Georgia
Standards of Excellence
Curriculum Map

Mathematics

Accelerated GSE Geometry B / Algebra II

Georgia Department of Education

Richard Woods, Georgia's School Superintendent
"Educating Georgia's Future"

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Accelerated GSE Geometry B/Algebra II Curriculum Map

1st Semester					2nd Semester			
Unit 1 ***(5 – 6 weeks)***	**Unit 2** ***(3 – 4 weeks)***	**Unit 3** ***(3 – 4 weeks)***	**Unit 4** ***(2 – 3 weeks)***	**Unit 5** ***(2 – 3 weeks)***	**Unit 6** ***(3 – 4 weeks)***	**Unit 7** ***(4 – 5 weeks)***	**Unit 8** ***(3 – 4 weeks)***	**Unit 9** ***(3 – 4 weeks)***
Circles and Volume	**Geometric and Algebraic Connections**	**Applications of Probability**	**Quadratics Revisited**	**Operations With Polynomials**	**Polynomial Functions**	**Rational & Radical Relationships**	**Exponential & Logarithms**	**Mathematical Modeling**
MGSE9-12.G.C.1 MGSE9-12.G.C.2 MGSE9-12.G.C.3 MGSE9-12.G.C.4 MGSE9-12.G.C.5 MGSE9-12.G.GMD.1 MGSE9-12.G.GMD.2 MGSE9-12.G.GMD.3 MGSE9-12.G.GMD.4	MGSE9-12.G.GPE.1 MGSE9-12.G.GPE.4 MGSE9-12.G.GPE.5 MGSE9-12.G.GPE.6 MGSE9-12.G.GPE.7 MGSE9-12.G.MG.1 MGSE9-12.G.MG.2 MGSE9-12.G.MG.3	MGSE9-12.S.CP.1 MGSE9-12.S.CP.2 MGSE9-12.S.CP.3 MGSE9-12.S.CP.4 MGSE9-12.S.CP.5 MGSE9-12.S.CP.6 MGSE9-12.S.CP.7	MGSE9-12.N.CN.1 MGSE9-12.N.CN.2 MGSE9-12.N.CN.3 MGSE9-12.N.CN.7 MGSE9-12.N.CN.8 MGSE9-12.A.REI.4 MGSE9-12.A.REI.4b MGSE9-12.N.RN.1 MGSE9-12.N.RN.2	MGSE9-12.A.APR.1 MGSE9-12.A.APR.5 MGSE9-12.A.APR.6 MGSE9-12.F.BF.1 MGSE9-12.F.BF.1b MGSE9-12.F.BF.1c MGSE9-12.F.BF.4 MGSE9-12.F.BF.4a MGSE9-12.F.BF.4b MGSE9-12.F.BF.4c	MGSE9-12.N.CN.9 MGSE9-12.A.SSE.1 MGSE9-12.A.SSE.1a MGSE9-12.A.SSE.1b MGSE9-12.A.SSE.2 MGSE9-12.A.APR.2 MGSE9-12.A.APR.3 MGSE9-12.A.APR.4 MGSE9-12.F.IF.4 MGSE9-12.F.IF.7 MGSE9-12.F.IF.7c	MGSE9-12.A.APR.7 MGSE9-12.A.CED.1 MGSE9-12.A.CED.2 MGSE9-12.A.REI.2 MGSE9-12.F.IF.4 MGSE9-12.F.IF.5 MGSE9-12.F.IF.7 MGSE9-12.F.IF.7b MGSE9-12.F.IF.7d	MGSE9-12.A.SSE.3 MGSE9-12.A.SSE.3c MGSE9-12.F.IF.7 MGSE9-12.F.IF.7e MGSE9-12.F.IF.8 MGSE9-12.F.IF.8b MGSE9-12.F.BF.5 MGSE9-12.F.LE.4	MGSE9-12.A.SSE.4 MGSE9-12.A.CED.1 MGSE9-12.A.CED.2 MGSE9-12.A.CED.3 MGSE9-12.A.CED.4 MGSE9-12.A.REI.11 MGSE9-12.F.IF.6 MGSE9-12.F.IF.9 MGSE9-12.F.BF.3

These units were written to build upon concepts from prior units, so later units contain tasks that depend upon the concepts addressed in earlier units.
All units will include the Mathematical Practices and indicate skills to maintain.
***Revised standards indicated in bold red font.**

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics.

