CCGPS
Curriculum Map

Mathematics

CCGPS Pre-Calculus

Dr. John D. Barge, State School Superintendent
"Making Education Work for All Georgians"

Georgia Department of Education

Common Core Georgia Performance Standards
High School Mathematics
CCGPS Pre-Calculus – At a Glance

Georgia Performance Standards: Curriculum Map						
1st Semester				2nd Semester		
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Conics	**Trigonometric Functions**	**Trigonometry of General Triangles**	**Trigonometric Identities**	**Matrices**	**Vectors**	**Probability**
MCC9-12.G.GPE.3(+)	**MCC9-12.F.BF.4d(+)** **MCC9-12.F.TF.3(+)** **MCC9-12.F.TF.4(+)** **MCC9-12.F.TF.6(+)** **MCC9-12.F.TF.7(+)**	**MCC9-12.G.SRT.9(+)** **MCC9-12.G.SRT.10(+)** **MCC9-12.G.SRT.11(+)**	**MCC9-12.F.TF.9(+)**	**MCC9-12.N.VM.6(+)** **MCC9-12.N.VM.7(+)** **MCC9-12.N.VM.8(+)** **MCC9-12.N.VM.9(+)** **MCC9-12.N.VM.10(+)** **MCC9-12.N.VM.12(+)** **MCC9-12.A.REI.8(+)** **MCC9-12.A.REI.9(+)**	**MCC9-12.N.CN.3(+)** **MCC9-12.N.CN.4(+)** **MCC9-12.N.CN.5(+)** **MCC9-12.N.CN.6(+)** **MCC9-12.N.VM.1(+)** **MCC9-12.N.VM.2(+)** **MCC9-12.N.VM.3(+)** **MCC9-12.N.VM4a(+), b(+), c(+)** **MCC9-12.N.VM.5a(+), b(+)** **MCC9-12.N.VM.11(+)**	**MCC9-12.S.CP.8(+)** **MCC9-12.S.CP.9(+)** **MCC9-12.S.MD.1(+)** **MCC9-12.S.MD.2(+)** **MCC9-12.S.MD.3(+)** **MCC9-12.S.MD.4(+)** **MCC9-12.S.MD.5a(+), b(+)** **MCC9-12.S.MD.6(+)** **MCC9-12.S.MD.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 (★).

Georgia Department of Education
Dr. John D. Barge, State School Superintendent
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Common Core Georgia Performance Standards
CCGPS Pre-Calculus – 1st Semester

Common Core Georgia Performance Standards: Curriculum Map

Standards for Mathematical Practice

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

1st Semester

Unit 1	Unit 2	Unit 3	Unit 4
Conics	**Trigonometric Functions**	**Trigonometry of General Triangles**	**Trigonometric Identities**
Translate between the geometric description and the equation for a conic section **MCC9-12.G.GPE.3 (+)** 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.	**Build new functions from existing functions** **MCC9-12.F.BF.4** Find inverse functions. **MCC9-12.F.BF.4d (+)** Produce an invertible function from a non-invertible function by restricting the domain. **Extend the domain of trigonometric functions using the unit circle** **MCC9-12.F.TF.3 (+)** Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number. **MCC9-12.F.TF.4 (+)** Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **Model periodic phenomena with trigonometric functions** **MCC9-12.F.TF.6 (+)** Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. **MCC9-12.F.TF.7 (+)** 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.★	**Apply trigonometry to general triangles** **MCC9-12.G.SRT.9 (+)** 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. **MCC9-12.G.SRT.10 (+)** Prove the Laws of Sines and Cosines and use them to solve problems. **MCC9-12.G.SRT.11 (+)** 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).	**Prove and apply trigonometric identities** **MCC9-12.F.TF.9 (+)** Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Georgia Department of Education

Common Core Georgia Performance Standards
CCGPS Pre-Calculus – 2nd Semester

Common Core Georgia Performance Standards: Curriculum Map

Standards for Mathematical Practice

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

2nd Semester

Unit 5	Unit 6	Unit 7
Matrices	**Vectors**	**Probability**
Perform operations on matrices and use matrices in applications. **MCC9-12.N.VM.6 (+)** Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. **MCC9-12.N.VM.7 (+)** Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. **MCC9-12.N.VM.8 (+)** Add, subtract, and multiply matrices of appropriate dimensions. **MCC9-12.N.VM.9 (+)** Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. **MCC9-12.N.VM.10 (+)** 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. **MCC9-12.N.VM.12 (+)** Work with 2 X 2 matrices as transformations of the plane, and interpret the absolute value of the determinant in terms of area. **Solve systems of equations** **MCC9-12.A.REI.8 (+)** Represent a system of linear equations as a single matrix equation in a vector variable. **MCC9-12.A.REI.9 (+)** 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).	**Perform arithmetic operations with complex numbers.** **MCC9-12.N.CN.3 (+)** Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers. **Represent complex numbers and their operations on the complex plane.** **MCC9-12.N.CN.4 (+)** 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. **MCC9-12.N.CN.5 (+)** Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. **MCC9-12.N.CN.6 (+)** 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. **Represent and model with vector quantities.** **MCC9-12.N.VM.1 (+)** 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, $\|v\|$, $\|\|v\|\|$, v). **MCC9-12.N.VM.2 (+)** Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. **MCC9-12.N.VM.3 (+)** Solve problems involving velocity and other quantities that can be represented by vectors. **Perform operations on vectors.** **MCC9-12.N.VM.4 (+)** Add and subtract vectors. **MCC9-12.N.VM.4a (+)** Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the	**Use the rules of probability to compute probabilities of compound events in a uniform probability model** **MCC9-12.S.CP.8 (+)** 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.★ **MCC9-12.S.CP.9 (+)** Use permutations and combinations to compute probabilities of compound events and solve problems.★ **Calculate expected values and use them to solve problems** **MCC9-12.S.MD.1 (+)** 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.★ **MCC9-12.S.MD.2 (+)** Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.★ **MCC9-12.S.MD.3 (+)** Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.★ **MCC9-12.S.MD.4 (+)** Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.★ **Use probability to evaluate outcomes of decisions** **MCC9-12.S.MD.5 (+)** Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.★ **MCC9-12.S.MD.5a (+)** Find the expected payoff for a game of chance.★ **MCC9-12.S.MD.5b (+)** Evaluate and compare strategies on

	magnitude of a sum of two vectors is typically not the sum of the magnitudes. **MCC9-12.N.VM.4b (+)** Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. **MCC9-12.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. **MCC9-12.N.VM.5 (+)** Multiply a vector by a scalar. **MCC9-12.N.VM.5a (+)** Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$. **MCC9-12.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 $c < 0$). **Perform operations on matrices and use matrices in applications.** **MCC9-12.N.VM.11 (+)** 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.	the basis of expected values.★ **MCC9-12.S.MD.6 (+)** Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).★ **MCC9-12.S.MD.7 (+)** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).★