of mathematical argument and justification.	0
GA.9-12.M1.G.2.a (MM1G2.a.) Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.	0
GA.9-12.M1.G.2.b (MM1G2.b.) Understand and use the relationships among a statement and its converse, inverse, and contrapositive.	0

CC.9-12.G.CO.10 Prove geometric theorems. Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180 degrees; 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.

GA.9-12.M1.G.3 (MM1G3.) Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.	0
GA.9-12.M1.G.3.a (MM1G3.a.) Determine the sum of interior and exterior angles in a polygon.	0
GA.9-12.M1.G.3.b (MM1G3.b.) Understand and use the triangle inequality, the side-angle inequality, and the exterior-angle inequality.	0
GA.9-12.M1.G.3.e (MM1G3.e.) Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid.	0

GA.9-12.M1.G.2 (MM1G2.) Students will understand and use the language of mathematical argument and justification.	0
GA.9-12.M1.G.2.a (MM1G2.a.) Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.	0
GA.9-12.M1.G.2.b (MM1G2.b.) Understand and use the relationships among a statement and its converse, inverse, and contrapositive.	0

CC.9-12.G.CO.11 Prove geometric theorems. 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.

GA.9-12.M1.G.3 (MM1G3.) Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.	0
GA.9-12.M1.G.3.d (MM1G3.d.) Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.	0
GA.9-12.M1.G.2 (MM1G2.) Students will understand and use the language of mathematical argument and justification.	0
GA.9-12.M1.G.2.a (MM1G2.a.) Use conjecture, inductive reasoning, deductive reasoning, counterexamples, and indirect proof as appropriate.	0
GA.9-12.M1.G.2.b (MM1G2.b.) Understand and use the relationships among a statement and its converse, inverse, and contrapositive.	0

CC.9-12.G.CO.12 Make geometric constructions. 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.

GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.1.a Perform basic constructions using both compass and straight edge, and appropriate technology. Constructions should include copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.	2 to 5
GA.9-12.M1.G.1 (MM1G1.) Students will investigate properties of geometric figures in the coordinate plane.	0
GA.9-12.M1.G.1.b (MM1G1.b.) Determine the distance between a point and a line.	0

CC.9-12.G.CO.13 Make geometric constructions. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

GA.7.G.1 Students will construct plane figures that meet given conditions.	2 to 5
GA.7.G.1.b Recognize that many constructions are based on the creation of congruent triangles.	2 to 5

CC.9-12.G.SRT.1 Understand similarity in terms of similarity transformations. 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.
-- b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

GA.7.G.3 Students will use the properties of similarity and apply these concepts to geometric figures.	2 to 5
GA.7.G.3.a Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts.	2 to 5
GA.7.G.3.b Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths	2 to 5

and areas of similar geometric figures.

CC.9-12.G.SRT.2 Understand similarity in terms of similarity transformations. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

GA.7.G.3 Students will use the properties of similarity and apply these concepts to geometric figures.	2 to 5
GA.7.G.3.a Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts.	2 to 5
GA.7.G.3.b Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures.	2 to 5

CC.9-12.G.SRT.3 Understand similarity in terms of similarity transformations. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

GA.7.G.3 Students will use the properties of similarity and apply these concepts to geometric figures.	2 to 5
GA.7.G.3.a Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts.	2 to 5
GA.7.G.3.b Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures.	2 to 5

CC.9-12.G.SRT.4 Prove theorems involving similarity. 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.

GA.7.G.3 Students will use the properties of similarity and apply these concepts to geometric figures.	2 to 5
GA.7.G.3.a Understand the meaning of similarity, visually compare geometric figures for similarity, and describe similarities by listing corresponding parts.	2 to 5
GA.7.G.3.b Understand the relationships among scale factors, length ratios, and area ratios between similar figures. Use scale factors, length ratios, and area ratios to determine side lengths and areas of similar geometric figures.	2 to 5

CC.9-12.G.SRT.5 Prove theorems involving similarity. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

GA.9-12.M1.G.3 (MM1G3.) Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons.	0
GA.9-12.M1.G.3.c (MM1G3.c.) Understand and use congruence postulates and theorems for triangles (SSS, SAS, ASA, AAS, HL).	0
GA.9-12.M1.G.3.d (MM1G3.d.) Understand, use, and prove properties of and relationships among special quadrilaterals: parallelogram, rectangle, rhombus, square, trapezoid, and kite.	0

CC.9-12.G.SRT.6 Define trigonometric ratios and solve problems involving right triangles. 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.

