



Program Information for Undergraduate Majors

2019-2020

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MATH CONCENTRATIONS AT A GLANCE

GS (B.A.)

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Gen Study in Math

A basic theoretical program suitable for students who intend to pursue graduate study in mathematics or intend to work in such fields as actuarial science, financial analysis, cryptography etc. This program is similar to BSc, but involves fewer electives.

• 49-52 required credit hours

BSc (B.S.)

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Gen Study in Math

A basic theoretical program suitable for students who intend to pursue graduate study in mathematics or intend to work in such fields as actuarial science, financial analysis, cryptography etc. This program is similar to GS, but offers a B.S. degree (instead of B.A.) and requires 4 more electives.

• 64-68 required credit hours

A (B.S.)

p.20

Actuarial Science

Actuarial Science uses mathematical and statistical methods to assess and manage risk. Actuaries play the key role in insurance companies, financial institutions, government agencies etc. This program provides a curriculum for students intending to pursue a career as an actuary.

• 79 required credit hours

GS/AM (B.A.)

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Gen Study in App Math

A basic theoretical program suitable for students who intend to pursue graduate study in applied mathematics or intend to work in such fields as actuarial science, financial analysis, mathematical modeling etc. This program is similar to BSc/AM, but offers a B.A. degree (instead of B.S.) and requires fewer electives.

• 65-67 required credit hours

BSc/AM (B.S.)

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Gen Study in App Math

A basic theoretical program suitable for students who intend to pursue graduate study in applied mathematics or intend to work in such fields as actuarial science, financial analysis, mathematical modeling etc. This program is similar to GS/AM, but offers a B.S. degree (instead of B.A.) and requires 4 more electives.

• 77-83 required credit hours

C (B.A.)

p.22

Computing & App Math

A program for students interested in careers as applied mathematicians or scientific computer programmers. Combines the standard math courses with courses on programming, data structures and numerical analysis.

• 64-68 required credit hours

GS/ED (B.A.)

p.24

Gen Study in Math & Edu

A program for students who plan to be mathematics teachers. Completion of this program provides advanced status toward initial NYS teacher certification.

• 74-75 required credit hours

M/E (B.A.)

p.26

Joint Major in Math & Econ

A joint program with the Department of Economics. Suitable for students intending to pursue graduate study in economics.

• 64-65 required credit hours

M/P (B.S.)

p.28

Joint Major in Math & Phys

A joint program with the Department of Physics. Suitable for students intending to pursue graduate study in mathematical physics.

• 78 required credit hours

GC (B.A.)

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Gen Curriculum in Math

A basic liberal arts program in mathematics. Well suited to students pursuing multiple majors.

• 36 required credit hours

BA/MA (B.A./M.A.)

p.32

Comb Degree Prog in Math

A five-year program suitable for students interested in teaching, financial applications, actuarial work and any other profession in which advanced mathematical training and degrees are valued.

• 63-66 required credit hours

UBTEACH (B.A./ED.M)

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Comb Degree in Math Ed

A five-year program resulting in a BA in Math, an Masters in Education, and a preliminary New York State teaching certification recommendation. Suitable for students interested in teaching mathematics at the high school level in New York State.

• 116-118 required credit hours

HOW TO BECOME A MATH MAJOR

1 Seek advisement early. If you are interested in becoming a math major you should contact the Math Department Undergraduate Office for an Advisement Meeting at the Math Department soon after beginning your studies at UB. Many of our program concentrations require extensive coursework which is difficult to complete without an early developed plan of study. Early planning is also very important if you intend to pursue a double degree or a double major. The initial Advisement Meeting with the Math Department does not commit you to anything, but it is an opportunity to discuss the concentrations we offer and to clarify which programs are best suited for your needs.

2 Complete the prerequisites. Before you can be officially admitted to the math major you need to complete prerequisite courses. For most of our concentrations the prerequisites are the three courses in the calculus sequence: MTH 141 Calculus I/153 Honors Calculus I, MTH 142

Calculus II /154 Honors Calculus II, and MTH 241 Calculus III/251 Honors Calculus III. Your GPA in these courses must be at least 2.5. While this is not a requirement, it is recommended that before you seek admission to our more theoretically oriented programs (GS, BSc, GS/AM, BSc/AM, BA/MA) you take the course MTH 311 Introduction to Higher Mathematics. This is an introductory proof-based course that will give you a taste of what to expect in all higher level mathematics courses, and will test your aptitude toward abstract mathematics.

3

Apply for admission. Once your prerequisites are complete you will be ready to apply for admission to the math major. You can apply in person only, by scheduling an Advisement Meeting with the Math Department. At this meeting you will discuss your choice of concentration and plan your courses for the next few semesters. Upon approval your university status will be updated in the HUB - you will officially become a math major.

Advanced Placement Credit

Students who receive a grade 4 or 5 in the BC Calculus Advanced Placement Exam may receive credit for MTH 141 and MTH 142 (8 credit hours). Students who receive a grade of 4 or 5 on the AB Calculus Advanced Placement Exam may receive credit for MTH 141 (4 credit hours). This credit can be applied to the math major program requirements.

Transfer Students

If you are a transfer student and you intend to major in mathematics you should arrange an Advisement Meeting with the Math Department very early in your first semester at UB to determine equivalency of transferred mathematics coursework. Transfer students are required to complete at least four upper division mathematics courses (i.e. courses above MTH 309) at UB if they are pursuing a math major, and at least two upper division mathematics courses for the math minor.

Double Degrees And Double Majors

Establishing expertise in multiple disciplines can enhance your job prospects and help in your post-college career. One way to achieve this is to obtain degrees in two areas. This can be done by completing either a double degree or a double major. The following table summarizes the requirements for a double degree and a double major and shows differences between these two options:

Double Degree	Double Major
You must pursue two majors in <i>two different baccalaureate types</i> (e.g. a B.A. in Mathematics and a B.S. in Chemical Engineering). Your transcript will specify two separate degrees and two majors.	You must pursue two majors in <i>the same baccalaureate type</i> (e.g. a B.S. in Mathematics and a B.S. in Physics). Your transcript will specify one degree and two majors.
You must complete all requirements for both programs.	You must complete all requirements for both programs.
You must complete at least 30 credits hours beyond the requirements of the degree with the larger number of required credits.	There are no restrictions on the number of credit hours you must complete.
You must accrue at least 150 credits total.	You must accrue at least 120 credits total (same as for a single major).
At most two 300 and 400 level courses, other than MTH 306 and MTH 309, taken to satisfy requirements of one degree can be used to satisfy the requirements of the other degree. MTH 306 and/or MTH 309 can be used for both degrees if they are relevant. Before you graduate you will be required to complete the double degree application form listing all 300 and 400 level courses you took in each degree program. The form will need to be signed by the undergraduate directors and submitted to the Office of the Registrar.	Any number of courses can be used to satisfy requirements of both programs.
Upon graduation you will receive two diplomas, one for each degree awarded.	Upon graduation you will receive one diploma listing both majors.

If you wish to pursue a double degree or a double major you should plan for it early in your academic career, with the guidance of both program directors to prepare a plan of study that meets the above criteria.

SUGGESTED MINOR PROGRAMS FOR MATH MAJORS

As a mathematics major you may want to complement your training with a minor in an area related to your major program. Skills in programming, statistics, business, finance etc. are very compatible with the abilities we expect from our majors. A background in one of these areas will broaden the range of your potential career choices and can give you a competitive edge on the job market.

Computer Science Minor

Requires six CSE courses, with at least two at the 300 level or above. A minimum GPA of 2.0 overall in those courses is required. At least three courses must be taken at UB. A maximum of two of these courses may be used for a student's major.

Statistics Minor

Prerequisites

MTH 121, 131, 141 or 153; MTH 122, 142 or 154; and STA 119

Required Courses

STA 301 or MTH 411; STA 302 or MTH 412; STA 403, and STA 404

Physics Minor

Prerequisites

MTH 141 or 153, MTH 142 or 154, PHY 107 or 117, PHY 108 or 118, PHY 158

Required Courses

PHY 207, PHY 208, PHY 301, PHY 403, and one 300/400 level PHY elective course.

Chemistry Minor

Prerequisites

CHE 101, 105 or 107; and MTH 121, 141 or 153.

Required Courses

CHE 102, 106 or 108, CHE 201-202, or CHE 251-252, MTH 122, 142, or 154, and 10 additional credit hours in 300/400 level chemistry courses.

Education Minor

Required Courses

LAI 350, CEP 400, or ELP 405, and at least 11 credits of education elective courses, with at least six being at the 300/400 level.

Note: Math majors pursuing the GS/ED concentration will complete all requirements of this minor in the course of their study.

