

MATHEMATICAL SCIENCES

The Department of Mathematics

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The Study of Mathematics

Students major in mathematics for many reasons: some are drawn by the beauty of the subject, others by its practicality, and many by a combination of the two. Mathematics provides outstanding training for the mind and develops skills in logical reasoning and problem solving. It plays a central role in science, technology, economics, and data-driven fields, from climate modeling and genomics to finance and medicine. Long the language of physics, mathematics is an essential component of nearly all the sciences, especially in an era of computation and modeling. An undergraduate degree in mathematics opens the door to a wide range of careers and to graduate study in mathematics and many related disciplines.

Please see the Math department website for a [link](#) to career resources.

Programs of Study

Math majors include Mathematics, Applied Mathematics, Mathematical Sciences, Mathematics-Statistics, Mathematics-Computer Science, and Economics-Mathematics.

Math minors include Mathematics and Mathematical Sciences.

Program-level Student Learning Outcomes

Students graduating with a major in Mathematical Sciences should be able to attain the following outcomes:

- Demonstrate mastery of core foundational concepts, structures, and problem-solving techniques in mathematics.
- Apply mathematical, statistical, and computational reasoning to analyze complex data sets and mathematical structures.
- Construct, evaluate, and critique logically sound mathematical arguments, algorithms, and analytical models.
- Communicate complex mathematical, statistical, and computational ideas clearly in written and oral formats.
- Engage in collaborative problem-solving, algorithmic design, and interdisciplinary inquiry.

Student Advising

Advising Resources

- Students who have special placement problems, are unclear about their level, or would like to know more about course offerings should make an appointment with a faculty member or the Chair. Information about [Student Advising](#) with links to advisor contact information can be found on our website.

- Open House events are scheduled each semester for prospective and current math majors to meet faculty, ask questions, and get to know each other.
- [A Students' Guide to Studying Math at Barnard](#), available on our website, is a useful guide written by and for students. It answers many frequently asked questions and provides comments and opinions from math majors.

Courses for First-Year Students

The systematic study of Mathematics begins with one of the following alternative sequences:

Calculus I, II, III, IV

MATH UN1101	CALCULUS I
MATH UN1102	CALCULUS II
MATH UN1201	CALCULUS III
MATH UN1202	CALCULUS IV
Honors Math A-B	
MATH UN1207	HONORS MATHEMATICS A
MATH UN1208	HONORS MATHEMATICS B

Credit is allowed for only one of the calculus sequences. The calculus sequence is a standard course in differential and integral calculus. *Honors Mathematics A-B* is for exceptionally well-qualified students who have strong advanced placement scores. It covers second-year Calculus (MATH UN1201 CALCULUS III–MATH UN1202 CALCULUS IV) and MATH UN2010 LINEAR ALGEBRA, with an emphasis on theory.

Calculus II is NOT a prerequisite for *Calculus III*, so students who plan to take only one year of calculus may choose between I and II or I and III. The latter requires a B or better in Calculus I and is a recommended option for some majors.

MATH UN2000 INTRO TO HIGHER MATHEMATICS is a course that can be taken in their first or second year by students with an aptitude for mathematics who would like to practice writing and understanding mathematical proofs.

An additional list of [Courses Recommended for First-Year Students](#) can be found on our website.

Placement in the Calculus Sequence

College Algebra and Analytical Geometry is a refresher course for students who intend to take Calculus but do not have adequate background for it.

Advanced Placement: Students who have passed the advanced placement test for Calculus AB with a grade of 4 or 5 or BC with a grade of 4 receive 3 points of credit. Those who passed Calculus BC with a grade of 5 will receive 4 points of credit or 6 points on placing into Calculus III or Honors Math A and completing with a grade of C or better.

Calculus I, II, III: Students who have not previously studied calculus should begin with Calculus I. Students with 4 or higher on the Calculus AB or BC advanced placement test may start with Calculus II. Students with 5 on the Calculus BC test should start with Calculus III.

Honors Mathematics A: Students who have passed the Calculus BC advanced placement test with a grade of 5, and who have strong mathematical talent and motivation, should start with Honors Mathematics A. This is the most attractive course available to well-prepared, mathematically talented first-year students, whether or not they intend to be mathematics majors. Students who contemplate taking this

course should consult with the instructor. If this is not possible ahead of time, they should register and attend the first class.

Math Tutoring

Two help rooms, one in 404 Mathematics (on Columbia's campus) and one in 502 Milstein Center (on Barnard's campus), are available. Hours will be posted in the rooms and on <https://math.barnard.edu/math-tutoring-schedules> for students seeking individual help and counseling from Barnard tutors and Columbia teaching assistants. No appointments are necessary. Both Barnard and Columbia students are welcome. NOTE: Changes to tutoring schedules and remote tutoring can occur.

Preparation for Graduate Study, Business, or Teaching

Please read the first paragraph of the [Requirements](#) tab.