GA.9-12.M2.G.2 (MM2G2.) Students will define and apply sine, cosine, and tangent ratios to right triangles.	0
GA.9-12.M2.G.2.a (MM2G2.a.) Discover the relationship of the trigonometric ratios for similar triangles.	0
GA.9-12.M2.G.2.b (MM2G2.b.) Explain the relationship between the trigonometric ratios of	0

complementary angles.

GA.9-12.M2.G.1 (MM2G1.) Students will identify and use special right triangles. 0
GA.9-12.M2.G.1.a (MM2G1.a.) Determine the lengths of sides of 30°-60°-90° triangles. 0
GA.9-12.M2.G.1.b (MM2G1.b.) Determine the lengths of sides of 45°-45°-90° triangles. 0

CC.9-12.G.SRT.7 Define trigonometric ratios and solve problems involving right triangles. Explain and use the relationship between the sine and cosine of complementary angles.
GA.9-12.M2.G.2 (MM2G2.) Students will define and apply sine, cosine, and tangent ratios to right triangles. 0
GA.9-12.M2.G.2.b (MM2G2.b.) Explain the relationship between the trigonometric ratios of complementary angles. 0

GA.9-12.M2.G.1 (MM2G1.) Students will identify and use special right triangles. 0
GA.9-12.M2.G.1.a (MM2G1.a.) Determine the lengths of sides of 30°-60°-90° triangles. 0
GA.9-12.M2.G.1.b (MM2G1.b.) Determine the lengths of sides of 45°-45°-90° triangles. 0

CC.9-12.G.SRT.8 Define trigonometric ratios and solve problems involving right triangles. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
GA.9-12.M2.G.2 (MM2G2.) Students will define and apply sine, cosine, and tangent ratios to right triangles. 0
GA.9-12.M2.G.2.c (MM2G2.c.) Solve application problems using the trigonometric ratios. 0

GA.9-12.M2.G.1 (MM2G1.) Students will identify and use special right triangles. 0
GA.9-12.M2.G.1.a (MM2G1.a.) Determine the lengths of sides of 30°-60°-90° triangles. 0
GA.9-12.M2.G.1.b (MM2G1.b.) Determine the lengths of sides of 45°-45°-90° triangles. 0

CC.9-12.G.SRT.9 (+) Apply trigonometry to general triangles. 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.
GA.9-12.M4.A.7 (MM4A7.) Students will verify and apply A = (1/2)ab sin C to find the area of a triangle. 0

CC.9-12.G.SRT.10 (+) Apply trigonometry to general triangles. Prove the Laws of Sines and Cosines and use them to solve problems.
GA.9-12.M4.A.6 (MM4A6.) Students will solve trigonometric equations both graphically and algebraically. 0
GA.9-12.M4.A.6.c (MM4A6.c.) Apply the law of sines and the law of cosines. 0

CC.9-12.G.SRT.11 (+) Apply trigonometry to general triangles. 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).
GA.9-12.M4.A.6 (MM4A6.) Students will solve trigonometric equations both graphically and algebraically. 0
GA.9-12.M4.A.6.c (MM4A6.c.) Apply the law of sines and the law of cosines. 0

CC.9-12.G.C.1 Understand and apply theorems about circles. Prove that all circles are similar.
GA.9-12.M3.G.1 (MM3G1.) Students will investigate the relationships between lines and circles. 0
GA.9-12.M3.G.1.a (MM3G1.a.) Find equations of circles. 0
GA.9-12.M3.G.1.b (MM3G1.b.) Graph a circle given an equation in general form. 0

CC.9-12.G.C.2 Understand and apply theorems about circles. 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.

GA.9-12.M2.G.3 (MM2G3.) Students will understand the properties of circles. 0
GA.9-12.M2.G.3.a (MM2G3.a.) Understand and use properties of chords, tangents, and secants as an application of triangle similarity. 0
GA.9-12.M2.G.3.b (MM2G3.b.) Understand and use properties of central, inscribed, and related angles. 0

CC.9-12.G.C.3 Understand and apply theorems about circles. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

GA.9-12.M1.G.3 (MM1G3.) Students will discover, prove, and apply properties of triangles, quadrilaterals, and other polygons. 0
GA.9-12.M1.G.3.e (MM1G3.e.) Find and use points of concurrency in triangles: incenter, orthocenter, circumcenter, and centroid. 0

CC.9-12.G.C.4 (+) Understand and apply theorems about circles. Construct a tangent line from a point outside a given circle to the circle.

