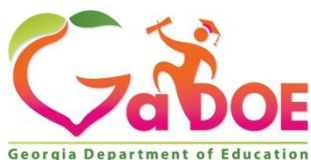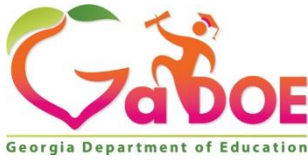# GEORGIA'S K-12 MATHEMATICS STANDARDS

COURSE DESCRIPTIONS

This document includes approved course descriptions for all K-12 mathematics courses aligned to Georgia's K-12 Mathematics Standards.
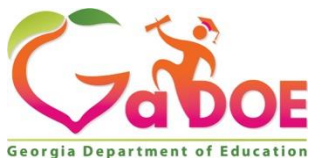
GEORGIA'S K-12 MATHEMATICS STANDARDS

Elementary (K-2)

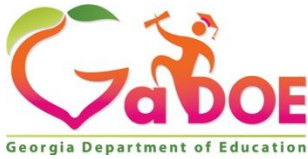| Grade Level	Course Description
Kindergarten 27.01100	Kindergarten mathematics regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework. The mathematics content in kindergarten focuses on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; and (2) describing shapes and space. More learning time in kindergarten is devoted to numbers than to other topics. Being intentional with ongoing exposure to mathematical concepts such as counting and shape identification using a variety of contexts supports students' efficacy and competence.
1st Grade 27.01200	First grade (1st grade) mathematics content regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework through four big ideas: (1) Numerical Reasoning, (2) Measurement and Data (Statistical) Reasoning, (3) Patterning and Algebraic Reasoning, and (4) Geometric and Spatial Reasoning. Students in first grade will extend the count sequence, develop place value understanding, use part-whole strategies to add and subtract, create and describe patterns to develop algebraic reasoning, reason with measurement of time and objects, reason with shapes and their attributes, and answer real-life questions using data and statistical reasoning.
2nd Grade 27.01300	Second grade (2nd grade) mathematics content regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework through four big ideas: (1) Numerical Reasoning, (2) Measurement and Data (Statistical) Reasoning, (3) Patterning and Algebraic Reasoning, and (4) Geometric and Spatial Reasoning. Students in second grade will develop deeper understandings of the structure of the base-ten place value system, part-whole thinking to build strategies for solving addition and subtraction problems and begin to build the foundations of for understanding multiplication using equal groups and arrays. Students will also explore a variety of patterns to further develop algebraic reasoning, build on measurement experiences to make sense of measurement using standard units, explore problems with time and money, sort shapes based on attributes, explore symmetry, and create visual representations of halves, thirds, and quarters by partitioning shapes.

GEORGIA'S K-12 MATHEMATICS STANDARDS

Elementary (3-5)

Grade Level	Course Description
3rd Grade 27.01400	Third grade (3rd grade) mathematics content regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework through four big ideas of content: (1) Numerical Reasoning, (2) Measurement and Data (Statistical) Reasoning, (3) Patterning and Algebraic Reasoning, and (4) Geometric and Spatial Reasoning. Students will develop place value understanding, part-whole strategies for addition, subtraction, multiplication, and division of whole numbers, reasoning of patterns and algebra, reasoning with measurement of time and objects, geometric area and perimeter measurement strategies, an understanding of geometric properties of shapes, and data and statistical reasoning methods.
4th Grade 27.01500	Fourth grade (4th grade) mathematics content regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework through four big ideas of content: (1) Numerical Reasoning, (2) Measurement and Data (Statistical) Reasoning, (3) Patterning and Algebraic Reasoning, and (4) Geometric and Spatial Reasoning. Students will develop place value understanding of larger numbers and decimal numbers, part-whole strategies for addition, subtraction, multiplication, and division of whole numbers, reasoning of patterns and algebra, reasoning with measurement of time and objects, geometric angle measurement strategies, a deeper understanding of geometric properties of shapes, and data and statistical reasoning methods.
5th Grade 27.01600	Fifth grade (5th grade) mathematics content regularly incorporates the 8 Mathematical Practices, the Statistical Reasoning Framework, and the Mathematical Modeling Framework through four big ideas of content: (1) Numerical Reasoning, (2) Measurement and Data (Statistical) Reasoning, (3) Patterning and Algebraic Reasoning, and (4) Geometric and Spatial Reasoning. Students will further develop place value understanding of larger numbers and decimal numbers, part-whole strategies for addition and subtraction of whole numbers, fractions, and decimals, multiplication, and division of whole numbers and fractions, reasoning with patterns and algebra with connections to coordinate geometry, reasoning with measurement of time and objects, geometric measurement strategies for determining volume, an understanding of classifying geometric shapes based on properties, and data and statistical reasoning methods.