Economics Minor

Prerequisites

MTH 121, 131, 141 or 153 and any two economics courses (ECO 181 and 182 highly recommended)

Required Courses

ECO 380, 405, 407, and 480 (may substitute MTH 411-412 for ECO 380), and at least 3 additional 300/400 level economics courses.

Philosophy Minor

Six credit hours of 100-level philosophy courses, plus 12 credit hours of 200-400 level philosophy courses.

Geography Minor

There are five programs available for geography minors. See the Director of Undergraduate Studies at the Department of Geography for details.

Honors and Distinction

There are three kinds of honors and distinctions you can earn as a math major. *Latin Honors* are awarded by the University based on your cumulative GPA in all courses. Separately, Department of Mathematics awards Departmental Distinction to math majors based on the GPA in the courses that fulfill the major requirements. You can also earn Departmental Honors by maintaining a high GPA and by writing an honors thesis.

Latin Honors

Eligibility for Latin Honors is based on UB cumulative GPA as specified in the table. To qualify for Latin Honors, you must complete at least 60 credit hours in undergraduate courses taken at UB. No less than 54 of these credits must be graded credits (i.e. not grades of 'P,' 'NP,' 'S' or 'U').

GPA	Honors
3.20	<i>cum laude</i>
3.50	<i>magna cum laude</i>
3.75	<i>summa cum laude</i>

Departmental Distinction

Mathematics majors can graduate with “Distinction”, “High Distinction”, or “Highest Distinction” based on criteria described in the following table:

		math program GPA needed to graduate with		
		distinction	high distinction	highest distinction
number of 300-400 level MTH courses and major requirements	6	4.0	not eligible	not eligible
	7	3.9	4.0	not eligible
	8	3.8	3.9	3.95
	9	3.7	3.8	3.85
	10	3.6	3.7	3.75
	11	3.5	3.6	3.75
	12	3.4	3.5	3.75
	13	3.3	3.5	3.75
	14+	3.2	3.5	3.75

Note: The math program GPA used to determine Departmental Distinction is computed from the courses used to fulfill the requirements of the math major program only. Transfer students must complete at least 50% of the math major credit hours at UB to be eligible.

Departmental Honors

In order to earn Departmental Honors a student must:

- Complete an honors thesis under the guidance of a faculty member. *Typically students register for MTH 499 Independent Study in the Fall semester and for MTH 497 Honors Thesis in the Spring semester of the senior year. Timing is flexible though and an honors thesis can be completed before the senior year Spring.*
- Complete at least 50% of the math major credit hours at UB.
- Maintain GPA as specified in the table for Departmental Distinction. *Completion of an honors thesis does not guarantee any form of honors for a students whose program GPA is not high enough for “Distinction”.*

Students that meet these requirements graduate “with Honors and Distinction”, “with High Honors and Distinction” or “with Highest Honors and Distinction” following the table for the Departmental Distinction.

SCHOLARSHIPS

Thanks to the generosity of our alumni and friends, the Department of Mathematics has several scholarships for undergraduates available each year. Information on applying is emailed to math majors and posted around the department. It is also available in the Office of Undergraduate Studies.

Harry Merrill Gehman Scholarship

The Gehman scholarship is awarded each spring to one or more mathematics majors who have a demonstrated interest in teaching. In 1995 Robert C. Luippold, University of Buffalo Class of 1940 and 1942, created the endowment for this scholarship in order to honor the memory of his mentor, Dr. Harry Merrill Gehman. Dr. Gehman came to UB in 1929 where he served as chairman of the mathematics department for 33 years until 1962. He retired from UB in June of 1968 with the title of professor emeritus. He died in 1981.

Hazel and John Wilson Scholarship

The Wilson Scholarship is awarded each spring to one or more outstanding mathematics majors, on the basis of financial need, academic achievement and potential. John Wilson was a 1967 University at Buffalo graduate in Mathematics. Until 2000 he was employed as a mathematician at Calspan, where he led a group responsible for numerical analysis and applications. On his death in 2006, he left half his estate to endow this scholarship in his and his mother's names. His generous bequest was to recognize the opportunity he felt UB and the mathematics program gave him, and to help provide similar opportunities to others.

Harriet F. Montague Award

The Harriet F. Montague Award is given each year to a junior who has demonstrated "intellectual and creative promise in mathematics." It was established to commemorate the career of Dr. Harriet F. Montague, who was one of the early graduates in our own mathematics program, and who returned to chair the Department for many years.

Summer Math Scholarships

Summer Math Scholarships provide funding for math majors who want to pursue a research project in mathematics over the summer mentored by a faculty member. One scholarship in the amount of \$3000 is awarded each year. Applications are solicited each Fall semester. Funding for these scholarships has been provided by the Summer Math Foundation, Inc.

The Woeppel Fund

The fund's purpose is "to defray the expenses of undergraduate students who attend conferences or participate in other types of academic travel experiences that serve to enrich the learning process for undergraduate students in the math department." Interested students should contact the Undergraduate Director about obtaining financial support from the fund. The Woeppel Fund was created thanks to a generous donation of Dr. James Woeppel. Dr. Woeppel earned his BA in mathematics at UB in 1965 and his doctorate from the University of Illinois in 1970. He retired after a long career at Indiana University.

EXTRACURRICULAR MATH PROGRAMS

If you are thinking of a career in mathematics or some related field then besides taking math courses offered at UB you should consider participating in a research or intensive study program at another institution. This is particularly important if you want to pursue a graduate degree in mathematics: many highly ranked graduate programs expect that students applying for admission have such experience. Even if your planned career does not involve a PhD in mathematics listing participation in such program on your resume will help you stand out among other job applicants. Most importantly though, these programs are a great opportunity to learn a lot, see how mathematics is done elsewhere, and make new friends.

There are numerous mathematics programs for undergraduates. Most are conducted over summer at various locations throughout the United States and abroad. Many programs provide stipends covering all expenses. Some examples of such programs are listed below. Contact the Office of Undergraduate Studies if you need more information or help applying.

Research Experience for Undergraduates (REUs).

Where: Numerous universities throughout the United States.
When: 6-8 weeks during summer.
For Whom: Math and science majors. US citizens and permanent residents only.
Cost: Participants usually receive stipends covering all their expenses.
Website: A list of REU programs can be found at: www.nsf.gov/crssprgm/reu/.

Many REUs and other programs handle applications via www.mathprograms.org

Description: REUs are programs funded by the National Science Foundation and run by various Math Departments throughout the country. REU participants work with faculty advisors on research projects.

Summer Undergraduate Applied Mathematics Institute.

Where: Carnegie Mellon University, Pittsburgh, PA.
When: 7 weeks during summer.
For Whom: Math majors who completed their sophomore or junior year and are considering graduate study in mathematics.
Cost: Participants who are US citizens permanent residents receive stipends covering their expenses. Non-US residents must pay the \$500 registration fee and cover their living expenses.
Website: www.math.cmu.edu/CNA/summer_institute.html.
Description: This program gives students a taste of what graduate study in mathematics feels like. Participants take courses in applied mathematics and computer programming, and work with faculty members on projects in applied mathematics.

Director's Summer Program at the National Security Agency.

Where: National Security Agency, Fort Meade, MD.
When: 12 weeks during summer.
For Whom: Math, physics and computer science majors. US citizens only.
Cost: Participants receive a plane ticket, subsidized housing and a salary.

Website: www.intelligencecareers.gov/icstudents.html

Description: Students take courses that introduce them to modern cryptologic mathematics and collaborate with NSA mathematicians on research projects. Note that the deadline for applications is very early (October 15).

NIST Summer Undergraduate Research Fellowship

Where: National Institute of Standards and Technology, Gaithersburg, MD and Boulder CO

When: 11 weeks during summer.

For Whom: Undergraduate Students in STEM majors. US citizens and permanent residents only.

Cost: Participants receive a travel allowance, room and board, and a stipend.

Website: www.nist.gov/surf.

Description: Program participants work on research projects related to mathematics, engineering, materials science, computer science etc. under the mentorship of NIST scientists. Note: you cannot apply to this program on your own; the application must be submitted on your behalf by UB. Contact the Math Undergraduate Director if you are interested in applying.

Women and Mathematics.

Where: Institute for Advanced Study, Princeton, NJ.

When: 11 days, usually in May.

For Whom: Students of junior or senior status.

Cost: Participants receive support for lodging, meals and transportation.

Website: www.math.ias.edu/wam.

Description: The Institute for Advanced Study is one of the most prestigious research institutions in the world. The program brings together research mathematicians with undergraduate and graduate students. Activities include lectures and seminars on a focused mathematical topic, mentoring, and discussions of career opportunities.

MSRI-UP

Where: Mathematical Sciences Research Institute, Berkeley, CA.

When: 6 weeks during summer .