GA.9-12.M3.G.1 (MM3G1.) Students will investigate the relationships between lines and circles. 0
GA.9-12.M3.G.1.c (MM3G1.c.) Find the equation of a tangent line to a circle at a given point. 0

GA.9-12.M2.G.3 (MM2G3.) Students will understand the properties of circles. 0
GA.9-12.M2.G.3.a (MM2G3.a.) Understand and use properties of chords, tangents, and secants as an application of triangle similarity. 0

CC.9-12.G.C.5 Find arc lengths and areas of sectors of circles. 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.

GA.9-12.M4.A.2 (MM4A2.) Students will use the circle to define the trigonometric functions. 0
GA.9-12.M4.A.2.a (MM4A2.a.) Define and understand angles measured in degrees and radians, including but not limited to 0°, 30°, 45°, 60°, 90°, their multiples, and equivalences. 0

GA.9-12.M2.G.3 (MM2G3.) Students will understand the properties of circles. 0
GA.9-12.M2.G.3.c (MM2G3.c.) Use the properties of circles to solve problems involving the length of an arc and the area of a sector. 0
GA.9-12.M2.G.3.d (MM2G3.d.) Justify measurements and relationships in circles using geometric and algebraic properties. 0

CC.9-12.G.GPE.1 Translate between the geometric description and the equation for a conic section. 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.

GA.9-12.M3.G.1 (MM3G1.) Students will investigate the relationships between lines and circles. 0
GA.9-12.M3.G.1.a (MM3G1.a.) Find equations of circles. 0
GA.9-12.M3.G.1.b (MM3G1.b.) Graph a circle given an equation in general form. 0

CC.9-12.G.GPE.2 Translate between the geometric description and the equation for a conic section. Derive the equation of a parabola given a focus and directrix.

GA.9-12.M3.G.2 (MM3G2.) Students will recognize, analyze, and graph the equations of the conic 0

sections (parabolas, circles, ellipses, and hyperbolas).	
GA.9-12.M3.G.2.a (MM3G2.a.) Convert equations of conics by completing the square.	0
GA.9-12.M3.G.2.b (MM3G2.b.) Graph conic sections, identifying fundamental characteristics.	0
GA.9-12.M3.G.2.c (MM3G2.c.) Write equations of conic sections given appropriate information.	0

CC.9-12.G.GPE.3 (+) Translate between the geometric description and the equation for a conic section. 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.

GA.9-12.M3.G.2 (MM3G2.) Students will recognize, analyze, and graph the equations of the conic sections (parabolas, circles, ellipses, and hyperbolas).	0
GA.9-12.M3.G.2.a (MM3G2.a.) Convert equations of conics by completing the square.	0
GA.9-12.M3.G.2.b (MM3G2.b.) Graph conic sections, identifying fundamental characteristics.	0
GA.9-12.M3.G.2.c (MM3G2.c.) Write equations of conic sections given appropriate information.	0

CC.9-12.G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).

GA.9-12.M1.G.1 (MM1G1.) Students will investigate properties of geometric figures in the coordinate plane.	0
GA.9-12.M1.G.1.e (MM1G1.e.) Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.	0

CC.9-12.G.GPE.5 Use coordinates to prove simple geometric theorems algebraically. 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).

GA.8.G.1 Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.	1 to 4
GA.8.G.1.a Investigate characteristics of parallel and perpendicular lines both algebraically and geometrically.	1 to 4
GA.9-12.M1.G.1 (MM1G1.) Students will investigate properties of geometric figures in the coordinate plane.	0
GA.9-12.M1.G.1.b (MM1G1.b.) Determine the distance between a point and a line.	0

CC.9-12.G.GPE.6 Use coordinates to prove simple geometric theorems algebraically. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