Grade 9-12 Key:

Number and Quantity Strand: RN = The Real Number System, Q = Quantities, CN = Complex Number System, VM = Vector and Matrix Quantities
Algebra Strand: SSE = Seeing Structure in Expressions, APR = Arithmetic with Polynomial and Rational Expressions, CED = Creating Equations, REI = Reasoning with Equations and Inequalities
Functions Strand: IF = Interpreting Functions, LE = Linear and Exponential Models, BF = Building Functions, TF = Trigonometric Functions
Geometry Strand: CO = Congruence, SRT = Similarity, Right Triangles, and Trigonometry, C = Circles, GPE = Expressing Geometric Properties with Equations, GMD = Geometric Measurement and Dimension, MG = Modeling with Geometry
Statistics and Probability Strand: ID = Interpreting Categorical and Quantitative Data, IC = Making Inferences and Justifying Conclusions, CP = Conditional Probability and the Rules of Probability, MD = Using Probability to Make Decisions

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Accelerated GSE Geometry B/Algebra II Expanded Curriculum Map – 1st Semester

Standards for Mathematical Practice	
1 Make sense of problems and persevere in solving them. **2** Reason abstractly and quantitatively. **3** Construct viable arguments and critique the reasoning of others. **4** Model with mathematics.	**5** Use appropriate tools strategically. **6** Attend to precision. **7** Look for and make use of structure. **8** Look for and express regularity in repeated reasoning.

1st Semester

Unit 1	Unit 2	Unit 3	Unit 4
Circles and Volume	**Geometric and Algebraic Connections**	**Applications of Probability**	**Quadratics Revisited**
<u>Understand and apply theorems about circles</u> **MGSE9-12.G.C.1 Understand that all circles are similar.** **MGSE9-12.G.C.2 Identify and describe relationships among inscribed angles, radii, chords, tangents, and secants. 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.** **MGSE9-12.G.C.3** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **MGSE9-12.G.C.4** Construct a tangent line from a point outside a given circle to the circle. **<u>Find arc lengths and areas of sectors of circles</u>** **MGSE9-12.G.C.5** Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector. **<u>Explain volume formulas and use them to solve problems</u>** **MGSE9-12.G.GMD.1 Give informal arguments for geometric formulas.** **a. Give informal arguments for the formulas of the circumference of a circle and area of a circle using dissection arguments and informal limit arguments.** **b. Give informal arguments for the formula of the volume of a cylinder, pyramid, and cone using Cavalieri's principle.** **MGSE9-12.G.GMD.2** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures. **MGSE9-12.G.GMD.3** Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.	**<u>Translate between the geometric description and the equation for a conic section</u>** **MGSE9-12.G.GPE.1** Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. **<u>Use coordinates to prove simple geometric theorems algebraically</u>** **MGSE9-12.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).* (Focus on quadrilaterals, right triangles, and circles.)** **MGSE9-12.G.GPE.5** Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point). **MGSE9-12.G.GPE.6** Find the point on a directed line segment between two given points that partitions the segment in a given ratio. **MGSE9-12.G.GPE.7** Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. **<u>Apply geometric concepts in modeling situations</u>** **MGSE9-12.G.MG.1** Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). **MGSE9-12.G.MG.2** Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). **MGSE9-12.G.MG.3** Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based	**<u>Understand independence and conditional probability and use them to interpret data</u>** **MGSE9-12.S.CP.1 Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events (*or, and, not*).** **MGSE9-12.S.CP.2 Understand that if two events A and B are independent, the probability of A and B occurring together is the product of their probabilities, and that if the probability of two events A and B occurring together is the product of their probabilities, the two events are independent.** **MGSE9-12.S.CP.3 Understand the conditional probability of A given B as P (A and B)/P(B). Interpret independence of A and B in terms of conditional probability; that is 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.** **MGSE9-12.S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, use collected 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.*** **MGSE9-12.S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.* **<u>Use the rules of probability to compute</u>**	**<u>Perform arithmetic operations with complex numbers.</u>** **MGSE9-12.N.CN.1 Understand there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi where a and b are real numbers.** **MGSE9-12.N.CN.2** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **MGSE9-12.N.CN.3 Find the conjugate of a complex number; use the conjugate to find the ~~absolute value (modulus) and~~ quotient of complex numbers.** **<u>Use complex numbers in polynomial identities and equations.</u>** **MGSE9-12.N.CN.7 Solve quadratic equations with real coefficients that have complex solutions by (but not limited to) square roots, completing the square, and the quadratic formula.** **MGSE9-12.N.CN.8 Extend polynomial identities to include factoring with complex numbers. *For example, rewrite $x^2 + 4$ as $(x + 2i)(x - 2i)$.*** **<u>Solve equations and inequalities in one variable</u>** **MGSE9-12.A.REI.4** Solve quadratic equations in one variable. **MGSE9-12.A.REI.4b Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, factoring, completing the square, and the quadratic formula, as appropriate to the initial form of the equation ~~(limit to real number solutions)~~.** **<u>Extend the properties of exponents to rational exponents.</u>** **MGSE9-12.N.RN.1 Explain how the meaning of rational exponents follows from extending the properties of integer exponents to rational numbers, 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 $[5^{(1/3)}]^3 = 5^{[(1/3) \times 3]}$ to hold, so $[5^{(1/3)}]^3$ must equal 5.***

