SDJA Mathematics MUS (6-12)

Mathematics education at SDJA is formed by the belief that all students are capable of learning mathematics and should be encouraged to excel. Through a comprehensive curriculum designed using current research on math education and student learning, the math department strives to develop students' curiosity, initiative, and confidence in using logical problem solving skills and strategies.

The goal of the mathematics program for all students is the mastery of mathematical concepts and logical problem solving skills, incorporating real world applications of mathematical ideas and methods, collaborative active learning, and exposure to the intrinsic rhythm of mathematics.

Middle and Upper School Core Courses

Math 6

This math course is a continuation of the Singapore-based math program used in the lower school. The Singapore approach focuses on problem solving while offering a balanced emphasis on conceptual understanding and procedural fluency. Students may use concrete and pictorial representations to solve multi-step and non-routine problems. Topics in this course include positive and negative numbers and the number line, fractions, ratios, rates, percent, introduction to algebraic expressions, equations and inequalities, the coordinate plane, area and surface area, circumference, volume, and statistics.

Math 7

This math course is based on the Go Math! Approach which focuses on problem solving while offering a balanced emphasis on conceptual understanding and procedural fluency. Students may use concrete and pictorial representations to solve multi-step and non-routine problems. Topics in this course include the real number system, rational number operations, algebraic expressions, algebraic equations and inequalities, direct and inverse proportion, angle properties and straight lines, volume and surface area of solids, statistics, and probability.

Math 8

The math curriculum for grade 8 is Houghton Mifflin's *Go Math* program. This curriculum is a rigorous approach to math education that narrows the student's focus for deeper understanding and mathematical concept mastery. The instructional approach incorporates math concepts, application, and skills instruction. Through the use of engaging activities and adaptive technology, math fluency and high order thinking skills are accomplished by students. This course utilizes a computer-based program that includes an online textbook as well as additional multimedia resources designed to enhance student learning. The course emphasizes applications of mathematical concepts in the real world and balances conceptual understanding and procedural fluency. Unit topics include real numbers, exponents and scientific notation, proportional and non-proportional relationships and functions, solving equations and systems of equations, transformational geometry, measurement geometry, volume, and statistics.

Algebra I

This course provides the basic building blocks necessary to all higher level mathematics courses. It utilizes a computer-based program that includes an online textbook as well as additional multimedia resources designed to enhance student learning. The course emphasizes applications of

mathematical concepts in the real world and balances the importance of both conceptual understanding and procedural fluency. Students are introduced to using the graphing calculator as a tool to enrich conceptual learning and problem solving. Unit topics covered in this course include the following: numbers and expressions, equations and functions, linear and exponential relationships, statistics and data, polynomial expressions and equations, functions, and modeling.

Geometry

This course focuses on applications of mathematical concepts in the real world and balances the importance of conceptual understanding with procedural fluency. Students learn and apply properties of geometrical objects and develop their ability to construct formal, logical arguments and proofs in geometric settings. Topics studied are tools of geometry, transformations, symmetry, congruent figures, lines, angles, triangles, quadrilaterals, circles, similarity, trigonometry, volume, solids, and probability.

Algebra II

This second-level algebra course reviews concepts from Algebra I (functions; algebraic expressions, equations, and inequalities; and using algebra to model real-world situations) before exploring more in-depth algebra. Topics covered include complex numbers; quadratic and polynomial equations; exponential and logarithmic functions; and sequences and series. Trigonometry is not covered in this course.

Precalculus

This course reviews the fundamental concepts of Algebra I and explores in greater depth topics introduced in Algebra II, particularly the graphical behavior of parent functions (specifically polynomial and rational functions, exponential and logarithmic functions, and trigonometric functions) and associated transformations. New content includes topics in trigonometry, sequences and series. Additionally, there is a strong emphasis placed on using mathematical models to predict phenomena in everyday life. The graphing calculator plays a role as an enrichment tool for solving math problems and modeling real-world scenarios. The goals of this course are to strengthen conceptual understanding and mathematical reasoning in the problem-solving approach, and to develop a solid foundation and background of essential trigonometric, geometric, and algebraic techniques which are necessary for the math portion of the SAT and ACT and subsequent math courses.

Electives, Honors, and AP Courses

Math 7 Honors

This preparatory algebra course utilizes a computer-based program that includes an online textbook as well as additional multimedia resources designed to enhance student learning. The course emphasizes applications of mathematical concepts in the real world and balances conceptual understanding and procedural fluency. This course moves at a more advanced pace compared to Math 7 as topics from both Math 7 and Math 8 are studied. Unit topics include the number system, ratios and proportional relationships, expressions, equations and inequalities, geometry, statistics, probability, real numbers, exponents, and scientific notation, linear relationships and equations, transformational geometry, measurement geometry, the Pythagorean Theorem and the distance formula.

- **Algebra I Honors**
- **Geometry Honors**

- **Algebra II / Trigonometry Honors**

  This course includes an additional unit on trigonometry.

