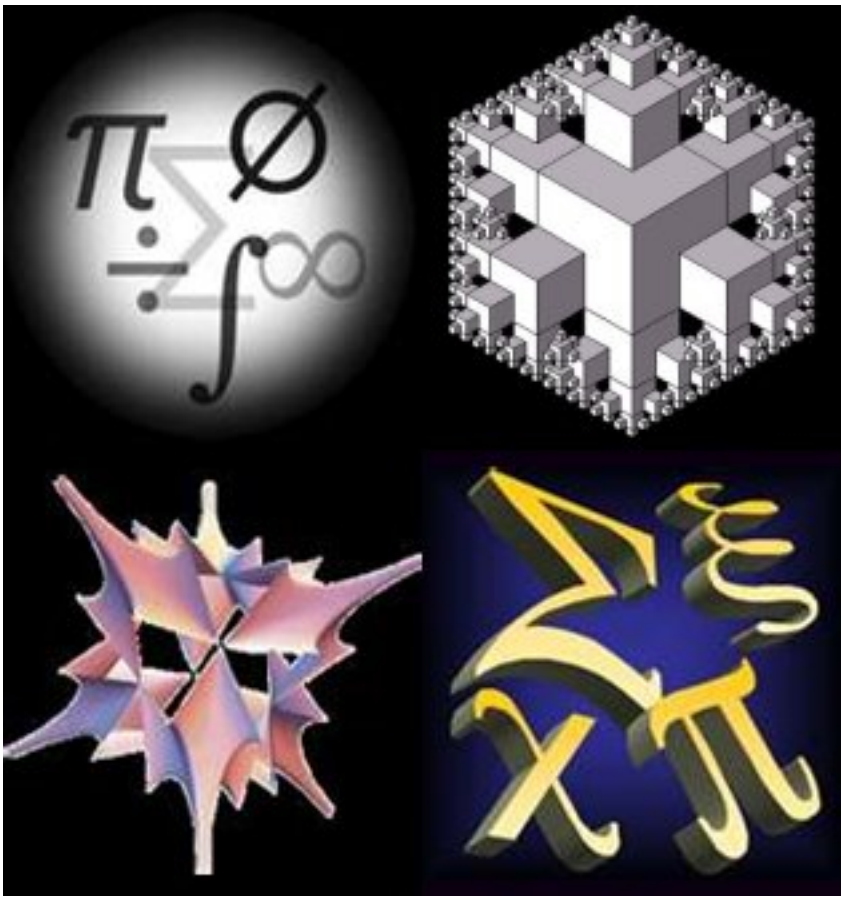
The University of Arizona

Undergraduate Programs in the Mathematical Sciences



2025–2026

UA SCIENCE
Mathematics

The information and requirements given here apply to the 2025–2026 catalog. For other catalog years, please consult the archive (`https://bit.ly/BABSArchive`).

This booklet describes the undergraduate degree programs in the Mathematical Sciences available for a student at The University of Arizona. It also contains information about facilities, activities, jobs, advising, and other services and activities supportive of these undergraduate programs, e.g., what they are, where to find them, whom to contact, and so on.

The contents of this booklet are a subset of the information available at the website `https://math.arizona.edu/academics/undergraduate` and the latest version of this booklet, in PDF form, may be downloaded from that web address.

You are presently looking at the booklet created on: **May 6, 2025**

To request an appointment with an advisor or ask a question, please use the contact forms in the menu across the top of the page at `https://mathcenter.math.arizona.edu`.

