

Department of Mathematics

University of California, Santa Barbara

A Guide to Our Majors

*Requirements, Descriptions, and
Possible Career Tracks*

How to Determine the Right Major for You

PLEASE NOTE:

While this pamphlet is a good general guide, it is not a replacement for the General Catalog or for academic advising in our office.

Bachelor of Science- Mathematics

You will find this major especially suitable if you wish to study at a rigorous pace. As opposed to a computational approach that deals with numerical calculations, this pure math degree deals in the abstract. There is an emphasis on understanding theory.

Preparation for the Major

The Mathematics Department uses a pre-major to ensure adequate preparation for this and all other math degrees. You must achieve at least a 2.5 GPA in a two-year calculus series, and an introductory course on proofs. One physics and one computer sciences course is also required, though they will not count toward your GPA requirement.

Upper Division

Students must complete 52 units of upper-division coursework ranging from abstract algebra to linear algebra, from theories of complex variables to real and complex analysis. It is a fairly regimented curriculum.

Possible Career Paths

While you are by no means required to take this major to qualify for graduate studies, it will provide you with excellent preparation for graduate work due to its emphasis on mathematical theory. This track also provides excellent preparation for law school since it will give you the skills needed to reason out a logical argument and explain it to others.

Bachelor of Science- Mathematical Sciences

If you are interested in applying the math you learn to real world situations, this major may appeal to you. It is a degree for those who enjoy working with numbers and equations; a “down and dirty,” hands-on major which focuses on how to solve real-world mathematical quandaries, particularly those with applications to the physical sciences and engineering.

Preparation for the major

Students must achieve at least a 2.5 GPA in a two-year calculus course and an introduction to proofs. One physics and one computer sciences course is also required. While the physics and computer sciences courses will not be factored into the 2.5 GPA requirement, they are given heavy consideration due to the nature of the coursework you will undertake.

Upper Division

Like the BS in Mathematics, students must complete 52 upper-division units; however, the BS in Mathematical Sciences has a less rigid set of required classes. This allows you the freedom to pick and choose from a plethora of offered courses and series, making for a fun and challenging experience. Classes focus on analyzing equations, numerical analysis, and computational techniques. Some classes require the use of computers for analyzing, some classes ban all but four-function calculators.

Possible Career Paths

Mathematicians can work in a variety of fields because of their highly developed problem solving skills. With this degree you could work in cryptology, engineering, or systems analysis. Visit www.siam.org/careers for more information.

Bachelor of Science- Financial Mathematics and Statistics

This major is ideal for you if you are interested in the role that mathematics plays in the financial market. It is a joint major between the Mathematics Department and the Department of Statistics and Applied Probability, so you can utilize both departments' resources as you complete your degree.

Preparation for the Major

Students must take a two-year series in calculus, two courses in micro- and macroeconomics and one introduction to mathematical proofs course. Students must also take a beginning computer science course, which will not be factored into the 2.5 GPA.

Upper Division

Students must complete 52 units of upper-division coursework. While there is a heavy emphasis on math, you will choose the proportion of mathematics, economics, and statistics courses you prefer to have represented in your coursework. These are rigorous courses, the majority of them mathematical. The major is less geared towards economics enthusiasts and is more suitable for those interested in business mathematics.

Possible Career Paths

This is a very focused degree to prepare you for MA or Ph.D programs in financial mathematics. The best paying and most interesting jobs in financial math require an advanced degree. However, companies need support to program models and run simulations. This kind of work requires only a BS. For an employee to be immediately useful to a firm, it is important to have a good background in programming, with C++ and MatLab at a minimum.

Bachelor of Arts- Economics/Mathematics

The Mathematics Department shares this major with the Economics Department. If you are interested in business administration or management science you may enjoy this major, since it involves more economics than mathematics. Economic theory is heavily emphasized.

Preparation for the Major

Students must achieve a 2.75 GPA in this pre-major, which requires one course each in micro- and macroeconomics, two years of calculus, and an introductory course in mathematical proofs. A beginning computer sciences course is also required, but this will not factor into the GPA.