For Whom: Students who have completed two years of college mathematics courses. US citizens and permanent residents only.

Cost: Participants receive a travel allowance, room and board, and a stipend.

Website: www.msri.org/web/msri/education/for-undergraduates/msri-up

Description: MSRI is a major mathematics research center. Students participating in MSRI-UP work on research projects under the direction of faculty and graduate student mentors.

UNDERGRADUATE TEACHING ASSISTANT PROGRAM

The Undergraduate TA Program is an opportunity to gain teaching experience by serving as a Teaching Assistant for mathematics courses. Each undergraduate TA teaches two recitation sections in a course ranging from MTH 121 to MTH 309. Undergraduate TAs are enrolled in the 3-credit course MTH 495 Undergraduate Supervised Teaching.

Prerequisites

1. In order to participate in this program you must have a junior status or above (i.e. at least 60 credit hours completed) and you must be a math major.
2. Your overall GPA must be at least 3.0 and you must have either A or A- in MTH 141/153, 142/154, and 241/251. Completion of several more mathematics courses is usually expected.
3. You must have very good communication skills, including excellent spoken English.
4. If you were an undergraduate TA once in the past you can apply again, but you can't be an undergraduate TA more than twice.

Undergraduate TA Responsibilities

1. Attend a training session during the first week of the semester. Recitations do not start until the second week of classes.
2. Lead two 50 minute recitations each week.
3. Hold office hours for two hours each week. The Math Department will provide an office space for this.
4. Depending on the course instructor you may be asked to help with grading of exams under supervision, preparation and grading of quizzes etc. You may also be asked to provide feedback to the instructor on how the students are doing.

The total commitment (including preparation, teaching, and office hours) is about 10-12 hours per week.

Application Process

1. Application forms are e-mailed to all math majors in the second half of each semester. They can be also picked up in the Math Undergraduate Office.
2. Toward the end of the semester qualified applicants will be invited for an interview.
3. If you are selected as a TA we will ask you for a list of classes you would like to teach. You will never be assigned to class you are not comfortable teaching or one that conflicts with the schedule of your courses.
4. We will let you know which recitations you will teach a few weeks before classes start. At that point you will be force registered into the 3-credit course MTH 495 Undergraduate Supervised Teaching.

Note: The course MTH 495 cannot be used as a mathematics elective in any concentration of the math major program.

CAREER OPTIONS FOR MATH MAJORS

There are two concentrations offered by the Math Department that were created with very specific careers in mind. The actuarial concentration (A) prepares for the profession of an actuary, and the GS/ED concentration is designed for students who want to teach mathematics in a high school or a middle school. The other concentrations are not so focused on one, specific profession. One reason behind it is that there are many possible career paths for mathematicians (see the websites listed below for more information). Secondly, in order to get a job as a mathematician in almost any setting one needs to have a graduate degree: MA, MS or PhD. As a result the primary goal of several of our concentrations is to provide a thorough preparation for graduate studies in mathematics, statistics, mathematical finance, mathematical physics, and in other areas. You should also keep in mind that mathematical training with the skills it brings (analytical thinking, problem solving etc.) is valued in many professions. Students who graduate with a math degree frequently have successful careers in areas that are not directly related to mathematics.

Whatever your interests are you should start thinking early on what career you want to pursue and plan your studies accordingly (we will be happy to help you with planning). Your goals may change over time, but you will be able to achieve them only if you set them first.

For information on professional careers for mathematicians check the following websites:

- stats.bls.gov/ooh/Math/
- mathcareers.maa.org
- www.careercornerstone.org/math/math.htm
- www.siam.org/careers/thinking.php

Where are our alumni?

Here is an a partial list of placements of students who graduated from our department in the last few years:

- Graduate program in mathematics (UB, Cornell, UCLA, Brown, RPI, Oregon, Arizona, NC State, Iowa, Northwestern, UIUC, UGA, NYU)
- Graduate program in statistics (Columbia, Duke, Northwestern)
- Graduate program in economics (Penn State, Pitt, Georgetown)
- Graduate program in physics (UB, Cornell, UC Davis, Berkeley, UC San Diego, U Chicago, Rice)
- Graduate program in chemistry (Columbia, Northwestern)
- Graduate program in education (UB, Rochester, Canisius, Buff State, CUNY, Purdue)
- Graduate program in computer science (UB, Purdue, UIUC, Washington, Columbia, NYU, WUSL)
- Grad program in operations research (Cornell)
- Grad program in accounting (UB, UT Austin)
- Graduate program in engineering (UB, Columbia, Ohio State, UCSB, Delaware, Johns Hopkins, Michigan, Carnegie Mellon, NYU, TAMU)
- Law School (Duke, Columbia, Notre Dame)
- Medical School (UB, Stony Brook, NYIT)
- Financial Institutions (Fidelity Investments, Ernst & Young, M&T Bank, AXA Advisors, Mizuho Bank, FactSet Research Systems, Liberty Mutual, Fiserv, HSBC, Citi Group, Goldman Sachs)
- Insurance and actuarial consulting (BCBS of WNY, Independent Health, Buck Consultants, Travelers Insurance Milliman, Liberty Mutual, Merchants Insurance Group)
- Hi-tech and IT industry (Sandia Labs, Google, Twitter, Facebook, Praxair, CUBRC, AECOM, NSA, CoachMePlus, Fidessa, Amazon)

APPLYING TO A GRADUATE SCHOOL

Below are some steps you should take if you plan to apply to a graduate program in mathematics. You don't necessarily need to do every single thing on this list. You should keep in mind though that your graduate school application will be evaluated almost exclusively based on your potential for doing research mathematics. Anything you can do to demonstrate this potential will help. Please contact the Undergraduate Director if you have any questions, need help selecting graduate programs to apply to, or if you need assistance with the application process.

1. Plan well ahead. The application process to a graduate school is a long one and you should start seriously preparing for it (by researching graduate programs, studying for the GREs etc.) definitely no later than the Spring semester on your junior year. Several steps outlined below require even earlier planning. The sooner you start preparing for a graduate school the more options you will have as to which schools you can reasonably apply to, and the bigger chances that you will get accepted by a high quality program.

2. Take as many advanced math classes as you can handle. When you will be applying to graduate schools your GPA will be a major factor. The minimum GPA in math courses required for admission usually ranges between 3.2 and 3.5 (depending on a university). Equally important will be the number and variety of mathematics courses you took. For example, completion of the bare requirements of the GC concentration even with a very high GPA is not a sufficient background for a graduate school applicant. If you are doing very well in 400-level math classes ask your professors if they think you may be ready for a 600-level graduate course. Taking such course will strengthen your math credentials and give you a taste of graduate coursework. Each year we have a few undergraduates who take and sometimes excel in these 600-level courses.

3. Write an honors thesis. Writing an honors thesis is highly recommended for at least two reasons. First, is it a way of gaining research experience, which is very highly valued by graduate schools. Secondly, each thesis is written under an individual supervision of a faculty member whom you can ask to write a reference letter for your graduate school application. As a bonus, if you write a thesis and your GPA is high

enough you will graduate with honors (see page 6 for details).

4. Participate in extracurricular mathematics programs. Extracurricular mathematics programs (REUs etc.) provide excellent opportunities for gaining experience with research and learning advanced math topics. Participation in such program will also demonstrate your interest in and dedication to mathematics. A summer research program sometimes can lead to a publication in a math journal which would greatly enhance your graduate school application. Also, faculty of these programs can provide reference letters for you. For more information on special programs see page 8.

5. Participate in math contests. The Putnam Exam is the most famous mathematics competition for US college students. The exam is given in December each year and you can take it at our department. Exam problems do not involve very advanced topics in mathematics but they require ingenuity and extensive training in problem solving skills. While there are no easy Putnam problems each exam includes a couple that a good student with sufficient preparation should be able to tackle. If this does not sound too encouraging consider that in the last 20 years students needed on average just 20 points (out of 120) to be listed among top 500 (i.e. about top 15%) of all exam takers. Such achievement would certainly be worth listing on a CV.

The University of Rochester Math Olympiad is organized each Match and has a format similar to the Putnam exam. You don't need to travel to Rochester to participate—you can take this exam in our department.

The Mathematical Contest in Modeling is a worldwide competition for undergraduate students. Over four days teams of students

research a practical problem using mathematical tools, computer simulation, etc., and write a paper describing their work and findings. The papers are submitted to the contest organizers for evaluation. The contest is held in January. In the last 10 years two teams of our students were awarded top prizes in this competition, placing ahead of several thousands of contestants from various countries.