GA.8.G.1 Students will understand and apply the properties of parallel and perpendicular lines and understand the meaning of congruence.	1 to 4
GA.8.G.1.c Understand the properties of the ratio of segments of parallel lines cut by one or more transversals.	1 to 4
GA.9-12.M1.G.1 (MM1G1.) Students will investigate properties of geometric figures in the coordinate plane.	0
GA.9-12.M1.G.1.c (MM1G1.c.) Determine the midpoint of a segment.	0

CC.9-12.G.GPE.7 Use coordinates to prove simple geometric theorems algebraically. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.*

GA.9-12.M1.G.1 (MM1G1.) Students will investigate properties of geometric figures in the coordinate plane.	0
GA.9-12.M1.G.1.d (MM1G1.d.) Understand the distance formula as an application of the	0

Pythagorean theorem.	
GA.9-12.M1.G.1.e (MM1G1.e.) Use the coordinate plane to investigate properties of and verify conjecture related to triangles and quadrilaterals.	0

CC.9-12.G.GMD.1 Explain volume formulas and use them to solve problems. 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.

GA.5.G.2 Students will understand the relationship of the circumference of a circle to its diameter is pi ($\pi \approx 3.14$).	4 to 7
GA.5.M.1. Students will extend their understanding of area of geometric plane figures.	4 to 7
GA.5.M.1.e Estimate the area of a circle through partitioning and tiling.	4 to 7
GA.5.M.1.g Derive the formula for the area of a circle.	4 to 7
GA.6.G.2 Students will further develop their understanding of solid figures.	3 to 6
GA.6.M.3 Students will determine the volume of fundamental solid figures (right rectangular prisms, cylinders, pyramids and cones).	3 to 6
GA.6.M.3.a Determine the formula for finding the volume of fundamental solid figures.	3 to 6
GA.7.G.4 Students will further develop their understanding of three-dimensional figures.	2 to 5
GA.7.G.4.a Describe three-dimensional figures formed by translations and rotations of plane figures through space.	2 to 5
GA.7.G.4.b Sketch, model, and describe cross-sections of cones, cylinders, pyramids, and prisms.	2 to 5

CC.9-12.G.GMD.2 (+) Explain volume formulas and use them to solve problems. Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

GA.9-12.M2.G.4 (MM2G4.) Students will find and compare the measures of spheres.	0
GA.9-12.M2.G.4.a (MM2G4.a.) Use and apply surface area and volume of a sphere.	0
GA.8.G.2 Students will understand and use the Pythagorean theorem.	1 to 4
GA.8.G.2.a Apply properties of right triangles, including the Pythagorean theorem.	1 to 4
GA.7.G.4 Students will further develop their understanding of three-dimensional figures.	2 to 5
GA.7.G.4.a Describe three-dimensional figures formed by translations and rotations of plane figures through space.	2 to 5
GA.7.G.4.b Sketch, model, and describe cross-sections of cones, cylinders, pyramids, and prisms.	2 to 5
GA.6.M.3 Students will determine the volume of fundamental solid figures (right rectangular prisms, cylinders, pyramids and cones).	3 to 6
GA.6.M.3.a Determine the formula for finding the volume of fundamental solid figures.	3 to 6

CC.9-12.G.GMD.3 Explain volume formulas and use them to solve problems. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.*

GA.9-12.M2.G.4 (MM2G4.) Students will find and compare the measures of spheres.	0
GA.9-12.M2.G.4.a (MM2G4.a.) Use and apply surface area and volume of a sphere.	0
GA.9-12.M2.G.4.b (MM2G4.b.) Determine the effect on surface area and volume of changing the radius or diameter of a sphere.	0

CC.9-12.G.GMD.4 Visualize relationships between two-dimensional and three-dimensional objects. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

GA.7.G.4 Students will further develop their understanding of three-dimensional figures.	2 to 5

GA.7.G.4.a Describe three-dimensional figures formed by translations and rotations of plane figures through space.	2 to 5
GA.7.G.4.b Sketch, model, and describe cross-sections of cones, cylinders, pyramids, and prisms.	2 to 5

CC.9-12.G.MG.1 Apply geometric concepts in modeling situations. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).*

GA.6.G.2 Students will further develop their understanding of solid figures.	3 to 6
GA.6.G.2.a Compare and contrast right prisms and pyramids.	3 to 6
GA.6.G.2.b Compare and contrast cylinders and cones.	3 to 6
GA.6.G.2.c Interpret and sketch front, back, top, bottom and side views of solid figures.	3 to 6
GA.6.G.2.d Construct nets for prisms, cylinders, pyramids, and cones.	3 to 6