Middle School (6-8)	
Grade Level	**Course Description**
6th Grade 27.02100	Sixth grade (6th grade) mathematics course content regularly incorporates the 8 Mathematical Practices, the Framework for Statistical Reasoning, and the Mathematical Modeling Framework through three big ideas of content: (1) numerical reasoning, (2) patterning and algebraic reasoning, and (3) geometric and spatial reasoning. The fundamental purpose of Grade 6 mathematics is to formalize and extend the fundamental mathematics that students learned in the previous grades. Students will build upon their numerical reasoning to perform more operations with whole numbers, fractions, and decimals, explore positive and negative numbers, and part-to-whole and part-to-part relationships. Reasoning with patterns will guide their exploration of one-step equations and inequalities to represent real-world phenomena. Students will also extend their geometric and spatial reasoning to explore complex shapes and volume. The Mathematical Practices, Mathematical Modeling Framework and Framework for Statistical Reasoning apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.
7th Grade 27.02200	Seventh grade (7th grade) mathematics course content regularly incorporates the 8 Mathematical Practices, the Framework for Statistical Reasoning, and the Mathematical Modeling Framework through four big ideas of content: (1) numerical reasoning, (2) probability reasoning, (3) patterning and algebraic reasoning, and (4) geometric and spatial reasoning. Students will build numerical reasoning skills through positive and negative number operations including all rational numbers in context then extend that learning to formally explore simple probability models to explain real-world phenomena. Students will build their algebraic reasoning skills to rewrite expressions, work with multistep equations and inequalities, and use proportional relationships to solve multistep percent problems, discover scale drawings using similar triangles to explain slope. Students will also explore geometric relationships involving area of a circle, volume of 3D shapes including cylinders, and exploring angle measure relationships. The fundamental purpose of Grade 7 mathematics is to formalize and extend the mathematics that students learned in the previous grades. Seventh grade standards use algebra to deepen and extend understanding of geometric knowledge from prior grades. The Mathematical Practices, Mathematical Modeling Framework and Framework for Statistical Reasoning apply throughout each course and, together with the content standards, prescribe that students experience mathematics as a coherent, useful, and logical subject that makes use of their ability to make sense of problem situations.