6. Get well acquainted with a few math professors. A major component of your graduate school application will be reference letters (usually three are required) written by your mathematics professors. During your studies you should make yourself known to some professors so that they will be able to write something meaningful about you. Good choices for reference letter writers include your honors thesis advisor (if you had one), faculty of a summer research program (if you participated in one), and professors with whom you took small, advanced mathematics classes provided that you participated actively, attended office hours, and overall made yourself recognizable.

7. Become an Undergraduate Math Teaching Assistant. This suggestion is of somewhat less importance since graduate school applicants are not required to have teaching experience. On the other hand though graduate students almost always serve as teaching assistants and sometimes teach their own courses, so demonstrating ability to teach on a college level won't hurt. See page 10 for more information on the Undergraduate TA program.

8. Take the General GRE test. The General GRE is a standard test taken by graduate school applicants in various areas. Most graduate programs require that you take this test. General GRE is given year-round, and one testing location is on the UB campus. For more information see this website: www.ets.org/gre.

9. Take the Subject Mathematics GRE. Subject Math GRE is a test that can be taken separately from the General GRE and that is designed specifically for applicants to graduate programs in mathematics. Not all graduate programs require this test, but if you take it and get a high score then it will increase your chances of being accepted even at schools where this test

is not officially required. You need to score above 50% to have a viable chance of getting admitted to a highly ranked program. Like with any test, the key to a good score on the Subject Math GRE is plenty of practice. This test is given only three times per year, so plan well in advance. For more information see this website: www.ets.org/gre/subject/

10. Write a personal statement. As a part of your graduate school application you will be asked to write a personal statement where you can introduce yourself, describe your background and interests in mathematics etc. Remember that admission committee members in graduate programs go through dozens or hundreds of applications and look for specifics while scanning through the fluffy parts. With this in mind concentrate on a concrete description of your mathematics-related accomplishments and interests. If you obtained a high score on the Putnam exam you should point it out. If you wrote an honors thesis or worked on a research problem you should say a bit about your work. You should write about summer programs, undergraduate conferences etc. you participated in. If you received a scholarship or an award, you were an undergraduate TA or took an active role in the math club you should write about it as well. If there is an area of mathematics that particularly interests you explain why. If some graduate program is especially attractive to you (e.g. you would love to work with a particular professor there or you know some of their graduate students) is it good to mention it. Don't make any of this up. Once you are finished writing your statement ask a faculty member (e.g. your honors thesis advisor or the undergraduate director) to read it and offer suggestions.

11. Contact professors in programs you are applying to. This tip should be treated judiciously. If you have a strong interest in a certain area of mathematics, and you know of a professor who works in that area at a university to which you are applying then you can write to him or her, introduce yourself, and perhaps ask a couple of questions. You can also write to a professor whom you know personally (e.g. from a summer program you participated in). On the other hand do not e-mail people at random.

ACTUARIAL CAREERS

What do actuaries do?

In most businesses it is fairly straightforward to calculate the cost of products the business sells: one simply adds the costs of materials, labor, marketing, distribution etc. These costs are usually known before the product is sold to customers, so the price a customer pays can be set to include them all. In some cases though the process of computing costs and setting prices becomes more complicated. For example, when an insurance company sells a car insurance policy it does not know if the insured car will be involved in an accident and if so then how much the insurance claim will cost. In this case the price of the product (i.e. the insurance policy) must be set before it is known what the actual cost of the product (i.e. the value of claims paid) will be. Actuaries are professionals who deal precisely with such problems: they use mathematical methods and statistical data to estimate risk of some future events and they put a price tag on that risk.

Where do actuaries work?

As the above example suggests insurance companies are the biggest employers, but actuaries are also employed by consulting companies (estimating financial risk of corporate mergers, etc.), banks (estimating risk of financial investments), government agencies, etc.

How to become an actuary?

In addition to a bachelor's degree with a strong mathematical background actuaries must pass a series of exams and satisfy Validation by Educational Experience requirements (VEEs) to earn the profession designation of an actuarial Associate or a Fellow. The actuarial exams are administered by the two largest actuarial associations in the US: the Society of Actuaries (SOA) and the Casualty Actuarial Society (CAS). In order to be employed at an entry-level position as an actuary one usually needs to pass one or two of these exams. The more advanced exams and other requirements can be completed while working. Many companies offer significant pay increases for each passed exam.

How to study to become an actuary?

1. While any math major concentration can provide sufficient mathematical background to get you started on the actuarial career path, if you are specifically interested in this profession you should consider the actuarial concentration (A). This concentration combines courses in mathematics, finance, economics, management, and computer science. Some of these courses are certified to satisfy the VEE requirements

that will give you a head start in the actuarial certification process.

2. You should plan to pass the first two actuarial exams (Exam P - Probability and Exam MF - Mathematical Finance) before the end of your studies. Passage of at least one of these exams is usually required by employers for entry-level actuarial positions, and passage of both is preferred. You should try to pass the first of these exams before the end of your junior year since this will help you get an actuarial summer internship.

3. Apply for actuarial internships. Most of these internships are offered during the summer, but some companies also offer internships involving part-time work during a semester. Most actuarial internships are paid. Besides offering professional experience, internships often serve as extended job interviews: several of our students were offered regular positions at the conclusion of their internships, that they could accept after finishing their undergraduate degrees. Students typically apply during their sophomore or junior year. Employers usually give preference to students who have at least one actuarial exam passed before the start of an internship. The Math Department sometimes receives information about internship positions and we e-mail it to all math majors. The SOA and CAS also have online career centers on their websites (see below). You may find additional opportunities by searching websites of insurance and healthcare companies.

For more information on actuarial careers, actuarial exams etc. see these websites:

www.beanactuary.org
www.soa.org
www.casact.org
www.actuarialoutpost.com

MATHEMATICS FACULTY

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Research: set theory, models, forcing

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Research: applied mathematics

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Research: geometry of 3-manifolds

GS

**General Study
in Mathematics
(B.A.)**

BSc

**General Study
in Mathematics
(B.S.)**

This is a program suitable for students who intend to pursue graduate study in pure mathematics. It is offered in two variants:

- **GS** leads to a B.A. degree and requires fewer electives than BSc.
- **BSc** leads to a B.S. degree and requires 4 electives more than GS.

Note: If you are interested in graduate studies in mathematics see page 12.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I	MTH 142 Calc II/ MTH 154 Honors Calc II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 309 Intro to Linear Algebra MTH 337 Intro Sci Computing	MTH 306 Intro to Diff Equations MTH 311 Intro to Higher Mathematics
Year 3	MTH 419 Intro to Abstract Algebra MTH 431 Intro to Real Variables I	MTH 420 Abstract Linear Algebra MTH 432 Intro to Real Variables II MTH elective
Year 4	MTH/CSE elective MTH elective (BSc) MTH elective (BSc)	MTH/CSE elective MTH/CSE elective (BSc) MTH/CSE elective (BSc)

Advising Notes

- If you are considering graduate school, please see p. 12.
- A MTH elective can be any MTH course numbered 300-389 or 400-489 except for MTH 417.
- A CSE elective can be any CSE course numbered 300-490, or 493.
- STA 301 and STA 302 are treated as equivalent to MTH 411 and MTH 412 respectively. Either of these courses can be used as a math elective, but if you can't use both a STA course and the corresponding MTH course.
- MTH 337 registration is often handled using a Google Form. Look a link in the "Comments" section of the Hub course listing.

Course	Credits	Grade	Semester
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Prerequisites (min 2.5 GPA)

MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		
MTH 337 Intro to Sci & Math Computing	4		
MTH 419 Abstract Algebra	4		
MTH 420 Abstract Linear Algebra	4		
MTH 431 Intro to Real Variables I	4		
MTH 432 Intro to Real Variables II	4		

MTH Elective (MTH 300/400 level, not MTH 399, 417, 495-499)

required for
BSc only

MTH/CSE Electives (MTH/CSE 300/400 level, not 494-499, MTH 399, 417, 492)

required for
BSc only

GS

**General Study
in Mathematics
(B.A.)**

BSc

**General Study
in Mathematics
(B.S.)**

GS/AM

**General Study
in Applied
Mathematics
(B.A.)**

BSc/AM

**General Study
in Applied
Mathematics
(B.S.)**

This is a program suitable for students who intend to pursue graduate study in applied mathematics. It is offered in two variants:

- **GS/AM** leads to a B.A. degree and requires fewer electives than BSc/AM.
- **BSc/AM** leads to a B.S. degree and requires 4 electives more than GS/AM.