CC.9-12.G.MG.2 Apply geometric concepts in modeling situations. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).*

GA.9-12.M1.A.2 (MM1A2.) Students will simplify and operate with radical expressions, polynomials, and rational expressions.	0
GA.9-12.M1.A.2.g (MM1A2.g.) Use area and volume models for polynomial arithmetic.	0
GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.c (MM2D2.c.) Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.	0

CC.9-12.G.MG.3 Apply geometric concepts in modeling situations. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).*

GA.9-12.M3.P.1 (MM3P1.) Students will solve problems (using appropriate technology).	0
GA.9-12.M3.P.1.c (MM3P1.c.) Apply and adapt a variety of appropriate strategies to solve problems.	0
GA.9-12.M3.P.5 (MM3P5.) Students will represent mathematics in multiple ways.	0
GA.9-12.M3.P.5.b (MM3P5.b.) Select, apply, and translate among mathematical representations to solve problems.	0

STATISTICS AND PROBABILITY

CC.9-12.S.ID.1 Summarize, represent, and interpret data on a single count or measurement variable. Represent data with plots on the real number line (dot plots, histograms, and box plots).*

GA.5.D.1 Students will analyze graphs.	4 to 7
GA.5.D.1.b Compare and contrast multiple graphic representations (circle graphs, line graphs, line plot graphs, pictographs, Venn diagrams, and bar graphs) for a single set of data and discuss the advantages/disadvantages of each.	4 to 7
GA.5.D.2 Students will collect, organize, and display data using the most appropriate graph.	4 to 7

CC.9-12.S.ID.2 Summarize, represent, and interpret data on a single count or measurement variable. 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.*

GA.7.D.1 Students will pose questions, collect data, represent and analyze the data, and interpret results.	2 to 5

GA.7.D.1.c Analyze data using measures of central tendency (mean, median, and mode), including recognition of outliers.	2 to 5
GA.7.D.1.d Analyze data with respect to measures of variation (range, quartiles, interquartile range).	2 to 5
GA.9-12.M2.D.1 (MM2D1.) Using sample data, students will make informal inferences about population means and standard deviations.	0
GA.9-12.M2.D.1.b (MM2D1.b.) Understand and calculate the means and standard deviations of sets of data.	0
GA.9-12.M2.D.1.c (MM2D1.c.) Use means and standard deviations to compare data sets.	0
GA.9-12.M2.D.1.d (MM2D1.d.) Compare the means and standard deviations of random samples with the corresponding population parameters, including those population parameters for normal distributions. Observe that the different sample means vary from one sample to the next. Observe that the distribution of the sample means has less variability than the population distribution.	0

CC.9-12.S.ID.3 Summarize, represent, and interpret data on a single count or measurement variable. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).*

GA.7.D.1 Students will pose questions, collect data, represent and analyze the data, and interpret results.	2 to 5
GA.7.D.1.c Analyze data using measures of central tendency (mean, median, and mode), including recognition of outliers.	2 to 5

CC.9-12.S.ID.4 Summarize, represent, and interpret data on a single count or measurement variable. 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.*

GA.9-12.M2.D.1 (MM2D1.) Using sample data, students will make informal inferences about population means and standard deviations.	0
GA.9-12.M2.D.1.b (MM2D1.b.) Understand and calculate the means and standard deviations of sets of data.	0
GA.9-12.M2.D.1.c (MM2D1.c.) Use means and standard deviations to compare data sets.	0
GA.9-12.M2.D.1.d (MM2D1.d.) Compare the means and standard deviations of random samples with the corresponding population parameters, including those population parameters for normal distributions. Observe that the different sample means vary from one sample to the next. Observe that the distribution of the sample means has less variability than the population distribution.	0
GA.9-12.M3.D.2 (MM3D2.) Students will solve problems involving probabilities by interpreting a normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution).	0
GA.9-12.M3.D.2.a (MM3D2.a.) Determine intervals about the mean that include a given percent of data.	0
GA.9-12.M3.D.2.b (MM3D2.b.) Determine the probability that a given value falls within a specified interval.	0
GA.9-12.M3.D.2.c (MM3D2.c.) Estimate how many items in a population fall within a specified interval.	0

