The Mathematics Department offers a rigorous program with a range of courses to meet the needs of individual students. The curriculum requires each student to complete the following sequence of courses: Algebra I, Geometry, Algebra II, and Pre-calculus. Beyond this basic requirement, students may elect to take courses in Calculus, Probability and Statistics, and courses team-taught with faculty from other departments. An independent study gives students the opportunity to work with faculty to explore advanced topics. Throughout this course of study, attention is focused on helping students become critical thinkers through analysis and problem solving. Emphasis is placed on understanding mathematics as a language with its own vocabulary, symbols, and syntax, and students are encouraged to look for multiple solutions to problems and to explain their calculations orally. Graphing calculators and computers are integrated into our teaching, and College Board-approved graphing calculators are required for most classes.

Algebra I: Math 100

Open to third-formers

This three-trimester course in algebra is designed to enhance the student’s understanding of the properties and operations associated with real numbers. The course content includes the study of the real number system, linear functions and their graphs, solving linear systems and inequalities, quadratic functions, exponents, radicals, polynomial functions, factoring, and applied problem solving. Students are required to have a College Board approved graphing calculator. If they receive the approval of the Mathematics Department, students who take Algebra I in the third form may take both Geometry and Algebra II in their fourth form year.

Geometry: Math 200:

Open to third- and fourth-formers; Prerequisite Algebra I

This three-trimester course in Euclidean Geometry investigates the definitions, postulates and theorems of two and three-dimensional figures. During the first trimester, study will focus on the building blocks of geometry; the various shapes and their properties, angles, parallel lines, as well as using geometric software to investigate patterns and make conjectures. Writing mathematical proofs will also be introduced. The second trimester will include advanced study of polygons, circles, and area formulas. The final trimester includes the study of solid geometry, similarity, and an introduction to trigonometry. The concepts of logical reasoning, problem solving skills, as well as organizational skills will be stressed throughout the year.

Honors Geometry: Math 220/H

Open by invitation to third- and fourth-formers; Prerequisite Algebra I

This three-trimester honors course includes all of the elements of Math 200, but has a limited number of seats available, requires more and deeper preparation by students and advances through topics at a faster pace. Students who wish to enroll in the honors section should express that desire on their Course Planning Worksheets, and indicate Math 200 as an alternate. Students will be enrolled based on a stated request, demonstrated motivation to tackle the course’s increased demands and achievement in other mathematics courses.

Algebra II: Math 310

Open to third-, fourth- and fifth-formers; Prerequisite Geometry

In this second-year algebra course, students review and expand the study of real numbers begun in Algebra I. Students learn how to solve polynomial equations of increasing complexity and to apply their solutions to “real world” situations. New topics explored in Algebra II include graphing polynomial functions, exponential, logarithmic, and rational functions and the complex number system. Students enhance their understanding of the important features of College Board approved graphing calculators.
**Honors Algebra II: Math 320/H**

*Open by invitation to third-, fourth- and fifth-formers; Prerequisite Geometry*

An honors section of Algebra II is offered to advanced students which covers conic sections, counting principles and probability and sequences and series as time permits. The class has a limited number of seats available, requires more and deeper preparation by students and advances through topics at a faster pace. Students who wish to enroll in the honors section should express that desire on their Course Planning Worksheets, and indicate Math 300 as an alternate. Students will be enrolled based on a stated request, demonstrated motivation to tackle the course’s increased demands and achievement in other mathematics courses.

**Precalculus Introduction: Math 400**

*Open by invitation to fifth- and sixth-formers; Prerequisite Algebra II*

This course unifies topics previously studied in algebra and geometry and provides the foundation needed to support future coursework in calculus, discrete mathematics, and statistics. During the first trimester students will study trigonometric functions, their graphs, inverses, and applications. The second trimester will synthesize trigonometric functions with a review of linear, quadratic, polynomial, rational, exponential and logarithmic functions through the application of regression analysis. The final trimester will be devoted to the study of some advanced topics in pre-calculus. College Board- approved graphing calculators are required for this course. Students interested in taking 400 should indicate this on their Class Planning Worksheets and list Math 410 as an alternate. Students will be enrolled based on a stated request and achievement in other mathematics courses. Completion of 400, 410 or 420 satisfies the requirement for graduation from St. George’s School.

**Precalculus: Math 410:**

*Open to fifth- and sixth-formers; Prerequisite Algebra II*

Like 400, this course unifies topics previously studied in algebra and geometry and provides the foundation needed to support future coursework in calculus, discrete mathematics, and statistics, but does so at a faster pace. During the first trimester students will study trigonometric functions, their graphs, inverses, and applications. The second trimester will synthesize trigonometric functions with a review of linear, quadratic, polynomial, rational, exponential and logarithmic functions through the application of regression analysis. The final trimester will be devoted to the study of advanced topics in pre-calculus to include a focus on sequences and series, probability, topics in analytic geometry, and limits. College Board- approved graphing calculators are required for this course. Completion of 400, 410 or 420 satisfies the mathematics requirement for graduation from St. George’s School.

