

## Interested in This Major?

Contact the Department of Mathematical Sciences:

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## What is Mathematics?

Mathematics is an international language at the core of science, technology, and engineering. It is also utilized in social science research in fields such as sociology, economics, and psychology. It is one of the oldest and most fundamental sciences. The beauty of mathematics is reflected in patterns from the natural and man-made worlds.

## Career Opportunities

Mathematicians work in a number of different fields such as astronomy and space exploration, climate study, medicine and biology, national security, robotics, animation, insurance, computer science, risk management, systems analysis, market research, finance, database management, and statistics. Teaching math at the high school or collegiate levels is also a common career track. Some professions require additional study beyond a bachelor's degree.

The fundamentals of mathematics underlie an endless number of processes in all types of businesses. For example, airlines schedule service and equipment based on past and predictive statistics, internet traffic is directed via mathematical algorithms, and insurance companies set prices based on mathematical analysis of risk. Career opportunities are very diverse for students with a degree in mathematics.

## Is Mathematics Right For Me?

Mathematics is ideal for students who enjoy solving puzzles, who want to use mathematics to model the real world to answer questions and/or who want to understand the structure of mathematics. It requires strong abilities in logical reasoning and analysis and a

natural curiosity about how mathematics can apply in an increasingly complex world.

Since mathematics courses build on each other, careful planning of when to take each course is required. Ideally, preparation will begin in high school.

There are many ways to tailor your degree at UWM to match your interests. The Mathematical Sciences department offers the following majors: Actuarial Science, Atmospheric Sciences, and Mathematics. A related degree program – Applied Mathematics and Computer Science (AMCS) – is offered and awarded jointly by the College of Letters and Science Department of Mathematical Sciences and the College of Engineering and Applied Science Department of Computer Science. For more information on these programs, please see their Fact Sheets.

## Preparatory Courses

For each Mathematics major, the core requirements include a minimum GPA of 2.5 in all classes in the major and at least 15 upper-level credits completed in residence at UWM. The following preparatory courses are required for all majors conferred by the department:

- Math 231, 232, AND 233 (Calculus I/II/III)
- Math 234 (Linear Algebra and Differential Equations) OR Math 240 (Matrices and Applications)
- One course in computer programming using a modern, high-level language

Beyond the preparatory courses, students choose a basic mathematics major or one of four specializations: Applied Mathematics, Computational Mathematics, Pure Mathematics, or Statistics.

## Basic Mathematics Major

The basic mathematics major must complete Math 341 (Intro to the Language and Practice of Mathematics) and 24 additional upper-level courses numbered 300 or above. These upper-level courses must include at least 3 credits from each of the specialization options: applied math, computational math, pure math, and statistics. The upper-division classes must also include at least one sequence of two or more courses that explore the same topic area. Finally, students must complete a capstone project near the end of their studies.

## Specializations In The Major

Students who are particularly interested in one area of mathematics or statistics may take courses with an emphasis in that interest. Each specialization requires at least 30 upper-level math credits in addition to Math 341 (instead of the 24 credits required for the basic mathematics major). Students must also complete the breadth, sequence and capstone requirements of the basic major.

### *Applied Mathematics Option*

Students choosing the applied mathematics option will complete:

- at least 9 credits from applied math
- at least 9 credits from computational math
- at least 6 credits from statistics
- two courses from: CompSci 151; CompSci 201; CompSci 251

### *Computational Mathematics Option*

Students choosing the computational mathematics option will complete:

- at least 6 credits from applied math
- at least 12 credits from computational math
- at least 6 credits from statistics
- CompSci 151 OR 153 (Intro to Scientific Programming in Fortran OR C++)
- CompSci 201 (Intro Computer Programming)
- CompSci 251 (Intermediate Computer Programming)
- CompSci 317 (Discrete Information Structures)
- CompSci 535 (Algorithm Design and Analysis)

### *Pure Mathematics Option*

Students choosing the pure mathematics option will complete:

- at least 18 credits from the Pure Math group with at least 9 credits from the Pure Math I group list
- CompSci 151 OR CompSci 153 OR CompSci 201

### *Statistics Option*

Students choosing the statistics option will complete:

- MthStat 215 (Elementary Statistical Analysis)
- Math 521/522 (Advanced Calculus) OR Math 621/622 (Intro to Analysis)
- MthStat 361/362 (Intro to Mathematical Statistics I/II)
- MthStat 563 (Regression Analysis)
- Three of the following:
  - » MthStat 562 (Design of Experiments)
  - » MthStat 564 (Time Series Analysis)
  - » MthStat 565 (Nonparametric Statistics)
  - » MthStat 568 (Multivariate Statistical Analysis)
  - » Math 571 (Intro to Probability Models)
- CompSci 151 OR CompSci 153 OR both CompSci 201 AND 251

## Scholarships and Awards

The department offers a number of scholarships for outstanding undergraduates:

- Alice Siu-Fun Leung Awards in Mathematics
- Morris and Miriam Marden Award in Mathematics

## Events

Each Spring, the Marden Lecture brings a distinguished mathematician to campus to give a general audience presentation. The Marden Lecture honors Morris Marden (1905 - 1991), who founded the graduate program and made the department into a research department.

Colloquia are held many Fridays during the semester and feature noted guest lecturers on a range of mathematical and atmospheric science topics.

The department also periodically sponsors social activities for students.

