

MATHEMATICS

LOWER SCHOOL

The Lower School Mathematics students learn the four whole-number operations in a step-by-step approach which seeks to develop mastery by the end of grade four. At each level, students read and solve word problems using the number operations that they are learning. Place value, measurement, geometry, fractions, and concepts of numbers are introduced and reinforced. Considerable use of manipulative objects teaches concepts and reinforces understanding. In first grade, addition and subtraction are introduced, and the concept of place value is taught. This work is extended during second grade with the introduction of regrouping in two-digit subtraction and three-digit addition. Multiplication is introduced in second grade. In third grade, multiplication and division are emphasized, including the multiplication and division facts, long division with remainders, and two-digit multiplication. In fourth grade, the emphasis is on complete mastery of all whole-number theory which has received attention throughout the curriculum of grades one through four.

MIDDLE SCHOOL

The Middle School Mathematics program's primary aim is to develop number-sense skills, problem-solving techniques, and the ability to see and to describe numerical and geometric patterns and relationships. Beginning with Computations and Concepts in grade 5, students are helped to start construction of the bridge that connects the concrete world of arithmetic to the abstract world of algebra. Student participation in class activities and discussion is encouraged as is the development of good communication skills. Many students will be ready to take Algebra I in the 8th grade, but others will not yet be ready for the necessary abstraction. The course sequence allows students to develop mathematical maturity at different paces and yet arrive at the common

goal of completing the bridge to the abstract with the same level of competence. Students in grades five and six will use the TI-30 series of scientific calculators to explore interesting numerical patterns and to enable them to solve realistic applied problems. Students in grade seven (beyond Mathematical Transitions) will be issued a TI-83 graphing calculator in their mathematics class at the beginning of the school year, and they should bring them to class daily. All eighth grade students returning to St. Mark's for the 2001-2002 school year are required to bring their school issued TI-83 graphing calculator to each class period. New eighth grade students will be issued a TI-83 calculator in their mathematics class at the beginning of the school year, and they should bring them to class daily. In the Spring, the department will make recommendations regarding each boy's course selection for the following year. The Mathematics Department makes recommendations based upon what would be the best course for the students. Thus, the students are expected to enroll in that course. Enrollment in an honors section is approved by the Department Chair.

UPPER SCHOOL

The Upper School Mathematics courses seek to develop skills and concepts which will enable students to analyze and solve problems from a wide range of mathematical areas, including algebra, geometry, probability, and the standard elementary (polynomial, rational, trigonometric, logarithmic, and exponential) functions. Emphasis is placed on active student participation in all aspects of the learning process. Other goals include the development of logical and critical thinking, of competence in the use of language and symbols, and of the ability to communicate clearly. Appropriate technology will be used to explore mathematical concepts and to allow a rich array of applied problems.

Students must complete the required sequence of mathematics courses through Algebra II before graduation, and must

take mathematics courses through their junior year, but they are encouraged to continue their study of mathematics through the senior year. The department offers a variety of electives to meet the needs and interests of students who complete the Algebra II course before the end of the junior year. Each spring the department will make recommendations as to appropriate course selections for students wishing to take an elective and/or an honors level course. The Mathematics Department makes recommendations based upon what would be the best course for the students. Thus, the students are expected to enroll in that course. Enrollment in an honors section is approved by the Department Chair.

All students returning to St. Mark's for the 2001-2002 school year are required to bring their school issued TI-83 graphing calculator to each class period. New Upper School students will be issued a calculator in their mathematics class at the beginning of the school year, and they should bring them to class daily.

Geometry students will use a class set of TI-92 calculators for instructional purposes.

COMPUTATIONS & CONCEPTS (405) GRADES 5-6

Full Year

This course stresses operations with real numbers. Students review whole numbers, continue their exploration of fractions and decimals, and are introduced to integers and irrational numbers. Among other topics discussed are geometry, measurement, counting problems, and statistics. Problem solving is an integral component in all units, and many enrichment activities supplement textbook units. The text is *Mathematics Today* by Abbott and Wells.

MATHEMATICAL TRANSITIONS (406) GRADES 6-7

Full Year

This course seeks to refine the student's skill level with regard to real num-

bers: fractions, decimals, integers, and irrationals, but special effort is made to help students understand the properties and concepts studied and apply them to novel problem-solving situations. Abstract reasoning, including the concepts of variable and equality, is gradually introduced, but not explored in depth. Supplementary topics such as number theory, geometry, and counting problems are introduced as enrichment topics. The text is *Transition Mathematics* by Usiskin, Flanders, et al.

MATHEMATICAL FOUNDATIONS (407)
GRADES 7-8

Full Year

This course is intended for those students who will profit from the reinforcement of the skills and concepts of arithmetic before moving on to course 408, 417 or 418. Although some abstract concepts will be developed, the emphasis of the course will be on helping students achieve both greater facility with arithmetic manipulations and a deeper understanding of arithmetic operations. Problem-solving techniques will be explored and enrichment activities will be incorporated to broaden student exposure to mathematical concepts. The text is *Pre-Algebra* by O'Daffer, Clemens, and Charles. **Limitation:** Department Chair approval required.

MATHEMATICAL CONNECTIONS (417)
MATHEMATICAL CONNECTIONS, HONORS (427)
GRADES 7-8

Full Year

This course hopes to complete the bridge being built between the concrete concepts of arithmetic and the abstract concepts of algebra and geometry. Patterns are used to develop an understanding of variable, equality, and inequality, as well as many of the principles of geometry. Students are expected to become proficient in communicating their reasoning both orally and in writing. By the end of the course, students should be confident in their ability to manipulate real numbers and should be ready to apply the same concepts in the abstract language of algebra. The

text is *Gateways* by Benson, et al. **Limitation:** Department Chair approval required.

