Bowdoin’s mathematics curriculum reflects the department’s belief that mathematics is important for both its practical applications and for its beauty. A broad program of courses has been designed to serve students with a wide range of interests. The heart of the elementary program is a sequence of three calculus courses, in which approximately 380 students enroll each year. Classes are divided into sections, and enrollments are limited to thirty students to allow faculty members to work individually with students as much as possible. Calculus courses consist of three hours of class meetings per week plus an average of two hours of computer laboratory work every other week.

There are two core courses that all majors take. One course is an introduction to mathematical reasoning and the kind of careful argument (called “proof”) at the heart of all mathematical theory. The other core course is linear algebra, which is extremely useful in applications of mathematics, as well as being an important mathematical topic in its own right. Major-level classes, which typically require the completion of at least one of the core courses, include analysis, combinatorics, and graph theory, topology, probability, statistics, biostatistics, number theory and cryptography, modern algebra, geometry, optimization, numerical analysis, and differential equations. The department also offers advanced courses in algebra, analysis, applied mathematics, probability and statistics, and geometry. Typically, there are between twenty and twenty-five students in major-level courses, and the advanced courses are limited to sixteen students.

The department also participates in interdisciplinary majors with economics, computer science, and education. In addition, the department has an interdisciplinary program in mathematical biology.

The Curriculum

Both depth and breadth are encouraged in the mathematics major program. When declaring a math major, a student consults with a member of the department to plan a program of courses. Major-level courses are grouped together to form concentrations in algebra, probability and statistics, geometry/topology, analysis, modeling and dynamics, and optimization and numerical methods. Majors are required to complete at least one advanced course as a capstone to a concentration to assure depth, and are encouraged to include both theoretical and applied courses in their programs for breadth and flexibility.

Requirements for the major are the two core courses and six major-level courses, including the advanced capstone course.

The minor in mathematics requires at least four from among the core or major-level courses.

The interdisciplinary major in mathematics and economics requires six courses in mathematics, four in economics, and either a seventh math course or a computer science course. The interdisciplinary computer science and mathematics major requires six computer science courses and five mathematics courses. The interdisciplinary major in mathematics and education requires four education courses, six mathematics courses, and one statistics course. See the College Catalogue online for details on required courses for each program.

Other options available to students at the elementary level include Quantitative Reasoning—an introductory course offered every semester. The two courses—Introduction to Statistics and Data Analysis, and Biostatistics—introduce students to methods of extracting information from data. The latter course is designed primarily for students in the life sciences. Students may take one or the other of these elementary statistics courses, but not both.

In addition, there are groupings of mathematics courses that will be especially beneficial to those going on to secondary school teaching, and for those pursuing postgraduate studies in mathematics, engineering and applied mathematics, economics and econometrics, statistics, computer science, and operations research and management science.

Facilities and Resources

The mathematics department is located in Searles Science Building, which houses faculty offices, mathematics classrooms, and computer laboratories. An excellent collection of mathematics books is housed in the nearby Hatch Science Library, and the department has online links to many mathematics organizations and databases.

Computers are used extensively in mathematics courses. There are four laboratories with Macs and PCs available in Searles Science Building. In addition, there are many other places to use workstations all over campus, many with 24-hour access.

Each year, the Department of Mathematics sponsors a series of mathematical lectures to supplement the classwork being done by students in math courses. There is also an informal weekly lunch for students and faculty where math talks are often given. In addition, members of the department and honors candidates present talks on their own work or on topics of special interest.
Independent Study and Honors

Majors who have demonstrated that they are capable of intensive, advanced work are encouraged to undertake independent study and honors projects. This kind of educational experience can be one of the most satisfying and productive ways for students to learn and pursue their special mathematical interests at an advanced level. It also fosters close ties between students and faculty. The honors program usually involves a yearlong project (two semesters of independent study) that culminates in the writing of an expository thesis during the spring semester. Two oral reports are required, one at the end of each semester.

Mathematics

Honors Projects

Recent honors projects completed by majors in the department have included:

- Language Theoretic Properties of Thompson's Group F
- The Twitterscape in Time and Space
- Earth's Temperature, Past and Present: Carbon, Ice, and Orbital Feedback Interactions in a Conceptual Climate Model
- Functional Analysis and Quantum Theory
- Constructing Minimal Length Representatives for Elements of Thompson's Group F
- Orbital Varieties of Type A
- The Cayley-Klein Geometries: Projective Geometry is All Geometry
- Mechanical Theory Proving Over Finite Geometries
- Mathematical Modeling of the Pituitary Gland
- Algebraic Geometry and Phylogenetics
- Stochastic Perturbations of the FitzHugh-Nagumo Equations

Faculty

William Barker, professor of mathematics, A.B. (Harpur College), Ph.D. (M.I.T.), specializes in Lie theory, analysis, geometry, and representation theory.

Adam B. Levy, professor of mathematics, B.A. (Williams), Ph.D. (Washington), specializes in applied mathematics, variational analysis, optimization, and control theory.

Jack O'Brien, assistant professor of mathematics, B.A. (Pomona College), Ph.D. (UCLA), specializes in Bayesian statistics, phylogenetics, metagenomics, and statistical genetics.

Thomas Pietroho, associate professor of mathematics, B.A. (Pomona College), Ph.D. (M.I.T.), specializes in Lie theory, analysis, and representation theory.

Amanda Redlich, assistant professor of mathematics, B.A. (Chicago), Ph.D. (M.I.T.), specializes in combinatorics, theoretical computer science, and probability.

Manuel Reyes, assistant professor of mathematics, B.S. (Westmont College), Ph.D. (California-Berkeley), specializes in Ring theory, module theory, noncommutative algebraic geometry, and operator algebras.

Jennifer Taback, associate professor of mathematics, B.A. (Yale), M.A., Ph.D. (Chicago), specializes in geometric group theory and large-scale geometry.

Mary Lou Zeeman, professor of mathematics, B.A., M.A. (Oxford), Ph.D. (California-Berkeley), specializes in geometric dynamical systems, mathematical biology, population dynamics, and hormone oscillations.

After Bowdoin

Majors in mathematics at Bowdoin provides a foundation for a wide range of future options. Some students complete an undergraduate major in preparation for more advanced training in mathematics or in mathematics-related areas. Others use it to develop quantitative and logical skills before pursuing a professional career in law, science, medicine, or business management. Many students in the second category make the study of mathematics part of a double major, while others complete the formal interdisciplinary major with economics or computer science. Prospective secondary school teachers often major in mathematics.

In all cases, a primary reason why students major in mathematics is simply because they enjoy it. Among the more than 225 Bowdoin mathematics majors who graduated during the last decade are elementary and secondary school teachers, current graduate students, computing professionals, business executives, actuaries, accountants, and auditors. Others are engaged in a variety of diverse professions, ranging from medicine to the arts. Many Bowdoin math majors have entered graduate programs in mathematics and statistics at the most prestigious universities in the country, including Brown, Dartmouth, Harvard, California-Berkeley, Chicago, Princeton, M.I.T., Cornell, Duke, Columbia, Penn State, Northwestern, Yale, and Wesleyan.

For more information, go to: bowdoin.edu/math/

Bowdoin

For more information about Bowdoin, please write or call: Dean of Admissions Bowdoin College, 5000 College Station Brunswick, ME 04011-8441 207-725-3100 bowdoin.edu admissions@bowdoin.edu

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