CC.9-12.S.ID.5 Summarize, represent, and interpret data on two categorical and quantitative variables. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.*

GA.9-12.M3.D.1 (MM3D1.) Students will create probability histograms of discrete random variables, using both experimental and theoretical probabilities.	0
GA.9-12.M3.D.2 (MM3D2.) Students will solve problems involving probabilities by interpreting a	0

normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution).	
GA.9-12.M3.D.2.a (MM3D2.a.) Determine intervals about the mean that include a given percent of data.	0
GA.9-12.M3.D.2.b (MM3D2.b.) Determine the probability that a given value falls within a specified interval.	0
GA.9-12.M3.D.2.c (MM3D2.c.) Estimate how many items in a population fall within a specified interval.	0
GA.7.D.1 Students will pose questions, collect data, represent and analyze the data, and interpret results.	2 to 5
GA.7.D.1.b Construct frequency distributions.	2 to 5

CC.9-12.S.ID.6 Summarize, represent, and interpret data on two categorical and quantitative variables. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.*

GA.8.D.4 Students will organize, interpret, and make inferences from statistical data	1 to 4
GA.8.D.4.a Gather data that can be modeled with a linear function.	1 to 4
GA.8.D.4.b Estimate and determine a line of best fit from a scatter plot.	1 to 4
GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.a (MM2D2.a.) Gather and plot data that can be modeled with linear and quadratic functions.	0
GA.9-12.M2.D.2.b (MM2D2.b.) Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."	0

CC.9-12.S.ID.6a Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*

GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.a (MM2D2.a.) Gather and plot data that can be modeled with linear and quadratic functions.	0
GA.9-12.M2.D.2.b (MM2D2.b.) Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."	0
GA.9-12.M2.D.2.c (MM2D2.c.) Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.	0

CC.9-12.S.ID.6b Informally assess the fit of a function by plotting and analyzing residuals.*

GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.b (MM2D2.b.) Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."	0
GA.9-12.M2.D.2.c (MM2D2.c.) Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.	0

CC.9-12.S.ID.6c Fit a linear function for a scatter plot that suggests a linear association.*

GA.8.D.4 Students will organize, interpret, and make inferences from statistical data	1 to 4
GA.8.D.4.a Gather data that can be modeled with a linear function.	1 to 4
GA.8.D.4.b Estimate and determine a line of best fit from a scatter plot.	1 to 4

CC.9-12.S.ID.7 Interpret linear models. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.*	
GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.a (MM2D2.a.) Gather and plot data that can be modeled with linear and quadratic functions.	0
GA.9-12.M2.D.2.b (MM2D2.b.) Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."	0
CC.9-12.S.ID.8 Interpret linear models. Compute (using technology) and interpret the correlation coefficient of a linear fit.*	
GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.a (MM2D2.a.) Gather and plot data that can be modeled with linear and quadratic functions.	0
GA.9-12.M2.D.2.b (MM2D2.b.) Examine the issues of curve fitting by finding good linear fits to data using simple methods such as the median-median line and "eyeballing."	0
GA.9-12.M2.D.2.c (MM2D2.c.) Understand and apply the processes of linear and quadratic regression for curve fitting using appropriate technology.	0
CC.9-12.S.ID.9 Interpret linear models. Distinguish between correlation and causation.*	
GA.9-12.M2.D.2 (MM2D2.) Students will determine an algebraic model to quantify the association between two quantitative variables.	0
GA.9-12.M2.D.2.d (MM2D2.d.) Investigate issues that arise when using data to explore the relationship between two variables, including confusion between correlation and causation.	0
CC.9-12.S.IC.1 Understand and evaluate random processes underlying statistical experiments. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.*	
GA.9-12.M1.D.3 (MM1D3.) Students will relate samples to a population.	0
GA.9-12.M1.D.3.b (MM1D3.b.) Compare the averages of the summary statistics from a large number of samples to the corresponding population parameters.	0
GA.9-12.M1.D.3.c (MM1D3.c.) Understand that a random sample is used to improve the chance of selecting a representative sample.	0
CC.9-12.S.IC.2 Understand and evaluate random processes underlying statistical experiments. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. For example, a model says a spinning coin falls heads up with probability 0. 5. Would a result of 5 tails in a row cause you to question the model?*	
GA.8.D.3 Students will use the basic laws of probability.	1 to 4
GA.8.D.3.a Find the probability of simple independent events.	1 to 4
CC.9-12.S.IC.3 Make inferences and justify conclusions from sample surveys, experiments, and observational studies. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.*	0
GA.9-12.M3.D.3 (MM3D3.) Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.	0
CC.9-12.S.IC.4 Make inferences and justify conclusions from sample surveys, experiments, and observational studies. 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.*	
GA.9-12.M4.D.2 (MM4D2.) Using student-generated data from random samples of at least 30 members, students will determine the margin of error and confidence interval for a specified level	0