Note: If you are interested in graduate studies in mathematics see page 12.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I PHY 107 General Physics I/ 117 Honors I CSE 115 Intro to Computer Science I	MTH 142 Calc II/ MTH 154 Honors Calc II PHY 108 General Physics II/ 118 Honors II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 309 Intro to Linear Algebra MTH 337 Intro to Sci & Math Computing	MTH 306 Intro to Diff Equations MTH 311 Intro to Higher Mathematics
Year 3	MTH 431 Intro to Real Variables I MTH 417 Multivariable Calculus MTH/CSE Elective (BSc/AM)	MTH 418 Survey of Partial Diff Equations Select <u>one</u> of following courses: MTH 419 Intro to Abstract Algebra MTH 420 Abstract Linear Algebra
Year 4	MTH 443 Fundamentals of App Math I MTH/CSE Elective MTH Elective (BSc/AM)	MTH/CSE Elective MTH Elective (BSc/AM) MTH Elective (BSc/AM)

Advising Notes

- If you are considering graduate school, please see p. 12.
- A MTH elective can be any MTH course numbered 300-389 or 400-489.
- A CSE elective can be any CSE course numbered 300-490, or 493.
- STA 301 and STA 302 are treated as equivalent to MTH 411 and MTH 412 respectively. Either can be used as a math elective, but if you can't use both a STA course and the corresponding MTH course.
- MTH 337 registration is often handled using a Google Form. Look a link in the "Comments" section of the Hub course listing.

GS/AM

General Study
in Applied Mathematics
(B.A.)

BSc/AM

General Study
in Applied Mathematics
(B.S.)

Course	Credits	Grade	Semester
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Prerequisites (min 2.5 GPA)

MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		
MTH 337 Intro to Sci & Math Computing	4		
MTH 417 Multivariable Calculus	4		
MTH 418 Survey of Partial Diff Equations	4		
MTH 419 / 420 Abstract Algebra	4		
MTH 431 Intro to Real Variables I	4		
MTH 443 Fundamentals of App Math I	4		

Required PHY Courses

PHY 107 Physics I/PHY 117 Honors Physics I	4		
PHY 108 Physics II/PHY 118 Honors Physics II	4		

Required CSE Course

CSE 115 Intro to Computer Science I	4		
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MTH/CSE Electives (MTH/CSE 300/400 level, not 399, 492, 494-499)

MTH Electives (MTH 300/400 level, not MTH 399, 495-499)

required for
BSc/AM only

required for
BSc/AM only

A

Actuarial Science (B.S.)

Actuarial Science uses mathematical and statistical methods to assess and manage risk. Actuaries play the key role in insurance companies, financial institutions, government agencies etc. This program provides a curriculum for students intending to pursue a career as an actuary.

Note: For more information of actuarial careers see page 14.

Admission requirements. In order to be accepted into this concentration you need to complete the calculus sequence: MTH 141/153, MTH 142/154, MTH 241/251, and also STA 119 Statistical Methods (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I STA 119 Statistical Methods	MTH 142 Calc II/ MTH 154 Honors Calc II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MGA 201 Intro to Accounting I MTH 411 Probability Theory/ STA 301 Intro to Probability	MTH 309 Intro to Linear Algebra MGA 202 Intro to Accounting II MTH 412/STA 302 Intro to Statistical Inference
Year 3	MTH 306 Intro to Diff Equations MTH 337 Intro Sci Computing STA 403 Regression Analysis/ MGQ 301 Stat Decisions in Management ECO 405 Microeconomic Theory	MTH 311 Intro to Higher Mathematics ECO 480 Econometrics I ECO 407 Macroeconomic Theory
Year 4	ECO 461 Eco Fluctuation & Forecasting MTH 458 Mathematical Finance I MGF 301 Corporation Finance	STA Elective: (400/500 level, not 403 or 502) MTH 459 Mathematical Finance II MGF 405 Advanced Corporate Finance

Advising Notes

- The STA elective can be any STA course numbered 400-589 except STA 403, 502.
- Students who choose STA 403 over MGQ 301 and select STA 404 as their STA elective will complete all requirements of the STA minor. Students must apply to the Biostatistics Department for the minor.
- MGQ 201 is listed as a prerequisite for MGQ 301, but this requirement is waived for actuarial science majors. Likewise, actuarial science majors can register for MGF 301 without MGQ 301.
- Prior to Summer 2019, ECO 380 was called ECO 480, and ECO 480 was called ECO 481.
- This program has a long prerequisite sequence: MTH 411/STA 301 > MTH 412/STA 302 > ECO 480 > ECO 461. Also, STA 302, MTH 412, and ECO 480 are all offered only in the spring, and ECO 461 is offered only in the fall. For this reason it is important to take MTH 411/STA 301 and MTH 412/STA 302 during the sophomore year. Students unable to do so may take ECO 380 in order to meet the prerequisite for ECO 480 on schedule.
- MTH 337 registration is often handled using a Google Form. Look a link in the "Comments" section of the Hub course listing.

Course	Credits	Grade	Semester
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Prerequisites (min 2.5 GPA)

MTH 141 Calculus I / I53 Honors Calculus I	4		
MTH 142 Calculus II / I54 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		
STA 119 Statistical Methods	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		
MTH 337 Intro to Sci Computing	4		
MTH 411 Prob Th / STA 301 Intro to Prob	4		
MTH 412/STA 302 Intro to Statistical Inference	4		
MTH 458 Mathematical Finance I	3		
MTH 459 Mathematical Finance II	3		

Required ECO Courses

ECO 405 Microeconomics	3		
ECO 407 Macroeconomics	3		
ECO 461 Eco Fluctuation & Forecasting	3		
ECO 480 Econometrics I	3		

Required MGA/MGF/MGQ/STA Courses

MGA 201 Intro to Accounting I	3		
MGA 202 Intro to Accounting II	3		
MGF 301 Corporation Finance	3		
MGQ 301 Stat Decisions / STA 403 Regression An	3		
MGF 405 Advanced Corporate Finance	3		

STA Elective (STA 400/500 level, not STA 403, 502)

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C

Computing and Applied Mathematics (B.A.)

This is a program for students interested in careers as applied mathematicians or scientific computer programmers. In addition to the standard calculus and differential equations courses students in concentration C take a year of programming in a high-level language, a course on principles of digital systems, and a course in data structures.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I CSE 115 Intro to Computer Science I	MTH 142 Calc II/ MTH 154 Honors Calc II CSE 116 Intro to Computer Science II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 309 Intro to Linear Algebra CSE 191 Discrete Structures	CSE 241 Digital Systems CSE 250 Algorithms & Data Structures (MTH 311 Intro to Higher Math)
Year 3	MTH 306 Intro to Diff Equations Select <u>one</u> of following courses: MTH 417 Multivariable Calculus MTH 431 Intro to Real Variables I	MTH Elective Continue 2 nd the selected sequence: MTH 418 Survey of Partial Diff Equations MTH 432 Intro to Real Variables II
Year 4	MTH 448 Data-Oriented Computing (MTH Elective)	MTH 437 Intro to Numerical Analysis I MTH/CSE Elective MTH/CSE Elective

Advising Notes

- Students in this program must complete either the MTH 417-418 sequence or the MTH 431-432 sequence.
- Students who select MTH 431-432 must take MTH 311 as shown before taking MTH 431. It will count towards the elective requirements. Students who select MTH 417-418 may take a different elective later, if they choose.
- A MTH elective can be any MTH course numbered 300-389 or 400-489.
- A CSE elective can be any CSE course numbered 300-490, or 493.
- STA 301 and STA 302 are treated as equivalent to MTH 411 and MTH 412 respectively. Either of these courses can be used as a math elective, but if you can't use both a STA course and the corresponding MTH course.
- For any student who has MTH 438 listed as a required course in their Hub, MTH 448 may be substituted.
- Students without prior python experience are encouraged to take MTH 337 as an elective to prepare for MTH 448. Students with prior python experience should speak to the MTH 448 instructor to be registered.
- MTH 337 registration is often handled using a Google Form. Look a link in the "Comments" section of the Hub course listing.

Course	Credits	Grade	Semester
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Prerequisites (min 2.5 GPA)

MTH 141 Calculus I / I53 Honors Calculus I	4		
MTH 142 Calculus II / I54 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		

Required MTH Courses

sequence
→

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 417 Multivar Calc / MTH 431 Real Var I	4		
MTH 418 Survey PDE / MTH 432 Real Var II	4		
MTH 437 Intro to Numerical Analysis I	4		
MTH 448 Data-Oriented Computing for Math	4		

Required CSE Courses

CSE 115 Intro to Computer Science I	4		
CSE 116 Intro to Computer Science II	4		
CSE 191 Discrete Structures	4		
CSE 241 Digital Systems	4		
CSE 250 Algorithms & Data Structures	4		

MTH Electives (MTH 300/400 level, not MTH 399, 495-499)

MTH/CSE Electives (MTH/CSE 300/400 level, not 399, 492, 494-499)

GS/ED

General Study in Mathematics and Education (B.A.)