Grade Level	Course Description
8th Grade 27.02300	Eighth grade (8th grade) mathematics course content regularly incorporate the 8 Mathematical Practices, the Framework for Statistical Reasoning, and the Mathematical Modeling Framework through four big ideas of content: (1) numerical reasoning, (2) functional & graphical reasoning, (3) patterning and algebraic reasoning, and (4) geometric and spatial reasoning. Much of the Grade 8 mathematics curriculum focuses on functions and linear relationships as building blocks to algebra and geometry. In this course, students will create, interpret, solve, and graph linear equations and inequalities in one variable, analyze the connections between proportional and non-proportional lines and equations, extend their knowledge of numerical reasoning and real numbers to include irrational numbers, develop an understanding of the properties of exponents, perform operations with numbers expressed in scientific notation, apply their geometric and spatial reasoning to interpret and solve problems involving the Pythagorean Theorem.
Enhanced Algebra: Concepts & Connections 27.09110	**Enhanced Algebra: Concepts and Connections** is a course option that thoughtfully blends Grade 8 content standards with Algebra: Concepts and Connections standards. This course awards high school credit for middle school students. In the Enhanced Algebra: Concepts & Connections course, instructional time should regularly incorporate the 8 Mathematical Practices, the Framework for Statistical Reasoning, and the Mathematical Modeling Framework through six big ideas of content: (1) mathematical modeling, (2) numerical reasoning, (3) functional & graphical reasoning, (4) patterning and algebraic reasoning, (5) data and statistical reasoning and (6) geometric and spatial reasoning. In this course, students will create, interpret, solve, and graph linear equations and inequalities in one variable and nonlinear (quadratic and exponential) equations and functions. Students will interpret quadratic and exponential expressions. Students will continue to enhance their algebraic reasoning skills when analyzing and applying a deep understanding of systems of linear inequalities and sums and products of rational and irrational numbers. Students will apply their algebraic and geometric reasoning skills to make sense of problems involving distance, midpoint, slope, area, perimeter, and statistical reasoning.

Algebra: Concepts & Connections

Overview

The document contains the course description for Georgia's K-12 Mathematics Standards for the High School Algebra: Concepts and Connections Course, which is the first course in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
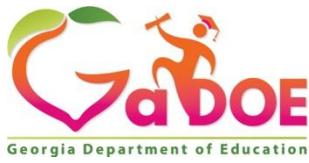
Course Description:

Algebra: Concepts and Connections (27.08110) is the first course in a sequence of three high school courses designed to ensure career and college readiness. Students will apply their algebraic and geometric reasoning skills to make sense of problems involving algebra, geometry, bivariate data, and statistics. This course focuses on algebraic, quantitative, geometric, graphical, and statistical reasoning. In this course, students will continue to enhance their algebraic reasoning skills when analyzing and applying a deep understanding of linear functions, sums and products of rational and irrational numbers, systems of linear inequalities, distance, midpoint, slope, area, perimeter, nonlinear equations and functions, quadratic expressions, equations and functions, exponential expressions, equations, and functions, and statistical reasoning.

High school course content standards are listed by big ideas including Data and Statistical Reasoning, Probabilistic Reasoning, Functional and Graphical Reasoning, Patterning and Algebraic Reasoning, and Geometric and Spatial Reasoning.

Prerequisite:

This course is designed for students who have successfully completed *Kindergarten through 8th grade mathematics.*

Enhanced Algebra: Concepts & Connections (Grade 8)

Overview

The document contains the course description for Georgia's K-12 Mathematics Standards for the Enhanced Algebra: Concepts and Connections Course, which is the course that provides students with the opportunity to earn high school Algebra: Concepts and Connections credit while in middle school. This would be the first high school course in a students enhanced mathematics course sequence.
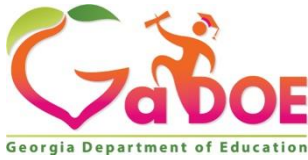
The standards for this course are organized into big ideas, course key competencies/ standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.

Course Description:

Enhanced Algebra: Concepts and Connections (27.09110) is a course option that thoughtfully blends Grade 8 content standards with Algebra: Concepts and Connections standards. This course awards high school credit for middle school students. In the Enhanced Algebra: Concepts & Connections course, instructional time should regularly incorporate the 8 Mathematical Practices, the Framework for Statistical Reasoning, and the Mathematical Modeling Framework through six big ideas of content: (1) mathematical modeling, (2) numerical reasoning, (3) functional & graphical reasoning, (4) patterning and algebraic reasoning, (5) data and statistical reasoning and (6) geometric and spatial reasoning. In this course, students will create, interpret, solve, and graph linear equations and inequalities in one variable and nonlinear (quadratic and exponential) equations and functions. Students will interpret quadratic and exponential expressions. Students will continue to enhance their algebraic reasoning skills when analyzing and applying a deep understanding of systems of linear inequalities and sums and products of rational and irrational numbers. Students will apply their algebraic and geometric reasoning skills to make sense of problems involving distance, midpoint, slope, area, perimeter, and statistical reasoning.