of confidence.

GA.9-12.M4.D.3 (MM4D3.) Students will use confidence intervals and margins of error to make inferences from data about a population. Technology is used to evaluate confidence intervals, but students will be aware of the ideas involved.	0

CC.9-12.S.IC.5 Make inferences and justify conclusions from sample surveys, experiments, and observational studies. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.*

GA.9-12.M3.D.3 (MM3D3.) Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.	0
GA.9-12.M2.D.1 (MM2D1.) Using sample data, students will make informal inferences about population means and standard deviations.	0
GA.9-12.M2.D.1.a (MM2D1.a.) Pose a question and collect sample data from at least two different populations.	0

CC.9-12.S.IC.6 Make inferences and justify conclusions from sample surveys, experiments, and observational studies. Evaluate reports based on data.*

GA.9-12.M3.D.3 (MM3D3.) Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data.	0

CC.9-12.S.CP.1 Understand independence and conditional probability and use them to interpret data. 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").*

GA.8.D.1 Students will apply basic concepts of set theory.	1 to 4
GA.8.D.1.a Demonstrate relationships among sets through use of Venn diagrams.	1 to 4
GA.8.D.1.b Determine subsets, complements, intersection, and union of sets.	1 to 4
GA.8.D.1.c Use set notation to denote elements of a set.	1 to 4
GA.8.D.2 Students will determine the number of outcomes related to a given event.	1 to 4
GA.8.D.2.b Apply the addition and multiplication principles of counting.	1 to 4
GA.9-12.M1.D.1 (MM1D1.) Students will determine the number of outcomes related to a given event.	0
GA.9-12.M1.D.1.a (MM1D1.a.) Apply the addition and multiplication principles of counting.	0

CC.9-12.S.CP.2 Understand independence and conditional probability and use them to interpret data. 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.*

GA.8.D.2 Students will determine the number of outcomes related to a given event.	1 to 4
GA.8.D.2.b Apply the addition and multiplication principles of counting.	1 to 4
GA.8.D.3 Students will use the basic laws of probability.	1 to 4
GA.8.D.3.a Find the probability of simple independent events.	1 to 4
GA.8.D.3.b Find the probability of compound independent events.	1 to 4
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability.	0
GA.9-12.M1.D.2.a (MM1D2.a.) Find the probabilities of mutually exclusive events.	0
GA.9-12.M1.D.2.b (MM1D2.b.) Find the probabilities of dependent events.	0
GA.9-12.M1.D.2.c (MM1D2.c.) Calculate conditional probabilities.	0
GA.9-12.M1.D.1 (MM1D1.) Students will determine the number of outcomes related to a given	0

event.
GA.9-12.M1.D.1.a (MM1D1.a.) Apply the addition and multiplication principles of counting. 0

CC.9-12.S.CP.3 Understand independence and conditional probability and use them to interpret data. 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.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.c (MM1D2.c.) Calculate conditional probabilities. 0

CC.9-12.S.CP.4 Understand independence and conditional probability and use them to interpret data. 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.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.c (MM1D2.c.) Calculate conditional probabilities. 0

CC.9-12.S.CP.5 Understand independence and conditional probability and use them to interpret data. 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.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.c (MM1D2.c.) Calculate conditional probabilities. 0

CC.9-12.S.CP.6 Use the rules of probability to compute probabilities of compound events in a uniform probability model. 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.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.c (MM1D2.c.) Calculate conditional probabilities. 0

CC.9-12.S.CP.7 Use the rules of probability to compute probabilities of compound events in a uniform probability model. 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.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.a (MM1D2.a.) Find the probabilities of mutually exclusive events. 0
GA.9-12.M1.D.2.b (MM1D2.b.) Find the probabilities of dependent events. 0