Coursework taken outside of Barnard

Advanced Placement Credit

Please see [AP Scores by Subject](#) on Barnard's website. Please note that Barnard does not grant major credit on the basis of exam scores; the college only permits course exemptions. Majors in the department must substitute another course for any exemption they receive on the basis of an exam score. Please speak to your major advisor or Chair about your situation.

Columbia College Courses

Please speak to your major advisor or Chair about which Columbia College courses are accepted toward your math major prior to registering for a course.

Transfer Credit

When students wish to transfer credit to Barnard from other institutions, their coursework is first evaluated for college elective credit by the Registrar's Office. If they are approved, departments can consider these courses for credit toward the major or minor. Please speak with your major advisor or Chair.

Study Abroad Credit

- Classes taken abroad through Columbia-led programs (i.e., those administered by Columbia's Center for Global Engagement) are treated as Columbia courses, equivalent to those taken on the Morningside Heights campus.
- Classes taken abroad through other institutions or programs are treated as transfer credit and are subject to the same policies as other transfer courses. Accordingly, there will be a limit on the number of study abroad courses taken at other institutions that can be counted toward the major or minor.
- To receive credit toward the major or minor for a study abroad course (whether taken through a Columbia program or another institution/program), students must submit a Study Abroad Approval form through Slate and obtain the approval of the Chair or departmental representative.

Summer Credit

- Summer courses at Barnard are equivalent to those taken during the academic year. Courses that have been approved for the fulfillment of departmental requirements will automatically count toward the major. For credits toward the minor, please speak to your advisor or Chair.

- Courses taken at other institutions (including Columbia) are considered transfer credit and are subject to the same policies governing other transfer courses. To receive major or minor credit for a summer course taken at another institution, students must submit a Summer Course form through Slate and have it approved by both the Registrar's Office and the Chair or department representative.

Senior Capstone Project

The Capstone Experience can be fulfilled by a senior thesis written under the supervision of a faculty member in your major area, or by completing the course Undergraduate Seminars in Mathematics. To learn more about courses needed for the major, please read the [Requirements](#) tab.

Departmental Honors and Prizes

[Prizes and Awards](#) provided by individual donors for students are listed on the math website.

Other Important Information

Professional Organizations

- Barnard's Mathematics Department is an Institutional Member of the Association for Women in Mathematics (AWM). All Barnard math majors receive a free student membership. They can participate in the [AWM Columbia Chapter](#) meetings and events.
- [Women in Mathematics and Statistics](#), in association with the Mathematics and Statistics Departments at Barnard and Columbia, offer free presentations that you can attend throughout the year.

Chair

Daniela De Silva (Ann Whitney Olin Professor of Mathematics)

Professor

Dusa McDuff (Joan Lyttle Birman '48 Chair of Mathematics)

Assistant Professor

Marco Castronovo
Alisa Knizel
Semon Rezchikov

Lecturer

Lindsay Piechnik

Term Associate Professor

Cristian Iovanov

Visiting Associate Professor

Wenjian Liu

Professors Emeriti

Dave Bayer
Joan Birman

Links to other faculty of Columbia University offering courses in Mathematics:

Faculty by Rank: <http://www.math.columbia.edu/people/faculty-by-rank/>

Alphabetical Faculty Listing: <http://www.math.columbia.edu/people/alphabetical-faculty-listing/>

Mathematical Sciences Major - 14 courses (a minimum of 42 credits) in the following three categories:

(Specific course requirements for the Mathematical Sciences major can be found on the Requirements tab under Mathematics.)

1. Six required courses in Mathematics (minimum of 18 credits).

Note: A student who places out of Calc I and/or Calc II with AP/IB credits will need to take a replacement course for each of those courses.

2. Five courses from a combination of Statistics and Computer Science (minimum of 15 credits).

3. Capstone requirement and two electives (minimum of 9 credits).

The Capstone Experience can be fulfilled by a significant thesis written under the supervision of faculty of any one of the three departments or by the Undergraduate Seminar in Mathematics.

Electives may be courses in Mathematics, Statistics or Computer Science, numbered at 2000 and above (with the exception of MATH UN1202 which is an accepted elective), or cognate courses from the list: <https://bulletin.columbia.edu/columbia-college/departments-instruction/mathematics/#requirementstext>

Please consult with the Mathematics Chair to confirm that a class is an accepted elective as there may be considerable overlapping between courses offered by different departments.

Requirements for the Minor in Mathematical Sciences - 6 courses

The minor in Mathematical Sciences comprises 6 courses, at least two from Mathematics and one from each of Statistics and Computer Science. There should be a minimum of three courses in Statistics and Computer Science. Eligible courses are any listed in the Mathematical Sciences Major with the exception of Calculus I and II.

Specific courses for the major in Mathematical Sciences can be found on the Courses tab under Mathematics.