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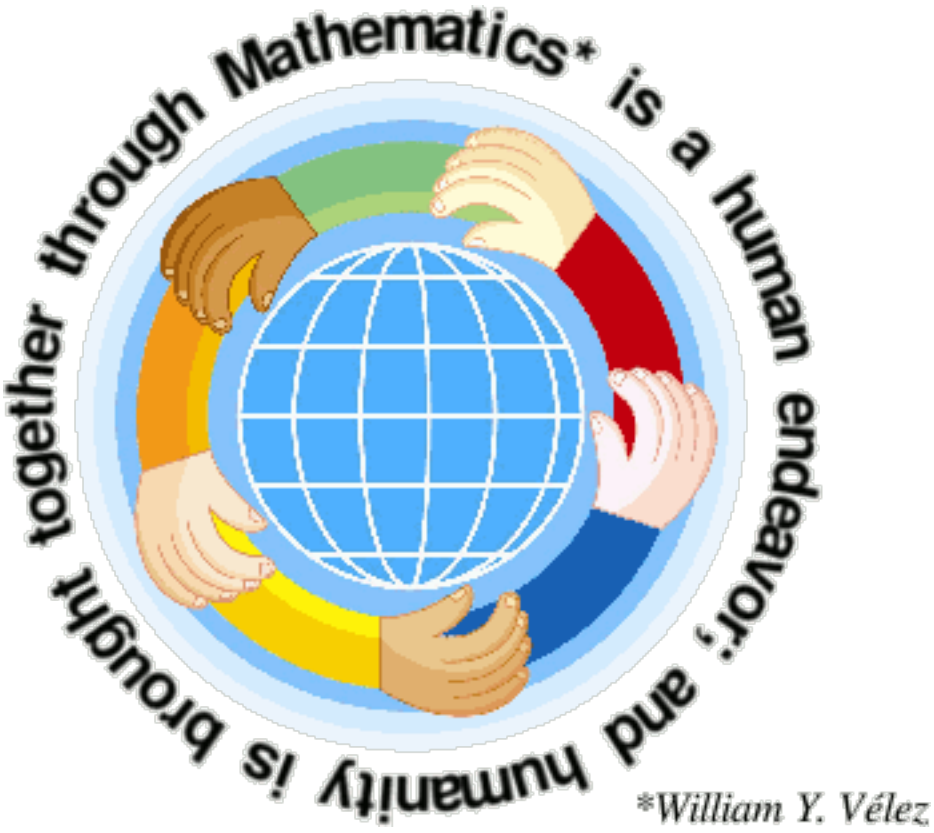
Why study mathematical sciences?



In many disciplines, the first decades of the twenty-first century have told of the introduction of more and more mathematical, statistical, and data science techniques. Mathematics has been established as a universal ingredient in the understanding of the world, and is the language used in conveying this understanding. Now, in the twenty-first century, higher mathematics and statistics are not just tools for physical scientists and engineers, but also of crucial importance in business, economics, social sciences, medicine, and many other fields. Many mathematicians still delight in the aesthetic appeal of their subject; however, it is ultimately the application of mathematics that makes it a critical element in modern civilization.

Statistics is a subfield of the mathematical sciences. Its applications to new technologies and big data are so numerous that it warrants its own major; however, to study statistics is essentially to study mathematics. When we refer to "mathematics" or "the mathematical sciences", statistics is included in those categories. Many students may find that their interests span courses from both the mathematics and

the statistics and data science programs, and we encourage you to study both! See policies regarding this on p. 12.

Benefits of a math or statistics/data science major

Undergraduate training in mathematical sciences is an important step along many career paths. It is essential for those who intend to continue toward a graduate degree in mathematics, applied mathematics, statistics, or computer science. Admissions committees for graduate studies in astronomy, physics, engineering, economics, or finance often prefer students with undergraduate mathematics majors (together with the proper minor) over students who have majored in their own subject. Some University of Arizona mathematics graduates have also used their degree as the first step toward professional degrees in law, medicine, and even divinity.

The mathematics department offers majors in mathematics and in statistics and data science. These majors are not just a path toward graduate education. Mathematics training is training in general problem solving. Many employers recognize this fact; they also recognize that a bachelors degree in mathematics or statistics is proof of an ability and willingness to work hard. Many of our majors have found success by completing more than one major. Double majors in mathematics and science, mathematics and business, among others, prepare graduates with enhanced ability to compete well in the job market.

Mathematics and statistics/data science majors are advised to develop both computing skills and communication skills during their time as a student. Experience using graphing calculators and standard mathematical software packages, programming experience, and experience using the internet are extremely useful in almost any career path today. And in virtually any type of position, the need for good communication skills is paramount.

The Mathematical Sciences Community at UA

Let us not forget one of the main reasons for becoming a mathematics or statistics major. It is fun! Our programs afford students plenty of time to link their interests in the mathematical sciences to other intellectual endeavors. Students who combine mathematics/statistics/data science, computer science, and another area will find themselves with many options when they graduate with an undergraduate degree. The Department of Mathematics created the Math Center (see p. 36) to ensure that our majors have a home base to turn to during their undergraduate studies. One of

our goals is to integrate the undergraduate mathematics and statistics/data science majors into the intellectual life of this university and this nation. Our faculty tend to be involved in three areas: the creation of new mathematics or statistics/data science, the application of mathematics or statistics/data science to solve real-world problems, and the teaching of mathematics or statistics/data science. Many of our undergraduate majors are able to perform these same activities during their undergraduate years through various research and teaching/tutoring opportunities and summer internship opportunities (see p. 45).