CC.9-12.S.CP.8 (+) Use the rules of probability to compute probabilities of compound events in a uniform probability model. Apply the general Multiplication Rule in a uniform probability model, P(A and B) = [P(A)]x[P(B|A)] =[P(B)]x[P(A|B)], and interpret the answer in terms of the model.*
GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.a (MM1D2.a.) Find the probabilities of mutually exclusive events. 0
GA.9-12.M1.D.2.b (MM1D2.b.) Find the probabilities of dependent events. 0

CC.9-12.S.CP.9 (+) Use the rules of probability to compute probabilities of compound events in a uniform probability model. Use permutations and combinations to compute probabilities of compound events and solve problems.*

GA.9-12.M1.D.1 (MM1D1.) Students will determine the number of outcomes related to a given event. 0

GA.9-12.M1.D.1.b (MM1D1.b.) Calculate and use simple permutations and combinations. 0

CC.9-12.S.MD.1 (+) Calculate expected values and use them to solve problems. Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.*

GA.9-12.M3.D.1 (MM3D1.) Students will create probability histograms of discrete random variables, using both experimental and theoretical probabilities. 0

GA.9-12.M3.D.2 (MM3D2.) Students will solve problems involving probabilities by interpreting a normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution). 0

GA.9-12.M3.D.2.a (MM3D2.a.) Determine intervals about the mean that include a given percent of data. 0

GA.9-12.M3.D.2.b (MM3D2.b.) Determine the probability that a given value falls within a specified interval. 0

GA.9-12.M3.D.2.c (MM3D2.c.) Estimate how many items in a population fall within a specified interval. 0

CC.9-12.S.MD.2 (+) Calculate expected values and use them to solve problems. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0

GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.3 (+) Calculate expected values and use them to solve problems. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0

GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.4 (+) Calculate expected values and use them to solve problems. Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

GA.9-12.M3.D.2 (MM3D2.) Students will solve problems involving probabilities by interpreting a normal distribution as a probability histogram for a continuous random variable (z-scores are used for a general normal distribution). 0

GA.9-12.M3.D.2.c (MM3D2.c.) Estimate how many items in a population fall within a specified interval. 0

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0

GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.5 (+) Use probability to evaluate outcomes of decisions. Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.5a (+) Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.5b (+) Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.6 (+) Use probability to evaluate outcomes of decisions. Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).*

GA.9-12.M1.D.2 (MM1D2.) Students will use the basic laws of probability. 0
GA.9-12.M1.D.2.d (MM1D2.d.) Use expected value to predict outcomes. 0

CC.9-12.S.MD.7 (+) Use probability to evaluate outcomes of decisions. Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).*

GA.9-12.M3.D.3 (MM3D3.) Students will understand the differences between experimental and observational studies by posing questions and collecting, analyzing, and interpreting data. 0

GA.9-12.M1.A.1. (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques. 0
GA.9-12.M1.A.1.h (MM1A1.h.) Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither. 0

GPS NOT ALIGNED TO CC

Do we continue to teach these? If so, where should they be taught?

GA.9-12.M1.A.1. (MM1A1.) Students will explore and interpret the characteristics of functions, using graphs, tables, and simple algebraic techniques.
GA.9-12.M1.A.1.h (MM1A1.h.) Determine graphically and algebraically whether a function has symmetry and whether it is even, odd, or neither.

GA.9-12.M3.A.1. (MM3A1.) Students will analyze graphs of polynomial functions of higher degree.
GA.9-12.M3.A.1.c (MM3A1.c.) Determine whether a polynomial function has symmetry and whether it is even, odd, or neither.

GA.9-12.M3.G.1. (MM3G1.) Students will investigate the relationships between lines and circles.
GA.9-12.M3.G.1.e (MM3G1.e.) Solve a system of equations involving two circles.

GA.9-12.M3.G.3 (MM3G3.) Students will investigate planes and spheres.
GA.9-12.M3.G.3.a (MM3G3.a.) Plot the point (x, y, z) and understand it as a vertex of a rectangular prism.
GA.9-12.M3.G.3.b (MM3G3.b.) Apply the distance formula in 3-space.
GA.9-12.M3.G.3.c (MM3G3.c.) Recognize and understand equations of planes and spheres.