Prerequisite:

This course is designed for students who have successfully completed *Kindergarten through Grade 7 mathematics.*

Geometry: Concepts & Connections
Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Advanced Algebra: Concepts and Connections Course, which is the third course in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/ standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/ standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
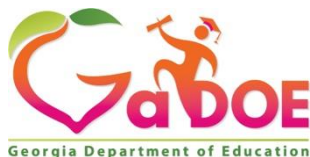
Course Description:

Geometry: Concepts and Connections (27.08210) is the second course in a sequence of three high school courses designed to ensure career and college readiness. This course is intended to enhance students' geometric, algebraic, graphical, and probabilistic reasoning skills. Students will apply their algebraic and geometric reasoning skills to make sense of problems involving geometry, trigonometry, algebra, probability, and statistics. Students will continue to enhance their analytical geometry and reasoning skills when analyzing and applying a deep understanding of polynomial expressions, proofs, constructions, rigid motions and transformations, similarity, congruence, circles, right triangle trigonometry, geometric measurement, and conditional probability.

High school course content standards are listed by big ideas including Data and Statistical Reasoning, Probabilistic Reasoning, Functional and Graphical Reasoning, Patterning and Algebraic Reasoning, and Geometric and Spatial Reasoning.

Prerequisite:

This course is designed for students who have successfully completed *Algebra: Concepts & Connections*.

Advanced Algebra: Concepts & Connections

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Advanced Algebra: Concepts and Connections Course, which is the third course in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
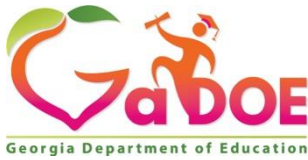
Course Description:

Advanced Algebra: Concepts & Connections (27.08310) is the third course in a sequence of courses designed to ensure career and college readiness. It is intended to prepare students for fourth mathematics course options relevant to their postsecondary pursuits. High school course content standards are listed by big idea, including Data and Statistical Reasoning, Probabilistic Reasoning, Functional and Graphical Reasoning, Patterning and Algebraic Reasoning, and Geometric and Spatial Reasoning.

In **Advanced Algebra: Concepts & Connections**, students will continue to enhance their data and statistical reasoning skills as they learn specific ways to collect, critique, analyze, and interpret data. Students will learn how to use matrices and linear programming to represent data and to solve contextually relevant problems. Students will strengthen their geometric and spatial reasoning skills as they learn how to solve trigonometric equations using the unit circle. In previous courses, students studied how to use linear and quadratic functions to model real-life phenomena. In Advanced Algebra: Concepts and Connections, students will further develop their functional and graphical reasoning as they explore and analyze structures and patterns for exponential, logarithmic, radical, polynomial, and rational expressions, equations and functions to further understand the world around them.

Prerequisite:

This course is designed for students who have successfully completed *Geometry: Concepts & Connections*.

Enhanced Advanced Algebra and AP Precalculus: Concepts and Connections

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School course, Enhanced Advanced Algebra and AP Precalculus: Concepts and Connections course, which is the third course option for students planning pursue studies involving advanced mathematics, including Calculus and Statistics.
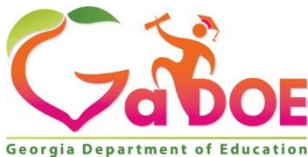
Course Description:

The **Enhanced Advanced Algebra and AP Precalculus: Concepts and Connections (27.09310)** course is a thoughtful blend of the topics from Advanced Algebra: Concepts & Connections and Precalculus. This is a single credit course, intended to provide students the opportunity to develop a deeper understanding of mathematical concepts that are critical to the study of advanced fourth mathematics course options, including Calculus. Students will continue to enhance their understanding of data and statistical reasoning, functional and graphical reasoning, patterning and algebraic reasoning, and geometric and spatial reasoning. There should be an emphasis on notational fluency and the use of multiple representations as students engage with all topics. Some of those topics include, sequences and series with the incorporation of convergence and divergence; conic sections as implicitly defined curves; the six trigonometric functions and their inverses; applications of trigonometry such as modeling periodic phenomena, modeling with vectors and parametric equations, solving oblique triangles in contextual situations, graphing in the Polar Plane; solutions of trigonometric equations in a variety of contexts; and the manipulation and application of trigonometric identities.

