

Mathematics

Math Curriculum Overview

The math department at St. Francis strives to provide students with not only the mathematical skills they will need to take their place in a technologically advanced society, but also with the fundamental skills, procedures, mathematical thinking, problem solving, and good judgment to continue their mathematics education at the most competitive universities and throughout their careers. We emphasize the necessity of communicating answers in mathematically correct notation, and in complete sentences. We expect our students to take advantage of the opportunity for personal interactions with their instructors, in accordance with the larger goal of having our students grow into mindful, informed young adults. Students are encouraged to be part of the process, driving discussions, working through problems, and being full partners in their own education.

We offer a full range of coursework in high-school mathematics, beginning with Algebra I, Geometry, and Algebra II, with a range of options after Algebra II. In the courses through Algebra II, we use texts that emphasize the importance of students confidently discovering the fundamentals of math through thoughtful problem solving and application of their basic skills. This process builds confidence in all students regardless of their past math experiences. After Algebra II, students can opt for MMT, Precalculus, AP Calculus AB/BC, AP Statistics, AP Computer Science Principles, and/or Advanced Mathematical Reasoning: Set Theory and Logic. Texts for these courses are college-level, and emphasize correct and consistent use of mathematical vocabulary and notation.

Beyond the ordinary curricula, we offer students the chance to participate in the Greater Louisville Math League, a challenging competition held four times per year, with both individual and team scores reported. Selected students are also invited to participate in the American Math Competition, the first level of a talent-search process. Those students scoring above 100 will be eligible to compete in the American Invitational Math Exam, and the top few hundred students in the nation on that exam will be invited to a summer camp to choose the US Math Olympiad Team, for international competition.

Math Department Course Offerings

Algebra I (*Miller; 1 credit*)

This is an introductory course in algebra covering the basics of using variables and grouping symbols, exponents, and real numbers, including irrational numbers. Topics will include simplifying variable expressions given values for the variables, solving linear equations in one variable, polynomial operations, factoring polynomials, working with algebraic functions, graphing linear equations and inequalities, exploring exponential patterns, and an introduction to quadratic functions. There will be considerable emphasis on word problems and on the correct and consistent use of appropriate mathematical notation and vocabulary. A TI-84+ calculator is required.

Geometry (*Jones; 1 credit*)*Prerequisite: Algebra I*

As well as being the study of the mathematics of points, lines, planes, and other geometric objects, geometry is concerned with the process of careful, organized, abstract thinking. Students will learn the importance of careful definitions and learn to make conjectures and justify arguments through different types of formal and informal proofs. Additional topics will include congruence and similarity, solid geometry, coordinate geometry, transformations, and graph theory. A TI-84+ calculator is required.

Algebra II (*Ray; 1 credit*)*Prerequisites: Algebra I and Geometry, or concurrent enrollment in Geometry*

This is the sequel to Algebra I, and although it is usually taken after Geometry, concurrent enrollment in Geometry will provide the necessary background. Topics covered will include linear equations and systems, quadratic equations and systems, polynomial, rational, exponential, matrix algebra, conic sections, and an introduction to trigonometry. A TI-84+ calculator is required.

Precalculus (*Miller; 1 credit*)*Prerequisites: Algebra II with a minimum grade of B- and permission of the instructor*

This is a course for students who plan to take calculus or have the necessary level of interest. Topics will include a detailed study of functions, including polynomial, exponential, logarithmic, logistic, rational, and trigonometric functions. Other topics include conic sections, polar- and parametrically-defined functions, vectors, complex numbers, matrix algebra, sequences and series, basic combinatorics, and probability. A TI-84+ calculator is required. The correct use of and the limitations of scientific calculators will be emphasized.

Mathematical Modeling (with Trigonometry) (*Jones; 1 credit*)*Prerequisites: Algebra II*

Students in this course will use a variety of algebraic, geometric and analytic skills to model real world phenomena and answer questions about those models. Students will study the mathematics of growth and decay, not only in the context of biological and chemical systems, but also as it pertains to finance. Students will use trigonometry to solve problems in engineering and other geometric applications. They will also use trigonometry to model periodic (or semi-periodic) phenomena, such as tides, sales, etc. Students will also do statistical and probabilistic analysis in a variety of contexts. Other topics may include--but are not limited to--voting theory, graph theory, physics applications, the mathematics of art and simple proof-writing.

AP Calculus AB/BC (*Jones; 1 credit*)*Prerequisites: Precalculus and permission of the instructor*

This is a one-year course covering all the items in the AP Calculus AB syllabus, and additionally the extra topics included in the BC syllabus. Upon successful completion of the course, students will be qualified to take the AP Calculus AB or BC examination. Topics will include limits and continuity, the derivative and its applications, the integral and its applications, and the fundamental theorem of calculus. BC-only topics include the calculus of polar and parametrically defined functions, vector functions, improper integral forms, L'Hospital's rule, first order separable differential equations, slope fields, and a detailed study of infinite series, including convergence tests and the MacLaurin and Taylor series. A TI-84+ calculator is required.

AP Statistics (Ray; 1 credit)

Prerequisites: Algebra II and permission of the instructor

This AP course in Statistics will introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. Students are exposed to four broad conceptual themes: (1) Exploring data: describing patterns and departures from patterns; (2) Sampling and Experimentation: planning and conducting a study; (3) Anticipating Patterns: Exploring random phenomena using probability and simulation; (4) Statistical Inference: estimating population parameters and testing hypotheses. Students who successfully complete the course and exam may receive credit, advanced placement, or both, equivalent to a one-semester introductory college statistics course. A TI-84+ or better calculator is required for both the course and the AP exam.

AP Computer Science Principles (Miller; 1 credit)

Prerequisites: Algebra II and permission of the instructor

AP Computer Science Principles offers a multidisciplinary approach to teaching the underlying principles of computation. The course will introduce students to the creative aspects of programming, abstractions, algorithms, large data sets, the Internet, cybersecurity concerns, and computing impacts. This course also gives students the opportunity to use current technologies to create computational artifacts for both self-expression and problem solving. Together, these aspects make up a rigorous and rich curriculum that aims to broaden participation in computer science.

Advanced Mathematical Reasoning: Set Theory and Logic (Ray; 1 credit)

Prerequisites: Algebra II and permission of the instructor

In Set Theory and Logic, students will learn the foundational material that the majority of their college mathematics coursework will be built upon. Students will learn set theory, the idea of a collection of items and the properties that stem from such collections. Next, students will explore basic logic through logical statements and truth tables. We will then explore proof methods for the remainder of the class while touching on various mathematical fields including linear algebra, graph theory, and counting. An emphasis in the class will be on precision of thought, words, and use of symbols.