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<u>Visualize relationships between two-dimensional and three-dimensional objects</u> **MGSE9-12.G.GMD.4** Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	on ratios).	**<u>probabilities of compound events in a uniform probability model</u>** **MGSE9-12.S.CP.6 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in context.** **MGSE9-12.S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answers in context.**	**MGSE9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents.

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Accelerated GSE Geometry B/Algebra II Expanded Curriculum Map – 2nd Semester

Standards for Mathematical Practice

1 Make sense of problems and persevere in solving them. **2** Reason abstractly and quantitatively. **3** Construct viable arguments and critique the reasoning of others. **4** Model with mathematics.	**5** Use appropriate tools strategically. **6** Attend to precision. **7** Look for and make use of structure. **8** Look for and express regularity in repeated reasoning.

2nd Semester

Unit 5	Unit 6	Unit 7	Unit 8	Unit 9
Operations With Polynomials	**Polynomial Functions**	**Rational & Radical Relationships**	**Exponential & Logarithms**	**Mathematical Modeling**
Perform arithmetic operations on polynomials **MGSE9-12.A.APR.1** **Add, subtract, and multiply polynomials; understand that polynomials form a system analogous to the integers in that they are closed under these operations.** **MGSE9-12.A.APR.5** **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.** **Rewrite rational expressions** **MGSE9-12.A.APR.6** **Rewrite simple rational expressions in different forms using inspection, long division, or a computer algebra system; 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).** **Build a function that models a relationship between two quantities** **MGSE9-12.F.BF.1** Write a function that describes a relationship between two quantities. **MGSE9-12.F.BF.1b** **Combine standard function types using arithmetic operations in contextual situations (Adding, subtracting, and multiplying functions of different types).** **MGSE9-12.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*	**MGSE9-12.N.CN.9** **Use the Fundamental Theorem of Algebra to find all roots of a polynomial equation** **Interpret the structure of expressions** **MGSE9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context. **MGSE9-12.A.SSE.1a** **Interpret parts of an expression, such as terms, factors, and coefficients, in context.** **MGSE9-12.A.SSE.1b** **Given situations which utilize formulas or expressions with multiple terms and/or factors, interpret the meaning (in context) of individual terms or factors.** **MGSE9-12.A.SSE.2** **Use the structure of an expression to rewrite it in different equivalent forms. 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 $(x^2 – y^2) (x^2 + y^2)$.** **Understand the relationship between zeros and factors of polynomials** **MGSE9-12.A.APR.2** Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). **MGSE9-12.A.APR.3** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **Use polynomial identities to solve problems** **MGSE9-12.A.APR.4** **Use polynomial identities to prove numerical relationships.** ***For example, use***	**Rewrite rational expressions** **MGSE9-12.A.APR.7** Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. **Create equations that describe numbers or relationships** **MGSE9-12.A.CED.1** **Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions ~~(integer inputs only)~~.** **MGSE9-12.A.CED.2** **Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)** **Understand solving equations as a process of reasoning and explain the reasoning** **MGSE9-12.A.REI.2** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **MGSE9-12.F.IF.4** **Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including:**	**Write expressions in equivalent forms to solve problems** **MGSE9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. **MGSE9-12.A.SSE.3c** **Use the properties of exponents to transform expressions for exponential functions.** ***For example, the expression 1.15^t, where t is in years, can be rewritten as $[1.15^{(1/12)}]^{(12t)} \approx 1.012^{(12t)}$ to reveal the approximate equivalent monthly interest rate is 15%.*** **Analyze functions using different representations** **MGSE9-12.F.IF.7** **Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.** **MGSE9-12.F.IF.7e** Graph exponential and logarithmic functions, showing intercepts and end behavior, ~~and trigonometric functions, showing period, midline, and amplitude.~~ **MGSE9-12.F.IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **MGSE9-12.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.* **Build new functions from existing**	**Write expressions in equivalent forms to solve problems** **MGSE9-12.A.SSE.4** Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* **MGSE9-12.A.CED.1** **Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear, quadratic, simple rational, and exponential functions ~~(integer inputs only)~~.** **MGSE9-12.A.CED.2** **Create linear, quadratic, and exponential equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (The phrase "in two or more variables" refers to formulas like the compound interest formula, in which $A = P(1 + r/n)^{nt}$ has multiple variables.)** **MGSE9-12.A.CED.3** **Represent constraints by equations or inequalities, and by systems of equation and/or inequalities, and interpret data points as possible (i.e. a solution) or not possible (i.e. a non-solution) under the established constraints.** **MGSE9-12.A.CED.4** **Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.** ***Examples: Rearrange Ohm's law V = IR to highlight resistance R; Rearrange area of a circle formula $A = \pi r^2$ to highlight the radius r.***

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weather balloon as a function of time. **Build new functions from existing functions** **MGSE9-12.F.BF.4** Find inverse functions. **MGSE9-12.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 $x \neq 1$. **MGSE9-12.F.BF.4b** Verify by composition that one function is the inverse of another. **MGSE9-12.F.BF.4c** Read values of an inverse function from a graph or a table, given that the function has an inverse.	***polynomial identities to prove $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$.*** **Interpret functions that arise in applications in terms of the context** **MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; ~~and periodicity~~.** **Analyze functions using different representations** **MGSE9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.** **MGSE9-12.F.IF.7c** Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	**intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.** **Interpret functions that arise in applications in terms of the context** **MGSE9-12.F.IF.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* **Analyze functions using different representations** **MGSE9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.** **MGSE9-12.F.IF.7b** Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **MGSE9-12.F.IF.7d** Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.	**functions** **MGSE9-12.F.BF.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **Construct and compare linear, quadratic, and exponential models and solve problems** **MGSE9-12.F.LE.4** For exponential models, express as a logarithm the solution to $ab^{(ct)} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	**Represent and solve equations and inequalities graphically** **MGSE9-12.A.REI.11 Using graphs, tables, or successive approximations, show that the solution to the equation f(x) = g(x) is the x-value where the y-values of f(x) and g(x) are the same.** **Interpret functions that arise in applications in terms of the context** **MGSE9-12.F.IF.6** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. **MGSE9-12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one function and an algebraic expression for another, say which has the larger maximum.*** **Build new functions from existing functions** **MGSE9-12.F.BF.3** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

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