In previous courses, students studied how to use linear and quadratic functions to model real-life phenomena. In the **Enhanced Advanced Algebra and AP Precalculus: Concepts and Connections** course, students will further develop their algebraic, functional, and graphical reasoning as they explore and analyze structures and patterns for exponential, logarithmic, radical, polynomial, piecewise and rational expressions, equations, and functions to further understand the world around them. Topics should be analyzed in multiple ways, including verbal and written, numerical, algebraic, and graphical presentations. Instruction and assessment should include the appropriate use of technology. Concepts should be investigated and applied, where appropriate, within the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Geometry: Concepts & Connections.*

GaDOE
Georgia Department of Education

Precalculus

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Precalculus Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/ standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The course key competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
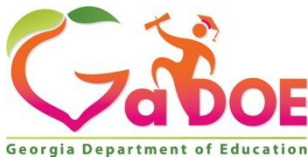
Course Description:

Precalculus (27.08410) is a fourth-year mathematics course option for students who have completed Advanced Algebra: Concepts and Connections (or the equivalent). The course is intended to provide students with opportunities to develop a deeper understanding of Algebraic concepts that are critical to the study of Calculus. Students will also deepen their understanding of trigonometry and its applications.

Throughout the Precalculus course there should be a focus on notational fluency and the use of multiple representations. The course includes the study and analysis of piecewise and rational functions; limits and continuity as related to piecewise and rational functions; sequences and series with the incorporation of convergence and divergence; conic sections as implicitly defined curves; the six trigonometric functions and their inverses; applications of trigonometry such as modeling periodic phenomena, modeling with vectors and parametric equations, solving oblique triangles in contextual situations, graphing in the Polar Plane; solutions of trigonometric equations in a variety of contexts; and the manipulation and application of trigonometric identities. Topics should be analyzed in multiple ways, including verbal and written, numerical, algebraic, and graphical presentations. Instruction and assessment should include the appropriate use of technology. Concepts should be introduced and investigated, where appropriate, in the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Algebra: Concepts and Connections.*

Advanced Financial Algebra

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Advanced Financial Algebra Course, which is a fourth mathematics course option in the high school sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
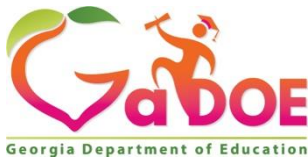
Course Description:

Advanced Financial Algebra (27.08430) is a fourth-year mathematics course option designed for students who have successfully completed Advanced Algebra: Concepts and Connections. The course extends and deepens student understanding of algebra, statistics, and research design while introducing students to relevant financial and business applications. Students will create, apply, and interpret a wide variety of algebraic function-models to aid in real-world decision making. Statistical research and analysis will be used to determine the efficacy of model applications and further assist in exploring scenarios with financial implications. Financial contexts for these mathematical concepts will include business operations and optimization, tax considerations, insurance and risk management, banking services, budget creation, loan and credit analysis, investment strategies and retirement plans, stock market performance, real estate fundamentals, and automobile ownership.

Instruction and assessment should include the appropriate use of manipulatives and technology. Topics should be represented in multiple ways, such as concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic. Concepts should be introduced and used, where appropriate, in the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Algebra: Concepts and Connections.*

Advanced Finite Mathematics

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Advanced Finite Mathematics Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
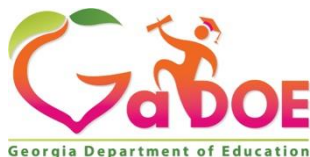
Course Description:

Advanced Finite Mathematics (27.07910) is a fourth-year mathematics course option designed to meet the needs of advanced students who have completed Precalculus or the Enhanced Advanced Algebra Concepts and Connections and Precalculus course (or the equivalent) and will pursue careers which require the mastery of discrete mathematics topics often associated with modern computer science.