Upper Division

This major requires completion of 40 upper-division units, and gives you a sizable amount of leeway in deciding what upper division courses to take. There are a few math classes that emphasize rigorous proofs, and the rest are economics courses. Microeconomic and macroeconomic theories are studied in depth, but the focus of the degree is left for you to decide. The large number of elective courses allows you to focus on what interests you while allowing time to try new and exciting classes.

Possible Career Paths

This degree serves as excellent preparation for graduate studies in economics or for MBA programs. You may also consider this major if you are interested in jobs in actuarial science, communications, computer science, market analysis, operations research, systems analysis, mathematical economics, or management.

Bachelor of Arts- Mathematics

This major has two possible emphases, the Liberal Arts and High School Teaching. You may opt for this major, particularly the Liberal Arts track, if you are considering a double major. A degree in math shows employers that you have quantitative skills and that you can think logically to solve problems.

Preparation for the Major

Students must earn at least a 2.5 GPA in the pre-major, which covers required courses in calculus and an introduction to mathematical proofs. Completion of one physics and one computer sciences course is required, but these courses will not factor into the GPA requirement.

Though this pre-major does not require the full two-year calculus series, the Math Department advises that you take one or both of the last two courses to clear pre-requisites for certain upper-division courses.

Upper Division

Both concentrations of this major require 40 upper-division units.

Concentration I: Liberal Arts- This emphasis provides a liberal education in pure mathematics. There are very few required courses compared to some of the other majors, which may appeal to you if you want a more personally tailored academic experience.

Concentration II: High School Teaching- This emphasis prepares students to pursue the California single subject teaching credential. It examines the historical context of mathematics, covers a broad range of concepts, and touches upon applications to familiar theorems.

Choosing a Major

It is common for our students to choose a track when they are ready to begin their upper-division course work in their junior year. Many students even start their pre-major on one track and later choose a different one. For example, our introductory course on proofs is ideal to distinguish a passion for theoretical math from a passion for applied math, which might help a student decide between the BS in Mathematics and the BS in Mathematical Sciences. If you are not sure which direction you want to take when you start at UCSB, take the opportunity to think about what aspects of your pre-major courses you enjoy. This information will be helpful when it is time to choose your major.

If you want more thoughts on what you can do with math, check out <http://www.ams.org/mathmoments>. This site features numerous applications of mathematics in everyday life.

Opportunities for Academic Distinction

Various prizes and awards are offered each year to outstanding majors in mathematics. Each award is given on the basis of academic excellence in the mathematics program.

The Mochizuki Memorial Award is presented each year in the memory of Professor Horace Mochizuki, a renowned group theorist who was a member of the UCSB faculty from 1965 to 1989. One Mochizuki award is given to a graduating senior each year.

The Wilder Awards are given in memory of Professor Raymond L. Wilder, a distinguished topologist who was a member of the Department of Mathematics from 1972 to 1982. They are given to graduating seniors and first-year graduate students.

You can also choose to complete the honors program in math to earn Distinction in the Major at graduation.

The Mathematics Minors

Why Minor in Math?

A minor in mathematics is ideal if you want to continue your mathematical education, but prefer to commit to a major (or double major) in a different subject. A mathematics minor is an excellent complement to any major. It shows proof of a well-rounded education that will make you more competitive in the job market, especially if your major requires writing skills. There are two possible tracks to achieve a minor in mathematics.

Minor Preparation

Students must complete required courses in our calculus series and an introduction to proofs. We strongly recommend that you pay attention to the pre-requisites for upper division courses that interest you, since this may require you to go beyond the required preparation.

Upper Division

Minor in Mathematics: Students must complete 24 upper-division units in mathematics to complete the minor. This track allows you the freedom to choose from any of our courses, as long as you meet the pre-requisites.

Minor in Mathematics for High School Teaching: Students must complete 24 upper-division units in mathematics or statistics. This course of study has several required upper-division courses to aid in preparation for the California single subject teaching credential.