Careers

There are few jobs with the title *Mathematician*. Majors in mathematics or statistics may end up in a job with a title such as *Engineer* or *Analyst*. Likewise, those graduating with a degree in data science may not always have the title *Data Scientist*; there are also *Data Engineers*, *Data Managers*, *Analysts*, and so on. Career opportunities in the mathematical sciences fall into two broad categories, Educators and Practitioners:

Educators

University Professor

A Ph.D. degree in mathematics or statistics is required for this position. A university professor teaches courses, mentors students, and provides service to the institution and the community. A university professor can also be considered a practitioner to the extent that they conduct research and develop new knowledge in their field. A university professor may also engage in consulting activities.

College Teacher

College teachers may have a master's degree or a Ph.D., depending on the level and nature of the institution. Responsibilities may be exclusively instruction-related, as in the case of a community college, or may include some research.

High School or Middle School Teacher

Well-qualified mathematics teachers are in high demand. A bachelor's degree is the minimum requirement for teaching in secondary schools. State requirements for certification, which usually include courses in education, must also be met. The traditional areas of secondary school mathematics—algebra, geometry, and

trigonometry—have been augmented in many schools by analytic geometry and calculus and other courses that are intended to meet diverse student needs. Newer curricula include computer programming, probability and statistics, data science, linear algebra, and applications. The prospective teacher who is familiar with these latter areas will have a competitive advantage.

Practitioners

Actuary

Actuaries are hired by insurance companies (life, health, casualty, etc.), pension plans, businesses, consulting firms (business and actuarial), and government agencies. To become an actuary (Associate or Fellow), one must pass a series of examinations administered by the Society of Actuaries. The initial exams are primarily mathematics, including probability and statistics, and can be taken while still an undergraduate student. Because actuarial science is a mixture of mathematics and business, the student should speak with an advisor about other course work needed to prepare for this career. Students who are interested in becoming actuaries will find additional information and suggestions on our Careers in Actuarial Science pages (`https://bit.ly/UAactuary`).

Computational Scientist

A computational scientist is an applied mathematician who interprets problems arising from the physical sciences and engineering in mathematical form and develops mathematical solutions to these problems. Very large and sophisticated computers are used intensively. Potential employers include government laboratories, the chemical industry, and the biotech industry.

Financial Planner

Financial planners are qualified investment professionals who work with individuals and families to organize their finances and meet their long-term financial objectives. They advise clients on how to reach financial goals, including saving, budgeting, investing, and preparing for retirement. Some also specialize in tax planning, asset allocation, risk management, and/or estate planning. Financial planners require excellent communication skills, as well as the financial, data science, and analytic expertise to inspire confidence in their advice.

Operations Research Analyst

Also called management science analysts, operations research analysts help organizations coordinate activities and operate in the most efficient manner, by applying scientific methods and mathematical principles to organizational problems. Computers are used extensively in their work. Students interested in this career path should minor in Electrical and Computer Engineering (ECE) or Systems and Industrial Engineering (SIE).

Systems Engineer or Systems Analyst

A systems engineer or analyst usually has substantial course work in engineering or another technical field. This enables them to apply mathematical techniques to solve the problems unique to the industry of their employer. Students interested in this career path should consider minoring in Systems and Industrial Engineering (SIE).

Scientific Writer/Communicator

The scientific publishing industry has a need for scientifically trained individuals for sales and editing. Excellent writing and oral communication skills are essential in this career field. Accurate and understandable technical writing is widely needed.

Software Engineer or Software Consultant

A software engineer generally designs and writes software that performs nonnumerical functions, such as graphics. A background in math and computer science is needed. Employers include consulting firms and large corporations which do their own software development. There is also room in this field for the entrepreneur or consultant.

Statistician

Statistics is both a very applied field and also a theoretical one. Many, but not all, statisticians are active in both applications and the development of new theory, but the greatest potential in terms of jobs is in applied statistics. Statisticians generally work with people in other fields, therefore communication skills are very important. Statistical applications nearly always include the analysis of data and hence some knowledge and experience in computing is very important. There are opportunities for statisticians in the government, in industry, business, medicine, and in academia.

Research Mathematician

In non-academic positions, research mathematicians conduct mathematical research in areas of interest to large corporations and various departments of government. These include the Department of Energy, various branches of the military, and security agencies. While the demand for non-academic research mathematicians has been shrinking in recent years, there still are positions available at national laboratories, the National Security Agency (NSA), and other government entities, as well as some large corporations. An advanced degree is usually required for these positions.