Students in this course will examine mathematics in four areas through the lens of both pure mathematics and applied mathematics: set theory, number theory, probability/combinatorics, and graph theory. There will be a strong focus on the presentation of mathematical ideas through both written and oral communication, particularly through logic and proofs. Mathematical proofs will be presented through an abstract approach that characterizes upper-level mathematics courses. The goal is for students to develop the skills and techniques they will need as they study advanced mathematics or computer science at the college level. This is an alternative course for those students who do not wish to enroll in an Advanced Placement course, but who still wish to learn higher-level mathematics.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Algebra: Concepts and Connections.*

Advanced Mathematical Decision Making

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Advanced Mathematical Decision Making Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/ standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The course key competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
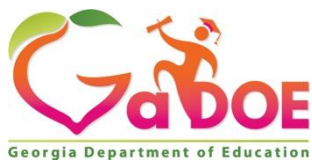
Course Description:

Advanced Mathematical Decision Making (AMDM) (27.08500) is a fourth-year mathematics course option designed to follow the completion of Advanced Algebra: Concepts and Connections. Students will enhance their understanding of concepts explored in the context of real-life phenomena. The intent of this course is for students to combine their understanding of multiple mathematical concepts as they explore and solve real-world mathematical problems. Students will investigate applications of mathematics in a variety of contexts, including business and financial decision-making, earning, investing, spending, and borrowing money, using functions to model problem situations in both discrete and continuous relationships, and using ratios, rates, and percentages to solve problems,

Instruction and assessment should include the appropriate use of manipulatives and technology. Topics should be represented in multiple ways, such as concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic. Concepts should be introduced and applied, where appropriate, in the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Algebra: Concepts and Connections.*

Calculus

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Calculus Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/ standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
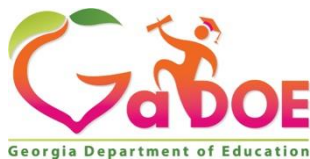
Course Description:

Calculus (27.07800) is a fourth-year mathematics course option for students who have completed Precalculus or the Enhanced Advanced Algebra Concepts and Connections and Precalculus course. The course provides students with the opportunity to develop an understanding of the derivative and its applications as well as the integral and its applications. Throughout the course there should be a focus on notational fluency and the use of multiple representations.

The **Calculus** course includes the study and analysis of limits and continuity as applied to a variety of functions; the derivative as related to limits and continuity; various derivative rules such as product, quotient, and chain; applications of the derivative including curve analysis, applied max/min situations, related rate problems, and use of Mean Value Theorem; the definite integral as a limit of Riemann sums; properties of definite integrals; the Fundamental Theorem of Calculus as it relates derivatives and integrals; techniques of integration including u-substitution; and applications of the integral including solving separable differential equations, finding a particular solution curve given an initial condition, area between curves on a coordinate plane, and average value situations.

Topics should be analyzed in multiple ways, including verbal and written, numerical, algebraic, and graphical presentations. Instruction and assessment should include the appropriate use of technology. Concepts should be introduced and investigated, where appropriate, in the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Precalculus* (or the equivalent).

College Readiness Mathematics (Mathematics Capstone Course)

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School College Readiness Mathematics Capstone Course (CRM), which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.

Course Description:

College Readiness Mathematics Capstone Course (CRM) (27.08900) is a fourth mathematics course option for students who have completed Advanced Algebra: Concepts and Connections (or the equivalent). The course is designed to serve as a bridge for high school students into postsecondary opportunities. The course has been approved by the University System of Georgia as a fourth mathematics course beyond Advanced Algebra: Concepts and Connections for *majors* outside of mathematics, science, and engineering.

The focus of this course is on key content and practice standards to ensure that students will be ready for postsecondary academic courses and career opportunities. The course will revisit and expand the understanding of content standards introduced in earlier mathematics courses and will emphasize numeracy, algebra and functions, geometry, and statistics in a variety of contexts. Instruction and assessment should include the appropriate use of manipulatives and technology. Mathematics concepts should be represented in multiple ways, such as concrete/pictorial, verbal/written, numeric/data-based, graphical, and symbolic. Concepts should be introduced and used, where appropriate, in the context of realistic experiences. The Standards for Mathematical Practice will provide the foundation for instruction and assessment. The content standards selected are essential for a variety of postsecondary opportunities.

Students will be expected to complete a capstone project where they select one of the areas listed in the standard to identify a problem and use mathematical modeling to address it.

Prerequisite:

This course is designed for students who have successfully completed Advanced Algebra: Concepts and Connections (or the equivalent).
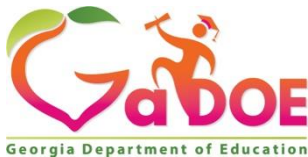
GEORGIA'S K-12 MATHEMATICS STANDARDS

Differential Equations

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Differential Equations Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.

Course Description:

Differential Equations (27.07520) is a course option for students who have completed Advanced Placement (AP) Calculus BC. The course introduces ordinary differential equations. Topics include the solution of first, second, and higher order differential equations, systems of differential equations, series solutions and Laplace transforms. There will be a strong focus on the presentation of mathematical ideas through both written and oral communication. The goal is to give students the skills and techniques they will need as they study advanced mathematics at the college level.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Placement* (*AP) Calculus BC.*
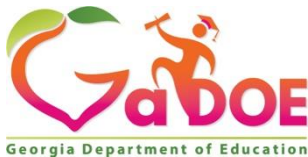
Engineering Calculus

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Engineering Calculus Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
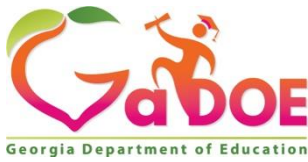
Course Description:

Engineering Calculus (27.08000) is a course option for students who have completed Advanced Placement (AP) Calculus BC. The course provides students with opportunities to develop an understanding of multivariable calculus as it applies to engineering systems, the history of engineering and its contributions to society. The course includes three-dimensional coordinate geometry; matrices and determinants; limits and continuity of functions with two independent variables; partial differentiation; multiple integration; the gradient; the divergence; the curl; Theorems of Green, Stokes, and Gauss; line integrals; integrals independent of path; and linear first-order differential equations.

Instruction and assessment should include the appropriate use of technology. Topics should be presented in multiple ways, such as verbal/written, numeric/data-based, algebraic, and graphical. Concepts should be introduced and applied, where appropriate, in the context of realistic phenomena.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Placement (AP) Calculus BC*.

History of Mathematics

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School History of Mathematics course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
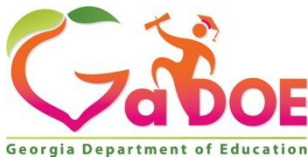
Course Description:

History of Mathematics (27.08630) is a two-semester elective course option for students who have completed Advanced Placement (AP) Calculus or are taking AP Calculus concurrently. The courses traces the development of major branches of mathematics throughout history, specifically algebra, geometry, number theory, and methods of proofs, how that development was influenced by the needs of various world cultures, and how the mathematics in turn influenced world culture.

Instruction and assessment should include appropriate use of technology and manipulatives. Concepts should be introduced and used in an appropriate historical context.

Prerequisite:

This course is designed for students who have successfully *completed Advanced Placement (AP) Calculus or are taking AP Calculus concurrently*.

Linear Algebra with Computer Science Applications

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Linear Algebra with Computer Science Applications Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning. Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
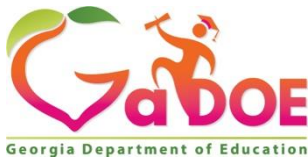
Course Description:

Linear Algebra with Computer Science Applications (27.08530) is designed to meet the needs of students who have completed Precalculus or the Enhanced Advanced Algebra Concepts and Connections and Precalculus course (or the equivalent) and will pursue careers which require linear algebra topics often associated with modern computer science.