This program is designed for students whose career goal is to earn a master's degree and a professional certification in adolescent mathematics education (grades 7-12). It is intended to be coupled with courses in Teacher Education. Completion of this program (including the required education courses) provides advanced status toward initial NYS teacher certification.

Note: 1) If you consider this concentration you should consult with the Teacher Education Institute as early as your freshman year for advice on prerequisites for required courses in education and selection of general education courses fulfilling the NYS Education Department requirements. 2) By completing this program you will fulfill all requirements of the minor in education, but you need to apply for this minor separately at the School of Education.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I	MTH 142 Calc II/ MTH 154 Honors Calc II CSE 115 Intro to Computer Science I
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III CSE 191 Discrete Structures MTH 337 Intro Sci Computing/ CSE 116 Intro to Computer Science II	MTH 309 Intro to Linear Algebra MTH 311 Intro to Higher Mathematics LAI 350 Intro to Education
Year 3	MTH 306 Intro to Diff Equations MTH 431 Intro to Real Variables I	MTH 335 Elements of Geometry CEP 400 Educational Psychology ELP 405 Sociology of Education
Year 4	Education Elective Education Elective MTH 411 Probability Theory/ STA 301 Intro to Probability	MTH Elective Education Elective MTH 419 Intro Abstract Algebra/ MTH 420 Abstract Linear Algebra

Advising Notes

- A MTH elective can be any MTH course numbered 300-389 or 400-489, or STA 302.
- An education elective can be CEP 401, 404, or 453, or LAI 205, 414, 416, 474, 490
- Students in this major will complete the requirements for the education minor.

Course	Credits	Grade	Semester
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Prerequisites (min 3.0 GPA, min 2.5 overall GPA)

MTH 141 Calculus I / I53 Honors Calculus I	4		
MTH 142 Calculus II / I54 Honors Calculus II	4		
MTH 241 Calculus III / 251 Honors Calculus III	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro Higher Mathematics	4		
MTH 335 Elements of Geometry	4		
MTH 411 Prob Th / STA 301 Intro to Prob	4		
MTH 419 Intro Abs Alg / MTH 420 Abs Lin Alg	4		
MTH 431 Intro to Real Variables I	4		

Required CSE courses

CSE 115 Intro Comp Sci I	4		
MTH 337 Intro Sci Comp / CSE 116 Intro CS II	4		
CSE 191 Discrete Structures	4		

Required CEP/ELP/LAI Courses

CEP 400 Educational Psychology	3		
ELP 405 Sociology Education	3		
LAI 350 Intro to Education	4		

MTH Elective (MTH 300/400 level, not MTH 399, 495-499)

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EDU Electives (3 from: CEP 401, 404, 453 and LAI 205, 414, 416, 474, 490)

M/E

Joint Major in Mathematics and Economics (B.A.)

This is a program for students intending to pursue graduate study in economics. Note that since this is a joint major you must apply to it separately in the Mathematics Department and the Economics Department. After obtaining approval of the Director of Undergraduate Studies in Economics, you should schedule an Advisement Meeting with the Math Department to be formally admitted into this program.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5. Admission to this joint program must be approved by both departments (Mathematics and Economics).

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I	MTH 142 Calc II/ MTH 154 Honors Calc II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III ECO 405 Microeconomic Theory I	MTH 306 Intro to Diff Equations MTH 309 Intro to Linear Algebra ECO 406 Microeconomic Theory II*
Year 3	MTH 311 Intro to Higher Mathematics MTH 411 Probability Theory/ STA 301 Intro to Probability ECO 407 Macroeconomic Theory	MTH 412/STA 302 Intro to Statistical Inference ECO Elective MTH Elective
Year 4	MTH 431 Intro to Real Variables I ECO Elective ECO Elective*	MTH 419 Intro Abstract Algebra/ MTH 420 Abstract Linear Algebra ECO 480 Econometrics I*

Advising Notes

- A MTH elective can be any MTH course numbered 300-389 or 400-489, except MTH 417.
- An ECO Elective can be any 300 or 400 level ECO course, except ECO 480 and ECO 481.
- You need to be approved by the Economics department before you can be admitted by the mathematics department. The Economics department may want to see good performance in some ECO courses, in addition to MTH 141/153, 142/154, 241/251.
- * effective Fall 2020

Course	Credits	Grade	Semester
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Prerequisites (min 3.0 GPA, min 2.5 overall GPA)

MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro Higher Mathematics	4		
MTH 411 / STA 301 Probability Th	4		
MTH 412/STA 302 Intro to Statistical Inference	4		
MTH 419 Abstr Alg / 420 Abstr Linear Alg	4		
MTH 431 Intro Real Var I	4		

Required ECO courses

ECO 405 Microeconomics I	3		
ECO 406 Microeconomics II	3		
ECO 407 Macroeconomics I	3		
ECO 480 Econometrics I	3		

MTH Elective (MTH 300/400 level, not MTH 399, 417, 495-499)

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ECO Electives (ECO 300/400 level, not ECO 495, 496, 498 or 499.)

M/P

Joint Major in Mathematical Physics (B.S.)

This is a program for students intending to pursue graduate study in mathematical physics. Note that since this is a joint major you must apply to it separately in the Mathematics Department and the Physics Department. After obtaining approval at an Advisement Meeting with the Math Department, you should see the Director of Undergraduate Studies in Physics to be formally admitted into this program.

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 as well as PHY 107 (or PHY 117), PHY 108 (or PHY 118), and PHY 158. Your GPA in these courses must be at least 2.5. Admission to this joint program must be approved by both departments (Mathematics and Physics).

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I Physics I: Select <u>one</u> of following courses: PHY 107 General Physics I PHY 117 Honors Physics I	MTH 142 Calc II/ MTH 154 Honors Calc II PHY 158 General Physics II Lab Physics II: Select <u>one</u> of following courses: PHY 108 General Physics II PHY 118 Honors Physics II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 306 Intro to Diff Equations PHY 208 General Physics IV	MTH 309 Intro to Linear Algebra PHY 257 General Physics III Lab Physics III: Select <u>one</u> of following courses: PHY 207 General Physics III PHY 217 Honors Physics III
Year 3	MTH 417 Multivariable Calculus PHY 301 Intermediate Mechanics I PHY 401 Modern Physics I	MTH 418 Survey of Partial Diff Equations PHY 307 Modern Physics Lab Physics Elective: Select <u>one</u> of the following courses: PHY 302, 402, 404, 406.
Year 4	PHY 403 Electricity & Magnetism I PHY 405 Thermal & Stat Physics I PHY 431 Mathematical Physics I MTH 311 Intro to Higher Math	MTH 425 Intro to Complex Variables PHY 407/PHY 408 Advanced Lab MTH 419 Intro to Abstract Algebra/ MTH 420 Abstract Linear Algebra

MTH 311 is not a required course for this major. However, it is a prerequisite for both MTH 419 and MTH 420. Students interested in taking a different course in place of MTH 311 should first get permission from the MTH 419/420 instructor to waive this prerequisite. In that case, the student may substitute any 300/400 level MTH course other than MTH 399, MTH 495-499.

Course	Credits	Grade	Semester
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Prerequisites (min 3.0 GPA, min 2.5 overall GPA)

MTH 141 Calculus I / I53 Honors Calculus I	4		
MTH 142 Calculus II / I54 Honors Calculus II	4		
PHY 107 Gen Physics I / I17 Honors Physics I	4		
PHY 108 Gen Physics II / I18 Honors Physics II	4		
PHY 158 General Physics II Lab	1		

Required MTH Courses

MTH 241 Calculus III/251 Honors Calculus III	4		
MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 417 Multivariable Calculus	4		
MTH 418 Survey of Partial Diff Equations	4		
MTH 419 / 420 Abstract Algebra	4		
MTH 425 Intro to Complex Variables	3		

Required PHY courses

PHY 207 Gen Physics III / 217 Honors Physics III	4		
PHY 208 General Physics IV	3		
PHY 257 General Physics III Lab	1		
PHY 301 Intermediate Mechanics I	3		
PHY 307 Modern Physics Lab	2		
PHY 401 Modern Physics I	3		
PHY 403 Electricity & Magnetism I	3		
PHY 405 Thermal & Stat Physics I	3		
PHY 407 Advanced Lab / PHY 408 Advanced Lab	3		
PHY 431 Mathematical Physics I	3		

MTH Elective

MTH 311	4		
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PHY Elective (one of PHY 302, 402, 404, 406)

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**General
Curriculum
in Mathematics
(B.A.)**

This is a basic liberal arts program in mathematics. It is well suited to students pursuing mathematics as the second major. It is also suitable as a backup plan: students enrolled in any mathematics concentration and pressed for time can switch to GC to graduate on schedule. However, if mathematics is your main interest you should consider other math concentrations that offer more extensive training and better defined career options before selecting GC.