Data Scientist or Data Engineer

Data is collected constantly, from NASA's OSIRIS-REx spacecraft mapping the surface of the asteroid Bennu to your grocery store's loyalty card program. In many cases, the collections of data are too large to be handled by traditional means, or even to be stored on a single computer. The challenges inherent in working with and extracting meaning from big data ensure that skilled data scientists and engineers will continue to be in demand for the foreseeable future.

Undergraduate Degrees and Requirements

The complete official requirements for each emphasis are given in the *University Catalog* in the form of an *Academic Advisement Report (ADVIP)*. In the following, we cover the portion of the requirements specific to each major. It is important for students to consult with their academic advisor and faculty advisor about their choice and order of courses, as well as which additional courses would strengthen their degree program.
For an example of how to order your coursework to take into account prerequisites and meet all degree requirements, please consult sample 4-year plans (`https://www.math.arizona.edu/academics/undergraduate/math-center-advising/advising-handouts`) and prerequisite flow charts (`https://bit.ly/BABSArchive`). You will develop an individualized plan in consultation with your advisor.

Undergraduate Degrees and Majors Offered

The degree requirements below apply to students admitted in Fall 2025 or later; students who entered the university earlier should consult the archive (`https://bit.ly/BABSArchive`).

B.S. in Data Science

NEW as of Fall 2025: in cooperation with the Departments of Computer Science and Molecular and Cellular Biology in the College of Science, we now offer a Bachelor of Science (B.S.) in Data Science with several different emphases to meet the needs of students with varied interests in Data Science. This has replaced the B.S. in Statistics & Data Science for students entering the university in Fall 2025 and later; students who entered prior to Fall 2025 may choose to opt in to these requirements.

B.A. in Statistics and Data Science

We also still offer a Bachelor of Arts (B.A.) degree in Statistics and Data Science. (The B.S. in Statistics and Data Science is only available to continuing students who entered during or prior to the 2024-2025 academic year.) The B.A. program

has been revised to be less math-intensive and to include more electives, making this an excellent choice for a second major.

B.A. and B.S. in Mathematics

Students selecting the Mathematics major may choose either a Bachelor of Arts (B.A.) or Bachelor of Science (B.S.) and one of seven emphases. The mathematics major provides grounding in calculus, linear algebra, and proof-writing, supplemented by specialized courses to fit the individual's talents, interests, and career goals.

Policies and Additional Requirements

Double Degrees

Students pursuing a second major that has a degree title different from that of the first major are technically double-degree students. Additional requirements may apply to double degree students that do not pertain to double major students (students with two majors that have exactly the same degree title). See a Math Center advisor for detailed information about these additional requirements.

Departmental Policy on Multiple Use of Courses

In choosing your combination of majors and minors, keep in mind the following restrictions on multiple use of courses within the Mathematics Department's programs, in addition to the university's rules on multiple majors and degrees: https://bit.ly/3FEq5Cl

Multiple Majors with Other Departments:

Students pursuing a Mathematics (MATH), Statistics & Data Science (SDS), or Data Science (DS) major (or MATH or SDS minor) may apply multiple use of courses with a second major from another department, provided the other department permits multiple use of courses.

Double Majors within the Department (MATH, SDS, DS):

Students may pursue a double major or double degree in MATH and SDS, or in MATH and DS. However, MATH 323, MATH 355, and the 400-level emphasis

courses used for the MATH major may not be used to fulfill any requirements for the SDS or DS majors. Students may not pursue a double major or double degree in SDS and DS because of the substantial overlap in coursework.

Minor Requirements:

- **Mathematics Majors:** All emphases in the MATH major, except Education, require a minor.
  - To fulfill the minor requirement, a MATH major may complete any minor, second major, or second degree, provided it includes at least 18 units that are not applied to the MATH major requirements.
  - **Important Notes:**
    * An SDS minor alone does not fulfill the minor requirement for a MATH major.
    * Courses used for the MATH major may also count toward a Math Minor when fulfilling a minor requirement for a second degree.
    * Within the same degree, a MATH major may add an SDS minor as an additional minor, provided that at least 6 upper-division units in the SDS minor are not used toward the MATH major.
- **Statistics & Data Science Majors:** The SDS major requires a minor.
  - To fulfill the minor requirement, an SDS major may complete any minor, second major, or second degree, provided it includes at least 18 units that are not applied to the SDS major requirements.
  - **Important Notes:**
    * A Math minor alone does not fulfill the minor requirement for an SDS major.
    * Courses used for the SDS major may also count toward an SDS Minor when fulfilling a minor requirement for a second degree.
    * Within the same degree, an SDS major may add a Math minor as an additional minor, provided that at least 6 upper-division units in the Math minor are not used toward the SDS major and are not related to statistics and data science.
- **Data Science Majors:** The DS major does not require a minor.