The course will examine the use of vectors and matrices in mathematics and apply these concepts to computer science. There will be a strong focus on the presentation of mathematical ideas through both writing and programming. Mathematical concepts, such as vector spaces and Markov chains, will be presented through an abstract approach that characterizes upper-level mathematics courses. The goal is to give students the skills and techniques they will need as they study advanced mathematics or computer science at the college level. This is an alternative course for those students who do not wish to enroll in an Advanced Placement course, but who still wish to learn higher-level mathematics.

Prerequisite:

This course is designed for students who have successfully completed *Precalculus or the equivalent.*

Mathematics of Industry & Government

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Mathematics of Industry and Government course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.
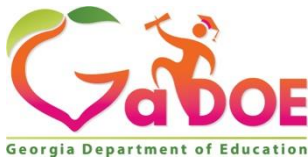
Course Description:

Mathematics of Industry and Government (27.08600) is a fourth-year mathematics course designed for students who have successfully completed Advanced Algebra: Concepts and Connections. Modeled after operations research courses, this course allows students to explore decision making in a variety of industries, such as: Airline - scheduling planes and crews, pricing tickets, taking reservations, and planning the size of the fleet; Pharmaceutical - R& D management; Logistics companies - routing and planning; Lumber and wood products - managing forests and cutting timber; Local government - deployment of emergency services, and Policy studies and regulation - environmental pollution, air traffic safety, AIDS, and criminal justice policy.

The focus of this course is on the development of mathematical models that can be used to model, improve, predict, and optimize real-world systems. These mathematical models include both deterministic models such as mathematical programming, routing or network flows and probabilistic models such as queuing, and simulation.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Algebra: Concepts and Connections.*

Multivariable Calculus

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Multivariable Calculus Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course key competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.

Course Description:

Multivariable Calculus (27.07700) is a mathematics course option for students who have completed Advanced Placement (AP) Calculus BC. It includes three-dimensional coordinate geometry; matrices and determinants; eigenvalues and eigenvectors of matrices; limits and continuity of functions with two independent variables; partial differentiation; multiple integration; the gradient; the divergence; the curl; Theorems of Green, Stokes, and Gauss; line integrals; integrals independent of path; and linear first-order differential equations.

Prerequisite:

This course is designed for students who have successfully completed *Advanced Placement (AP) Calculus BC.*
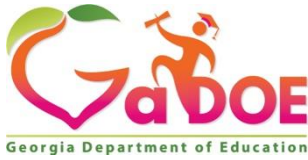
Statistical Reasoning

Overview

The document contains the course description for Georgia's 2021 K-12 Mathematics Standards for the High School Statistical Reasoning Course, which is a fourth mathematics course option in the high school course sequence.

The standards for this course are organized into big ideas, course competencies/standards, and learning objectives/expectations. The key competencies represent the standard expectation of learning for all students in that course. The competencies/standards are each followed by more detailed learning objectives that further explain the expectations for learning.

Instructional supports for teaching professionals and stakeholders are available in the Evidence of Student Learning Column that accompanies each learning objective. These instructional supports include clarification of language and expectations, detailed examples, possible instructional strategies, and more.

Course Description:

The **Statistical Reasoning (27.08800)** course offers students opportunities to strengthen their understanding of the statistical method of inquiry and statistical simulations. Students will formulate statistical investigative questions to be answered using data, will design and implement a plan to collect the appropriate data, will select appropriate graphical and numerical methods for data analysis, and will interpret their results to make connections with the initial question. The Mathematical Modeling and Statistical Reasoning Frameworks will provide the foundation for instruction and assessment. Topics should be introduced and assessed using simulations and appropriate supporting technology.

Prerequisite:

This course is designed for students who have completed *Advanced Algebra: Concepts and Connections.*