INTRODUCTION TO ALGEBRA (408)
GRADE 9

Full Year

This course continues to build the bridge between the concrete concepts of arithmetic and the abstract of algebra and geometry. It is intended for those students whose mathematical development requires more exploration before making the final transition to Algebra I. The text is *Elementary Algebra* by Jacobs. **Limitation:** Department Chair approval required.

ALGEBRA I (418)
ALGEBRA I-H (428)
GRADES 8-9

Full Year

These are rigorous first-year algebra courses. It is assumed that students have been previously introduced to the concept of variable and that they are familiar with symbolic representations of mathematical expressions. Furthermore, students should have a working knowledge of operations and their inverses and be able to apply that knowledge to the process of solving linear equations. Emphasis is placed on the concepts of equality, inequality, proportionality, and function. Linear and quadratic functions are explored in depth, symbolically and graphically. Students learn rules to re-express rational, radical, and exponential expressions in alternate forms. Concepts and procedures are explored within real-world settings as well as in a purely mathematical context and the TI-83 graphing calculator becomes a fundamental tool. The text is *Algebra I* by Foerster. **Limitation:** Department Chair approval required for the Honors class.

ALGEBRA II (410)
ALGEBRA II-H (420)
GRADES 10-11

Full Year

These courses emphasize functions. Linear, quadratic, rational and irrational algebraic, exponential, and logarithmic functions are studied in depth. Trigonometric functions are introduced, as are quadratic relations and sequences. Word problems are used extensively to increase student awareness of the real-world applications of these functions and as a vehicle to practice skills (including problem-solving skills.) The text for Algebra II is *Algebra and Trigonometry* by Foerster. The text for Algebra II-H is *Algebra and Trigonometry: A Graphing Approach* by Larson, Hostetler, and Edwards. **Prerequisite:** Algebra I. **Limitation:** Department Chair approval required for the Honors class.

GEOMETRY (419)
GEOMETRY-H (429)
GRADES 9-10

Full Year

Geometry and Geometry Honors are full-year courses which stress the organization of a deductive system, accurate use of language and logic, writing proofs, and developing the ability to analyze and solve problems. Plane, coordinate, and 3-dimensional geometries are studied, and Algebra is used as a tool in applying new facts. **Limitation:** Department Chair approval required for the Honors course.

PRECALCULUS (411)
PRECALCULUS-H (421)
GRADES 11-12

Full Year

This course expands the student's understanding of trigonometric, circular, polynomial, rational, exponential, and logarithmic functions. The syllabus also includes parametric equations, polar coordinates, sequences, series, and matrices. The traditional curriculum is enhanced by continuously adding geometric representa-

tions to the algebraic representations. **Limitation:** Department Chair approval required for the Honors class.

**SENIOR MATHEMATICS TOPICS
(412) GRADE 12**

Full Year

This course builds upon the concepts and procedures studied in previous mathematics classes including Precalculus. For example, linear functions serve as the foundation for a study of the concept of slopes of non-linear functions. Geometric sequences and series are used to explore the mathematics of investment and to build the concept of Riemann sums. Particular topics may vary from year to year to allow for the interests and strengths of the current students, but all students who successfully complete this course should be well prepared to take college level mathematics courses including calculus. There is no textbook for this class. **Limitation:** Department Chair approval required.

**AP CALCULUS - AB
(422) GRADE 12**

Full Year

This is the AB-level Advanced Placement Calculus course. Its syllabus is determined by the College Board, and requires extensive exploration with the TI-83 graphing calculator. Calculus AB is the equivalent of the first semester course in calculus offered by most universities. Students may earn credit and/or placement at universities by taking and passing the AP Examination in May. The text is *Calculus*, by James Stewart. **Limitation:** Department Chair approval required.

**AP CALCULUS - BC
(432) GRADE 12**

Full Year

This is the BC-level Advanced Placement Calculus course. Its syllabus is determined by the College Board, and requires exploration with the TI-83 graphing calculator. Calculus BC is the equivalent of a full first-year course in the calcu-

lus offered by most universities. Students may earn credit and /or placement at universities by taking and passing the AP Examination in May. This course is fast-paced and demanding. It is intended only for those students who have both an outstanding aptitude and a high interest in mathematics. The text is *Calculus*, by James Stewart. **Limitation:** Department Chair approval required.

**COLLEGE ALGEBRA-
TRIGONOMETRY
(430) GRADES 11-12**

Full Year

College Algebra expands the student's understanding of elementary functions. It covers polynomial, rational, exponential, and logarithmic functions with an emphasis on graphing and applications. Series, matrices, and probability may also be covered. The text is *Intermediate Algebra, A Graphing Approach* by Demana, Waits. Trigonometry begins with a review of right triangle trigonometry with applications, then introduces circular functions. Graphing, identities, solution to trigonometric equations, and applications are treated in depth. The text is *Trigonometry* by Foerster.

**INDEPENDENT STUDY IN
ADVANCED MATHEMATICS
(451) GRADE 12**

Full Year

Independent study in several advanced topics including linear algebra, number theory, and differential equations is available to students who have completed the BC Calculus course prior to their senior year, or who want a math elective in addition to Calculus. Such opportunity, however, will be based upon faculty availability. **Prerequisite:** AP Calculus – BC.

**AP STATISTICS
(452) GRADES 11-12**

Full Year

The purpose of this AP 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 data, planning a study, anticipating patterns in advance, and statistical inference. The text is *The Practice of Statistics* by Yates, Moore, and McCabe. **Prerequisite:** Algebra II. **Limitations:** Department Chair approval required.