**Precalculus Honors: Math 420/H**

*Open by invitation to fifth- and sixth-formers; Prerequisite Algebra II*

Like 400 and 410, this course unifies topics previously studied in algebra and geometry and provides the foundation needed to support future coursework in calculus, discrete mathematics, and statistics, but does so at a faster pace. (See further details under 400 or 410.) College Board- approved graphing calculators are required for this course. Students who wish to enroll in the honors section should express that desire on their Course Planning Worksheets, and indicate Math 410 as an alternate. Students will be enrolled based on a stated request, demonstrated motivation to tackle the course’s increased demands and achievement in other mathematics courses. Completion of 400, 410 or 420 satisfies the mathematics requirement for graduation from St. George’s School.
**Design Science: Math 433** *(Also offered as Art 433)*

Open to all forms; Prerequisites one trimester Geometry, Visual Foundations

This one-trimester course is intended to provide students with hands-on experience in designing, creating, and analyzing two- and three-dimensional geometric structures, sculptures, and models using a variety of media (including paper, wood, metal, ceramics, etc.). Students successfully completing this course would receive one trimester credit in Arts and one trimester credit in Mathematics. Possible topics and projects include tessellations, polyhedra, Platonic solids, Archimedean solids, and the mathematics and design of commercial packaging. Class periods for this course would include lecture/demonstration and hands-on labs. One or two field trips to local manufacturing facilities and art museums would be included. Each student will maintain a daily journal containing research assignments, design sketches, and potential ideas relating to class projects. The resources of the Arts Center, the Welding Lab, and the Fab-Lab would be utilized for the hands-on part of this course. Offered in the spring.

**Mathematics of Music: Math 443** *(also offered as Music 343)*

Open to all forms; Prerequisite Algebra II

From sound waves to chord structures to complex rhythms, music is full of mathematical concepts; in fact, ancient Greek philosophers like Pythagoras considered music and math to be inextricable. This trimester-long course, open to students who have completed Algebra II, will explore the diverse applications of mathematics in music through a study of the various connections between these disciplines. The trimester will begin with a basic orientation in musical language, especially in rhythmic notation; subsequent areas of focus may include monochords and the harmonic series, keyboard tuning systems (with a focus on J.S. Bach’s Well-Tempered Clavier), applications of the Golden Mean, instrument design and evolution, polyrhythms, rhythmic modulations, and the 20th-century practice of tone-row composition. Class meetings will consist of discussions of readings and audio and video examples. Students will also have opportunities for creative application of new skills. Offered in the spring.

**Probability and Statistics Introduction: Math 500**

Open to fifth- and sixth formers; Prerequisite Pre-calculus

In the world today, more and more decisions affecting the course of our lives are based, at least in part, on the results of statistical analysis. In this yearlong course, students are exposed to four broad conceptual themes: exploring and describing data, planning a statistical study, using probability to anticipate patterns in data, and statistical inference. This course focuses on the statistical thinking behind data gathering and interpretation and helps students become more discerning consumers of statistics, teaching them to look closely at what numbers from surveys, election polls, and medical studies really show.

**Advanced Placement Statistics: Math 510/A**

Open by invitation to fifth- and sixth-formers; Prerequisite Pre-calculus

The purpose of this year-long course is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students are exposed to four broad conceptual themes: exploring and describing data, planning a statistical study, using probability to anticipate patterns in data, and statistical inference. Specific topics to be covered include descriptive statistics, data collection, linear regression, experimental design, hypothesis testing, confidence intervals, and tests of significance. A College Board approved graphing calculator is used extensively, and students also are exposed to statistical software packages especially reading outputs from Mini-Tab.
Calculus: Math 600

Open to sixth-formers, and by invitation to fifth-formers

Calculus brings together the information and skills learned in previous courses and applies that knowledge to solve a wide variety of different problems. The three-trimester Calculus course begins with the study of limits, advances through differentiation, and concludes with integration.

Advanced Placement AB Calculus: Math 610/A

Open by invitation to fifth- and sixth-formers

Calculus AB is a three-trimester course in the calculus of a single variable. Each course prepares students for successful completion of the Advanced Placement Exam in the spring. AB and BC Calculus contain common topics but the BC course covers additional topics such as parametric equations, vectors, and Taylor series. In both courses, students are exposed to concepts, problems, and solutions in graphical, numerical, analytical and verbal form.

Advanced Placement BC Calculus: Math 620/A

Open by invitation to fifth- and sixth-formers

Calculus BC is an extended version of the three-trimester AB course. Each course prepares students for successful completion of the Advanced Placement Exam in the spring. AB and BC Calculus contain common topics but the BC course covers additional topics such as parametric equations, vectors, and Taylor series. In both courses, students are exposed to concepts, problems, and solutions in graphical, numerical, analytical and verbal form.

Multivariable Calculus Honors: Math 630/H

This yearlong course is intended for students who successfully complete BC Calculus before their senior year. Exceptionally strong AB Calculus students will also be considered. This course extends the fundamental concepts of calculus to functions of more than one variable. Vectors and curves in two or more dimensions, double and triple integrals, line integrals, surface integrals, Stokes Theorem, and Green’s Theorem are among the topics covered. Students will make extensive use of appropriate software and online resources throughout the course.

Independent Study: Math 611, Math 612, Math 613

For those students who have completed Advanced Calculus (AB or BC) and are looking to continue their math studies there is the option to take one or more trimester-long Independent Study courses. These are offered in a variety of topics and recent courses have included Game Theory, Differential Equations, and Linear Algebra. These classes afford the opportunity for the student to pursue in-depth study of the material while working one-on-one with a member of the math department. Instructions for proposals for Independent Study appear under “Course Planning” and must be completed and received by the Academic Office by the midpoint of the trimester prior to study.