Precalculus Honors

This AP Calculus preparatory course reviews the trigonometric, geometric, and algebraic techniques needed in the study of calculus, and strengthens students' conceptual understanding of the mathematical analysis and reasoning involved in solving problems. Students are expected to use particular types of functions to model real world behavior as well as find and interpret solutions analytically, numerically, graphically, and verbally. Parent functions, transformations, and characteristics of functions are heavily stressed throughout this course. Discrete mathematics, analytic trigonometry and analytic geometry in two and three dimensions are explored. The concepts of limits and derivatives are studied at the end of the course as an introduction to calculus.

Statistics

This is an introductory course that discusses the art, science, use, and misuse of statistical data. Students will explore the following topics: quantitative and categorical data; display of data using appropriate graphs and charts; normal distributions; scatterplots and correlation; sampling, surveys, and experiments; and chance and probability. This is a very language-intensive course that examines statistics through applications. Students who struggle with language and reading comprehension are not recommended to take this course.

AP Statistics

This course is the high school equivalent of a one-semester, introductory college statistics course. In this course, students develop strategies for collecting, organizing, analyzing, and drawing conclusions from data. Students design, administer, and tabulate results from surveys and experiments. Probability simulations aid students in constructing models for chance behavior. Sampling distributions provide the logical structure for confidence intervals and hypothesis tests. Students use a TI-84 plus graphing calculator and Web-based java applets to investigate statistical concepts. To develop effective statistical communication skills, students are required to prepare frequent written and oral analyses of real data. In order to be successful in this course, students must have a strong working knowledge of Algebra I and II content, as well as high reading comprehension levels and the ability to write analytically.

AP Calculus AB

AP Calculus AB is an extremely rigorous and fast-paced course. The purpose of this course is to provide a solid understanding of calculus concepts, experience with its methods and applications, and the ability to utilize these concepts in problem solving situations. Students will learn problem solving methods that they can apply across real-world problems involving theorems, definitions, and functions represented in different ways. Students will also use technology to explore, experiment, interpret results, and support their conclusions. The course places an emphasis on problems being expressed *graphically, numerically, analytically, and verbally*.

AP Calculus BC

In this class, students explore the key concepts, methods, and applications of single-variable calculus including all topics covered in AP Calculus AB (functions, graphs, and limits, derivatives, integrals, and the Fundamental Theorem of Calculus) as well as additional topics in differential and integral calculus, such as parametric, polar and vector functions, and series. Students become familiar with concepts, results, and problems expressed in multiple ways including graphically, numerically, analytically, and verbally. There will be an emphasis on using technology to help solve problems, experiment, interpret results, and support conclusions.

AP Computer Science A

This full-year course is recommended for students who are interested in learning how to program computers using the Java programming language, and for students who plan to take the AP Computer Science exam. This course is suited for disciplined students who are independent learners, critical thinkers and truly enjoy solving complex problems. It is strongly recommended that students who take this course have a strong foundation in Algebra I. Java is the programming language specified by the College Board for the AP Computer Science exam. Students will need a laptop (Mac or PC), and will need to install jGRASP (a free, down-loadable program). jGRASP is an integrated development environment (IDE) for writing, compiling and running Java programs.

Web Design

This one-semester course is recommended for students who have a solid background in Algebra I and are interested in learning how to create dynamic web sites that store data in a database, display data from a database, and use Google maps. Students will learn HTML, CSS (Cascading Style Sheets) and Javascript (a client-side scripting language). They will use PHP (a server-side scripting language) for working with MySQL databases. They will also learn how to add Google maps to a web page using the Google Maps API. Students will need a laptop. It is recommended that the laptop be a MacBook Pro or MacBook Air. Students will install MAMP on their Mac laptops (an environment that provides an Apache web server, MySQL database administration software and PHP). Windows (PC) laptops can run WAMP (Apache, MySQL and PHP for Windows), but the user interface is significantly different.

Computer Applications

This one-semester course is designed to teach students the computer skills they will need to do well in college. It will cover the following topics: databases, spreadsheets, charts, advanced word processing, image processing. Students will learn the shortcomings of flat-file databases, and how to create, populate and query relational databases. They will learn how to create and use spreadsheets and spreadsheet functions. They will also learn how to create and understand various types of charts, including XY-scatter charts, and how charts can be misleading or simply wrong. They will study advanced word processing skills (including headers and footers, page numbers, styles, tables of content, sections, footnotes and endnotes, text boxes and hand-drawn charts). They will learn how to crop and resize images without distorting them and how to create composite images from multiple images. Students will need a laptop with Microsoft Office installed (for Excel, Word and PowerPoint) -- Mac Office 2011 or later or Windows Office 2010 or later. Students will also be expected to download OpenOffice (free open source software for databases). GIMP (free open source software) will be used for image processing. It is recommended that students who take this course have a strong foundation in Algebra I.

iPhone Application Development

In this one-semester course students will learn how to develop applications for the iPhone. No prior programming experience is required for this course; however it is recommended that students have a strong background in Algebra I. A MacBook Pro or MacBook Air is required for this course, with OS X 10.9.4 or later as the installed operating system (Mavericks or Yosemite). Students will need to join Apple's Developer Program ($95). Development will be done using SWIFT (which is based on the Objective C programming language). Students will need to download XCode 6 or later (which includes the iOS SDK).