Note: If you apply for a major in mathematics you will be enrolled in the GC program by default, unless you request a different concentration and your selection is approved at an Advisement Meeting with the Math Department..

Admission requirements. In order to be accepted into this concentration you need to complete the three-course calculus sequence: MTH 141/153, MTH 142/154, and MTH 241/251 (or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before deviating from this suggested schedule.

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I	MTH 142 Calc II/ MTH 154 Honors Calc II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III	MTH 309 Intro to Linear Algebra
Year 3	MTH 306 Intro to Diff Equations	MTH 311 Intro to Higher Mathematics MTH Elective (3 or 4 credits)
Year 4	MTH Elective (3 or 4 credits)	MTH Elective (3 or 4 credits) (MTH Elective if elective credits <12)

Advising Notes

- A MTH elective can be any MTH course numbered 300-389 or 400-489.
- STA 301 and STA 302 are treated as equivalent to MTH 411 and MTH 412 respectively. Either of these courses can be used as a math elective, but if you can't use both a STA course and the corresponding MTH course.
- All UB math majors must have at least four MTH courses above MTH 309 taken at UB. Thus, students in the General Curriculum can not satisfy any requirement above MTH 309 with transfer credit.
- All majors in SUNY must have at least 24 credits at the 300-400 level. This can be accomplished by taking MTH 306, 309, 311 and three electives of four credits each. Students who take at least one 3 credit elective will need a fourth elective to meet this requirement.

Graduation requirements. Your overall GPA in the nine (or ten) courses listed above must be at least 2.5 to graduate in this program. This requirement is strictly enforced. If you fail to meet this condition you may take additional mathematics courses approved at an Advisement Meeting with the Math Department to achieve a package of nine (or ten) courses with a GPA of 2.5 or higher.



**General
Curriculum
in Mathematics
(B.A.)**

Course	Credits	Grade	Semester
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Prerequisites (min 2.5 GPA)

MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		

Required MTH Courses

MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		

MTH Electives (At least 12 total credits; MTH 300/400 level, not MTH 399, MTH 495-499)

BA/MA

Combined Degree Program in Mathematics (B.A./M.A.)

This is a five-year program combining undergraduate and graduate coursework and leading to the B.A./M.A. degree. The BA/MA program is suitable for students interested in teaching, financial applications, actuarial work, and any other profession in which advanced mathematical training and degrees are valued.

Admission requirements. In order to be accepted into this program you need to complete the calculus sequence: MTH 141/153, 142/154, 241/251, as well as MTH 309 Intro to Linear Algebra and MTH 306 Intro to Differential Equations. Your GPA in these courses must be at least 3.0. In addition, a letter of recommendation is required.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I <i>Computer courses such as CSE 115-116 are recommended although they are not required in this program.</i>	MTH 142 Calc II/ MTH 154 Honors Calc II
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 309 Intro to Linear Algebra	MTH 306 Intro to Diff Equations MTH 311 Intro to Higher Mathematics
Year 3	Undergraduate Electives (a total of 3 electives required): 1. Select <u>one</u> 300 or 400 level mathematics course AND 2. Select <u>two</u> 300 or 400 level courses in mathematics or computer science. Note: Electives must be approved at an Advisement Meeting with the Math Department. The courses MTH 417 and MTH 495-499 are NOT acceptable as electives.	
Year 4	MTH 519 Intro to Abstract Algebra MTH 531 Intro to Real Variables I	MTH 520 Abstract Linear Algebra MTH 532 Intro to Real Variables II
Year 5	Graduate Electives (a total of 18 credit hours required): Select 6 graduate level courses. At least 12 of these credits must be in mathematics courses. Included must be one year-long sequence in mathematics at the 500 level or above. Project or Thesis: up to 6 credits of the 18 credits of graduate level electives may be used for MTH 800 Thesis Guidance. Note: Electives must be approved by the Director of Graduate Studies in Mathematics.	

Total required credit hours in program BA/MA: **63-66** (33-36 undergrad. credits + 30 grad. credits)

BA/MA

Combined Degree
Program in Mathematics
(B.A./M.A.)

Course	Credits	Grade	Semester
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Prerequisites (min 3.0 GPA)

MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		
MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		

Undergraduate MTH Elective (MTH 300/400 level)

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Undergraduate MTH/CSE Electives (MTH/CSE 300/400 level)

Required graduate MTH courses

MTH 519 Intro to Abstract Algebra	3		
MTH 520 Abstract Linear Algebra	3		
MTH 531 Intro to Real Variables I	3		
MTH 532 Intro to Real Variables II	3		

Graduate Electives (18 credits, at least 12 in MTH courses)

UBTEACH

**Combined Degree
Program in Mathematics
and Mathematics
Education (B.A./Ed.M.)**

This is a five-year program combining undergraduate and graduate coursework and leading to the B.A. in Mathematics and a Masters degree in Education (Ed.M) in Mathematics Education. The UBTEACH program is suitable for strong students interested in becoming Middle/High School mathematics teachers. At the end of the five-year program, successful students will receive recommendation for New York State Initial and Professional Certification.

Admission requirements. This is a direct admit program for freshman and transfer students. Current UB students who are interested in changing to this major, should contact Louise Lalli at lmallli@buffalo.edu or 716-645-6622.

All students are required to obtain a GPA of at least 3.0 and earn a “C” or better in all undergraduate math courses and a “B-“ or better in all graduate courses. In order to progress to the graduate portion of the program, students are required to take the GREs and complete an interview in the Office of Educator Preparation in year three.

Calendar. This is a suggested calendar. Although all courses listed below are required there is some flexibility as to which semester the courses are completed in. Check course prerequisites before

	Fall Semester	Spring Semester
Year 1	MTH 141 Calc I/ MTH 153 Honors Calc I CSE 115 Intro to Comp Sci	MTH 142 Calc II/ MTH 154 Honors Calc II CSE 191 Discrete Structures LAI 350 Intro to Education
Year 2	MTH 241 Calc III/ MTH 251 Honors Calc III MTH 309 Intro to Linear Algebra MTH 306 Intro to Differential Equations	MTH 411 Probability Theory MTH 311 Intro to Higher Mathematics ELP 405 Sociology of Education
Year 3	MTH 337 Intro to Sci and Math Computing MTH 419 Intro to Abstract Algebra	MTH 335 Elements of Geometry MTH Undergrad Elective MTH Undergrad Elective
Year 4	MTH 531 Intro to Real Variables I MTH 543/548 Fundamentals of Applied Math <i>or</i> Data-Oriented Computing LAI xxx Math Education Elective CEP 501 Education Psychology LAI 574 Teaching the Exceptional Learner in the Regular Education Classroom	MTH 520 Abstract Linear Algebra MTH 512 Intro to Statistical Inference LAI 514 Adolescent Writing Across the Curr LAI 552 Middle Childhood/Adolescent Literacy Methods LAI xxx Math Education Elective
Year 5	LAI 618 Methods of Teaching Math LAI 667 Field Experience LAI 668 Supervised Teaching I LAI 698 Instructional Strategies in the Inclusive Classroom	LAI xxx Math Education Elective LAI 674 Seminar in Teaching LAI 595 Supervised Teaching 2 LAI 700 Capstone

Required credit hours in BA/Ed.M. program: **116-18**

Total required credit hours in program BA/Ed.M. program including UB Curriculum: **152**

UBTEACH

**Combined Degree
Program in Mathematics and Mathematics Education
(B.A./Ed.M.)**

Course	Credits	Grade	Semester
Required Undergraduate MTH Courses			
MTH 141 Calculus I /153 Honors Calculus I	4		
MTH 142 Calculus II /154 Honors Calculus II	4		
MTH 241 Calculus III/251 Honors Calculus III	4		
MTH 306 Intro to Diff Equations	4		
MTH 309 Intro to Linear Algebra	4		
MTH 311 Intro to Higher Mathematics	4		
MTH 335 Elements of Geometry	4		
MTH 419 Intro to Abstract Algebra	4		
MTH 411 Probability Theory	4		
Required Undergraduate CSE Courses			
CSE 115 Intro to Computer Science	4		
CSE 191 Discrete Structures	4		
MTH 337 Intro Sci/Math Comp/CSE 116 Intro CS II	4		
Required Undergraduate Education Courses			
LAI 350 Intro to Education	4		
ELP 405 Sociology of Education	3		
CEP 501 Educational Psychology	3		
LAI 514 Adolescent Writing Across the Curriculum	3		
LAI 574 Teaching the Exceptional Learner	3		
Undergraduate MTH Electives			
Required Graduate MTH courses			
MTH 512 Intro to Statistical Inference	3		
MTH 520 Abstract Linear Algebra	3		
MTH 531 Intro to Real Variables I	3		
MTH 543 Fund App Math/548Data-Oriented Comp	3		
Required Graduate Education Courses			
LAI 552 Middle Childhood/Adolescent Lit Methods	3		
LAI 595 Supervised Teaching 2	6		
LAI 618 Methods of Teaching Math	3		
LAI 667 Field Experience	3		
LAI 668 Supervised Teaching I	3		
LAI 674 Seminar in Teaching	3		
LAI 698 Instructional Strategies in the Inclusive Classroom	3		
LAI 700 Capstone	1		
Graduate Education Electives			

MINOR

Minor in Mathematics

A minor in mathematics is open to students with any major. It may be an especially attractive option for students who are majors in a related field such as engineering, economics, or natural sciences.