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This sample four-year plan shows just one possible pathway to earning a degree with this major in four years. This plan **does not** replace the advice of your advisor, and students are cautioned to meet regularly with their advisor to create a personalized plan that matches their particular circumstances. This plan also follows the degree requirements for students who began their UWM education in Fall of 2013 or later. If you started at UWM prior to Fall of 2013, your degree requirements may be different.

### Degree Requirements (brief summary):

1. English Proficiency and UWM Oral and Written Communication (OWC) GER - English 102 (OWC-A); and OWC-B course
2. Math Proficiency and UWM Quantitative Literacy (QL) GER - Math 102, 103, 105, or 108 (QL-A) and a QL-B course
3. Math and Formal Reasoning - Math 211, 221, or 231; an additional 200-level course from Math, Philos 212, or Letters and Science statistics course; and a QL-B course. (A single course may satisfy both formal reasoning and the QL-B GER)
4. Foreign Language – 2 semesters of a single Foreign Language
5. L&S Humanities – 12 credits
6. L&S Social Sciences – 12 credits
7. L&S Natural Science – 12 credits including a laboratory course in three distinct natural science areas
8. L&S International – 9 credits usually accomplished in conjunction with Humanities and/or Social Science courses
9. UWM Arts GER – 3 credits
10. UWM Cultural Diversity GER – 3 credits usually accomplished in conjunction with a Humanities or Social Science course
11. 120 credits including 90 credits in L&S and with 36 of the 90 credits in L&S upper-level (numbered 300 and above) courses and 30 of those 36 in courses designated upper-level Natural Science
12. Complete the Mathematics major requirements in either the Basic Mathematics major or in one of the specialized options: Applied Mathematics, Computational Mathematics, Pure Mathematics, or Statistics
  - Basic Mathematics major – 27 credits in Math or Math Stat numbered 300 or above of which 15 must be completed at UWM
    - All of Math 231, 232, 233 or both of Math 221, 222
    - Math 234 or 240
    - Math 341 and Math 599
    - One course in computer programming in a modern, high level language
    - One of Math 521, 531, 535, 551, 621, 623, 631
    - One of Math 307, 320, 321, 322, 371, 405, 431, 520, 525, 581, 623
    - One of Math 313, 314, 413, 415, 417, 615, 617
    - One of Math 471, 571; Math Stat 361, 362, 561, 562, 563, 564, 565, 567, 568, 569

- One of the sequences Math 313/314, 320/322, 361/362, 413/415, 413/417, 415/417, 413/615, 413/617, 415/615, 521/522, 531/535, 631/632; Math Stat 361/362
- Math electives to reach 27 credits numbered 300 or above

Applied Mathematics – 33 credits in Math or MthStat numbered 300 or above of which 15 must be completed at UWM

- Two of CompSci 151(or 153), 201, 251
- Complete Basic Mathematics major requirements including the following:
  - » three of Math 307, 320, 321, 322, 371, 405, 431, 520, 525, 581, 623
  - » three of Math 313, 314, 413, 415, 417
  - » two of Math 471, 571; Math Stat 361, 362, 561, 562, 563, 564, 565, 567, 568, 569
- Math Electives to reach 33 credits numbered 300 or above

Computational Mathematics – 33 credits in Math or Math Stat numbered 300 or above of which 15 must be completed at UWM

- All of Computer Science 151 (or 153), 201, 251, 317, 351, 535
- Complete Basic Mathematics major requirements including the following:
  - » two of Math 307, 320, 321, 322, 371, 405, 431, 520, 525, 581, 623
  - » four of Math 313, 314, 413, 415, 417, 615, 617
  - » two of Math 471, 571; Math Stat 361, 362, 561, 562, 563, 564, 565, 567, 568, 569
- Math Electives to reach 33 credits numbered 300 or above

Pure Mathematics – 33 credits in Math or Math Stat numbered 300 or above of which 15 must be completed at UWM

- One of CompSci 151, 153, 201
- Complete Basic Mathematics major requirements including:
  - » six of Math 451, 453, 511, 521, 522, 529, 531, 535, 537, 551, 553, 555, 621, 622, 623, 631, 632 with at least three from Math 521, 531, 535, 551, 621, 623, 631
- Math Electives to reach 33 credits numbered 300 or above



### Sample Four Year Plan:

There are hundreds of courses that satisfy various requirements (<http://www4.uwm.edu/lets/requirements/>), and courses in the major can be used. For example, Math 231 counts towards the major, the natural science GER, and the quantitative literacy part B requirement. (This sample assumes no high school Foreign Language was taken and that the student placed into college-level Math and English.)

### Basic Math Major:

	Semester 1	Semester 2
Year 1	Math 116	Math 231 (NS, QL-B)
	Math 117	CompSci 201
	1st semester Foreign Language	2nd semester Foreign Language
	English 101	English 102 (OWC-A)
	L&S Social Science/ International	L&S Humanities/ International
Year 2	Math 232 (formal reasoning)	Math 233
	Math 341	Math 234
	CompSci 251 or elective	L&S Humanities
	OWC-B course	L&S Natural Science with lab
	L&S Humanities/Cultural Diversity	L&S Social Science/ International
Year 3	MthStat 361	MthStat 362
	Math 431	Math upper-level
	L&S Natural Science with lab	any L&S upper-level / can be Math or MthStat
	Arts GER	L&S Natural Science upper-level
	L&S Social Science	L&S Social Science
Year 4	Math 413	Math 599
	Math 535	Math or MthStat upper-level
	any L&S upper-level / can be Math or MthStat	Math or MthStat upper-level
	L&S Natural Science with lab	Elective
	L&S Humanities	Elective

(NS) Natural Science GER