- DS majors who choose to pursue a minor outside of the Mathematics Department may apply multiple use of courses, subject to the other department's rules.
- Courses used for the DS major may also count toward an SDS Minor when fulfilling a minor requirement for a second degree.
- Within the same degree, a DS major may add a Math minor provided that at least 6 upper-division units in the Math minor are not used toward the DS major requirements and are not related to statistics and data science. However, a DS major may not add an SDS minor within the same degree.

Double Minors in MATH and SDS:

Students may not complete both a MATH minor and an SDS minor within the same degree, due to the substantial overlap in required coursework.

Course Overloads

Students who plan to enroll in three upper-division DATA/MATH courses in a single semester are advised to talk to their math department faculty advisor before finalizing their schedule. The Math Department requires that students enrolling in four or more upper-division DATA/MATH courses for a single term obtain permission from their math faculty advisor. Note that special courses like Supplemental Instruction, Workshops, Preceptorship (UTA or ULA program enrollment), Directed Research/Thesis, and Pedagogy courses for the Secondary Math Education Program are not counted toward this limit.

Mid-Career Writing Assessment (MCWA)

Every undergraduate degree program at the University of Arizona requires satisfaction of the MCWA. A grade of A or B in English 102, English 108, or English 109H will satisfy the requirement. Students who earn less than a B in the second semester composition course have several options for completing the MCWA:

- repeat the second semester English course (with GRO, if eligible) and earn at least a B, **or**
- complete ENGL 307, 308, or 313 with a grade of at least D.

B.S. in Data Science (DS)

The information and requirements given here apply to the 2025–2026 catalog (the major is new this year).

Data Science Supporting Requirements

The following requirements are part of the DS degree, but as supporting or foundation requirements, do not count in the major units or GPA.

Language Requirement

Students must demonstrate *second semester proficiency* in a second language for the B.S. degree.

Laboratory Science Requirement

The degree is science-intensive and requires two of the following lab science courses:

- First-semester courses (no prerequisites other than mathematics): PHYS 141, PHYS 161H, CHEM 151, CHEM 141 & (143 or 145)$^{(*)}$, CHEM 161 & 163$^{(*)}$, CHEM 181, MCB 181R & 181L$^{(*)}$, ECOL 182R & 182L$^{(*)}$, PSIO 201, GEOS 251, HWRS 350, PHYS 102 & 181$^{(*)}$, PHYS 110
- Courses that require one or more science prerequisites: PHYS 142, PHYS 241, PHYS 162H, PHYS 261H, CHEM 152, CHEM 142 & (144 or 146)$^{(*)}$, CHEM 162 & 164$^{(*)}$, CHEM 182, PSIO 202, GEOS 255, GEOS 302, GEOS 304, GEOS 308, GEOS 322, MSE 110, PHYS 103 & 182$^{(*)}$, PHYS 111

$^{(*)}$ *Lecture and lab must both be taken to constitute one lab science course.*

Minor Optional

A minor is optional for the B.S. in Data Science.

Data Science Major Emphases

The DS major requires a core of basic courses (listed at the bottom of this page) followed by additional courses specific to one of the emphases detailed below. There are currently four emphases available to Main Campus students:

- **Applied Statistics Emphasis:** This emphasis is intended primarily for students wanting a more statistical-focused data science major in preparation for entering the workforce after graduation. This emphasis may also be appropriate preparation for graduate study in fields that rely heavily on statistics and data science. (see p. 17)
- **Comprehensive Statistics Emphasis:** This emphasis prepares students for graduate study in data science, probability and statistics, and related fields. (see p. 18)
- **Computing Emphasis:** This emphasis is intended for students who want to learn more about the computational side of data science. (see p. 19)
- **Molecular and Cellular Biology Emphasis:** This emphasis is intended for students who are interested in applying data science methods to biology. (see p. 20)

Data Science Core Courses

The following courses are required for all DS majors:

- Choose one:
  - CSC 110 — Introduction to Computer Programming I OR
  - ISTA 130 — Computational Thinking and Doing
- Choose one:[1]
  - CSC 120 — Introduction to Computer Programming II OR
  - ISTA 131 — Dealing With Data
- MATH 122A AND MATH 122B[2] or MATH 125 — