CCGPS
Curriculum Map

Mathematics

CCGPS Analytic Geometry

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"Making Education Work for All Georgians"

Georgia Department of Education
Common Core Georgia Performance Standards
High School Mathematics
CCGPS Analytic Geometry - At a Glance

Common Core Georgia Performance Standards: Curriculum Map						
1st Semester				2nd Semester		
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Similarity, Congruence, and Proofs *(6 – 7 weeks)*	**Right Triangle Trigonometry** *(2 – 3 weeks)*	**Circles and Volume** *(4 – 5 weeks)*	**Extending the Number System** *(3 – 4 weeks)*	**Quadratic Functions** *(6 – 7 weeks)*	**Modeling Geometry** *(4 – 5 weeks)*	**Applications of Probability** *(4 – 5 weeks)*
MCC9-12.G.SRT.1 **MCC9-12.G.SRT.2** **MCC9-12.G.SRT.3** **MCC9-12.G.SRT.4** **MCC9-12.G.SRT.5** **MCC9-12.G.CO.6** **MCC9-12.G.CO.7** **MCC9-12.G.CO.8** **MCC9-12.G.CO.9** **MCC9-12.G.CO.10** **MCC9-12.G.CO.11** **MCC9-12.G.CO.12** **MCC9-12.G.CO.13**	**MCC9-12.G.SRT.6** **MCC9-12.G.SRT.7** **MCC9-12.G.SRT.8**	**MCC9-12.G.C.1** **MCC9-12.G.C.2** **MCC9-12.G.C.3** **MCC9-12.G.C.4(+)** **MCC9-12.G.C.5** **MCC9-12.G.GMD.1** **MCC9-12.G.GMD.2(+)** **MCC9-12.G.GMD.3**	**MCC9-12.N.RN.1** **MCC9-12.N.RN.2** **MCC9-12.N.RN.3** **MCC9-12.N.CN.1** **MCC9-12.N.CN.2** **MCC9-12.N.CN.3(+)** **MCC9-12.A.APR.1**	**MCC9-12.N.CN.7** **MCC9-12.A.SSE.1a,b** **MCC9-12.A.SSE.2** **MCC9-12.A.SSE.3a,b** **MCC9-12.A.CED.1** **MCC9-12.A.CED.2** **MCC9-12.A.CED.4** **MCC9-12.A.REI.4a,b** **MCC9-12.A.REI.7** **MCC9-12.F.IF.4** **MCC9-12.F.IF.5** **MCC9-12.F.IF.6** **MCC9-12.F.IF.7a** **MCC9-12.F.IF.8a** **MCC9-12.F.IF.9** **MCC9-12.F.BF.1a,b** **MCC9-12.F.BF.3** **MCC9-12.F.LE.3** **MCC9-12.S.ID.6a**	**MCC9-12.A.REI.7** **MCC9-12.G.GPE.1** **MCC9-12.G.GPE.2** **MCC9-12.G.GPE.4**	**MCC9-12.S.CP.1** **MCC9-12.S.CP.2** **MCC9-12.S.CP.3** **MCC9-12.S.CP.4** **MCC9-12.S.CP.5** **MCC9-12.S.CP.6** **MCC9-12.S.CP.7**
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.						

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

Specific modeling standards appear throughout the high school standards indicated by a star symbol ($\star$).

Georgia Department of Education
Common Core Georgia Performance Standards
CCGPS Analytic Geometry – 1ˢᵗ Semester

Common Core Georgia Performance Standards: Curriculum Map			
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
Similarity, Congruence, and Proofs	**Right Triangle Trigonometry**	**Circles and Volume**	**Extending the Number System**
Understand similarity in terms of similarity transformations **MCC9-12.G.SRT.1** 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. **MCC9-12.G.SRT.2** Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides. **MCC9-12.G.SRT.3** Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. **Prove theorems involving similarity** **MCC9-12.G.SRT.4** Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity. **MCC9-12.G.SRT.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. **Understand congruence in terms of rigid motions** **MCC9-12.G.CO.6** Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure;	**Define trigonometric ratios and solve problems involving right triangles** **MCC9-12.G.SRT.6** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. **MCC9-12.G.SRT.7** Explain and use the relationship between the sine and cosine of complementary angles. **MCC9-12.G.SRT.8** Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	**Understand and apply theorems about circles** **MCC9-12.G.C.1** Prove that all circles are similar. **MCC9-12.G.C.2** Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle. **MCC9-12.G.C.3** Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle. **MCC9-12.G.C.4 (+)** Construct a tangent line from a point outside a given circle to the circle. **Find arc lengths and areas of sectors of circles** **MCC9-12.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. **Explain volume formulas and use them to solve problems** **MCC9-12.G.GMD.1** Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. **MCC9-12.G.GMD.2 (+)** Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid	**Extend the properties of exponents to rational exponents.** **MCC9-12.N.RN.1** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. **MCC9-12.N.RN.2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. **Use properties of rational and irrational numbers.** **MCC9-12.N.RN.3** 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. **Perform arithmetic operations with complex numbers.** **MCC9-12.N.CN.1** Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real. **MCC9-12.N.CN.2** Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **MCC9-12.N.CN.3 (+)** Find the conjugate of a complex number; use conjugates to find ~~moduli and~~ quotients of complex numbers. **Perform arithmetic operations on polynomials** **MCC9-12.A.APR.1** Understand that polynomials form a system analogous to the integers, namely,

given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

MCC9-12.G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

MCC9-12.G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

MCC9-12.G.CO.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

MCC9-12.G.CO.10 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.

MCC9-12.G.CO.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Make geometric constructions

MCC9-12.G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

MCC9-12.G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

figures.

MCC9-12.G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★

they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. *(Focus on polynomial expressions that simplify to forms that are linear or quadratic in a positive integer power of x.)*

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Common Core Georgia Performance Standards
CCGPS Analytic Geometry – 2nd Semester

Common Core Georgia Performance Standards: Curriculum Map		
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
Quadratic Functions	**Modeling Geometry**	**Applications of Probability**
Use complex numbers in polynomial identities and equations. **MCC9-12.N.CN.7** Solve quadratic equations with real coefficients that have complex solutions. **Interpret the structure of expressions** **MCC9-12.A.SSE.1** Interpret expressions that represent a quantity in terms of its context.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)* **MCC9-12.A.SSE.1a** Interpret parts of an expression, such as terms, factors, and coefficients.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)* **MCC9-12.A.SSE.1b** Interpret complicated expressions by viewing one or more of their parts as a single entity.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)* **MCC9-12.A.SSE.2** Use the structure of an expression to identify ways to rewrite it. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)* **Write expressions in equivalent forms to solve problems** **MCC9-12.A.SSE.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)* **MCC9-12.A.SSE.3a** Factor a quadratic expression to reveal the zeros of the function it defines.★ **MCC9-12.A.SSE.3b** Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.★ **Create equations that describe numbers or relationships** **MCC9-12.A.CED.1** Create equations and inequalities in one variable and use them to solve problems. Include equations arising from ~~linear and~~ quadratic functions, ~~and simple rational and exponential functions~~.★ **MCC9-12.A.CED.2** Create equations in two or more variables to represent relationships between quantities; graph equations on	**Solve systems of equations** **MCC9-12.A.REI.7** Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. **Translate between the geometric description and the equation for a conic section** **MCC9-12.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. **MCC9-12.G.GPE.2** Derive the equation of a parabola given a focus and directrix. **Use coordinates to prove simple geometric theorems algebraically** **MCC9-12.G.GPE.4** Use coordinates to prove simple geometric theorems algebraically. *(Restrict to context of circles and parabolas)*	**Understand independence and conditional probability and use them to interpret data** **MCC9-12.S.CP.1** Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").★ **MCC9-12.S.CP.2** Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.★ **MCC9-12.S.CP.3** Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.★ **MCC9-12.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.★ **MCC9-12.S.CP.5** Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.★ **Use the rules of probability to compute probabilities of compound events in a uniform probability model** **MCC9-12.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 terms of the model.★ **MCC9-12.S.CP.7** Apply the Addition Rule, P(A or B) = P(A) + P(B) − P(A and B), and interpret the answer in terms of the model.★

coordinate axes with labels and scales.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

MCC9-12.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

Solve equations and inequalities in one variable

MCC9-12.A.REI.4 Solve quadratic equations in one variable.

MCC9-12.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.

MCC9-12.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 $a \pm bi$ for real numbers a and b.

Solve systems of equations

MCC9-12.A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.

Interpret functions that arise in applications in terms of the context

MCC9-12.F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; ~~and periodicity~~.★

MCC9-12.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

MCC9-12.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.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

Analyze functions using different representations

MCC9-12.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

MCC9-12.F.IF.7a Graph ~~linear and~~ quadratic functions and show intercepts, maxima, and minima.★

MCC9-12.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

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MCC9-12.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.

MCC9-12.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

Build a function that models a relationship between two quantities

MCC9-12.F.BF.1 Write a function that describes a relationship between two quantities.★ *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

MCC9-12.F.BF.1a Determine an explicit expression, a recursive process, or steps for calculation from a context. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

MCC9-12.F.BF.1b Combine standard function types using arithmetic operations. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

Build new functions from existing functions

MCC9-12.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. *(Focus on quadratic functions; compare with linear and exponential functions studied in Coordinate Algebra.)*

Construct and compare linear, quadratic, and exponential models and solve problems

MCC9-12.F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.★

Summarize, represent, and interpret data on two categorical and quantitative variables

MCC9-12.S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.★

MCC9-12.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.★