If you are interested in a minor in mathematics please contact Patti Wieclaw, the Undergraduate Studies Secretary at the Math Department (233 Mathematics Building, e-mail: pwieclaw@buffalo.edu phone: (716) 645-8785). In most cases requests to be admitted to the minor are processed on the walk-in basis.

Note: It is recommended that you apply for the minor in mathematics at least two semesters prior to your expected graduation date.

Admission requirements. In order to be accepted into the math minor you need to complete the three-course calculus sequence:

- **MTH 141** Calculus I/**MTH 153** Honors Calculus I
- **MTH 142** Calculus II/**MTH 154** Honors Calculus II
- **MTH 241** Calculus III/**MTH 251** Honors Calculus III

(or equivalent courses for transfer students). Your GPA in these courses must be at least 2.5.

Required Courses. In addition to the prerequisites listed above you need to complete the following courses:

- **MTH 306** Intro to Differential Equations
- **MTH 309** Intro to Linear Algebra
- **Electives:** Two additional 300 or 400 level MTH courses. The courses MTH 495-499 are not acceptable as electives. Transfer credit may not be used for Math Minor electives.

A minimum GPA of 2.0 in these seven courses is required for the minor in mathematics.

Total credit hours required for the minor in mathematics: **26-28**

FROM OUR ALUMNI

Every year we invite our graduating math majors for exit interviews. We ask them about their experience in the program, what they liked and what they think we should improve, what were their favorite (and least favorite) classes, what they plan for the future etc. Below are some excerpts from these interviews.

The best part of being a math major is...

- The community was welcoming. I never felt like I was looked down upon by anyone. It felt like a comfortable environment with peers and mentors.
- I appreciated the study groups in the lounge. I learned a lot by doing my homework in there. [*Our lounge is open to all math majors - you can come to study, to have lunch, or to relax between classes*].
- I enjoyed the opportunity to be a TA and to do an internship for credit. [*See p. 10 for information on the Undergraduate TA program.*].
- Honors thesis and independent study experience. It gave me a chance to work one-on-one with a professor on a research project.
- The friends I have made in my classes. Most of the classes in the major are small and you are surrounded by the same students. Everyone has been so nice and helpful. It's like everyone understands how hard the classes are and are willing to help each other succeed.
- The math help center was a blessing when I first started out. Coming from high school I had been very poorly prepared for physics/engineering courses. It really helped me understand everything and set me up for success in later courses. [*The Math Help Center in Math Building 110 is open daily for students who need help with their coursework*].

Instructors that had the biggest impact...

- Professor Javor was the start of it all. I was his student when I took Calculus 3 and Differential Equations during my second year as a physics student. His lectures were engaging and enriching, and the amount of work he demanded from us was quite a bit. To a certain extent I can attribute becoming a mathematics major to having taken classes with him.
- Dr Cowen's introduction to higher math course expanded my mind and my ability to think and reason in a logical manner. That class specifically is responsible for much of my later success in 400 level courses.
- Rob Busch. Excellent communicator, understands the other priorities in the lives of his students but also demands high standards. Helped me to finalize my decision to become a math major.

- Dr Ringland and Adam Cunningham, with MTH448 and 337 respectively, greatly influenced my way of thinking, and gave projects in the coursework which encouraged me to go far beyond what was required to simply get an A in the class, and actually create something I was proud of and had worked hard on.

- Professor Hundley has helped me dozens of times, from allowing me to take an independent study with him to writing me letters of recommendation. He's always there if I need someone to throw ideas around with or just to talk to.

Advice for new math majors...

- For God's sake, no matter how "smart" you think you are, do your homework. Don't be afraid to screw up, math is hard. Ask for help if you need it. Learn how to write code. Ask about REU's. There is always free coffee in the math lounge.
- Be careful with MTH 311, because it will be probably your first proof-based course. It is different than lower level math courses.
- Take MTH 311, MTH 337 as soon as possible! These are important courses. Also, try being an undergraduate TA, applying for REUs, and approach professors to do undergraduate research! Be friends with students in the math lounge!
- Make conversation with professors and classmates, and share info.
- Like with most things, you get out what you put into it.
- Always check ratemyprofessor.com.
- Always give 100%, be involved as much as possible, and go the extra mile— you will thank yourself when you graduate.
- Get involved with clubs and programs outside your comfort zone to work towards your goals. Apply for as many internships or research programs as you can because those will help you determine what you want to do with your life post-graduation.
- Start preparing for Actuarial Exams early on as they are very competitive.
- Go to recitations. Sometimes the TA is clearer in teaching the material than the actual professor.
- Do your HW!

NOTES

3.14

JOIN
UBMATH

IF YOU LIKE:

- * free pizza
- * game nights
- * math lectures given by professors
- * math competitions
- * helping the community
- * making friends

Then you'll love math club!

for more info email us at
ubmathc@gmail.com

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and
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go

How to become a math major:

1. Come see us

(optional but recommended)

As soon as you decide that you may be interested in majoring in mathematics schedule an Advisement Meeting with the Math Department to learn about program options, requirements etc. **It is never too soon to schedule this first meeting!**

2. Complete the prerequisites

Before you can get admitted to the math major you must complete the three-course calculus sequence: MTH 141/153, 142/154, and 241/251 with GPA at least 2.5. This will suffice for admission to most of our concentrations, but keep in mind that some of them have additional prerequisites - be sure to check.

3. Come see us again

The final step is an Advisement Meeting with the Math Department to apply for admission to the math major. At this meeting you will discuss your choice of concentration and plan your courses over the next few semesters.

To schedule an Advisement Meeting please contact Patti Wieclaw, the Undergraduate Secretary, by phone: (716) 645-8785 or e-mail: pwieclaw@buffalo.edu.

The many paths to a math degree:

GC General Curriculum in Mathematics (B.A.)

The basic, liberal arts program in mathematics.

• 36 required credit hours

[p.30](#)

GS General Study in Mathematics (B.A.)

Suitable for students interested in graduate study in pure mathematics. Similar to BSc but requiring fewer electives.

• 49-52 required credit hours

[p.16](#)

BSc General Study in Mathematics (B.S.)

Suitable for students interested in graduate study in pure mathematics. Similar to GS but with 4 additional electives.

• 64-68 required credit hours

[p.16](#)

GS/ED General Study in Mathematics and Education (B.A.)

Program for students who intend to become mathematics teachers in a high school or a middle school.

• 74-75 required credit hours

[p.24](#)

GS/AM General Study in Applied Mathematics (B.A.)

Suitable for students who are interested in graduate study in applied mathematics. Similar to BSc/AM but requiring fewer electives.

• 65-67 required credit hours

[p.18](#)

BSc/AM General Study in Applied Mathematics (B.S.)

Suitable for students who are interested in graduate study in applied mathematics. Similar to GS/AM but with 4 additional electives.

• 77-83 required credit hours

[p.18](#)

C Computing and Applied Mathematics (B.A.)

For students interested in careers as applied mathematicians or scientific applications programmers.

• 64-68 required credit hours

[p.22](#)

M/E Joint Major in Mathematics and Economics (B.A.)

For students interested in graduate study in economics. This is a joint program with the Department of Economics.

• 64-65 required credit hours

[p.26](#)

M/P Joint Major in Mathematical Physics (B.S.)

For students who are interested in graduate study in mathematical physics. This is a joint programs with the Department of Physics.

• 78 required credit hours

[p.28](#)

UBTEACH Combined Degree Program In Mathematics and Education (B.A./Ed. M.)

Combines GS/ED with Masters in Education, preliminary NYS teaching certification recommendation.

• 116-118 required credit hours

[p.34](#)

A Actuarial Science (B.S.)

For students intending to pursue a career as an actuary.

• 79 required credit hours

[p.20](#)

BA/MA Combined Degree Program in Mathematics (B.A./M.A.)

A five year program providing a fast track to a terminal Master's degree.

• 63-66 required credit hours

[p.32](#)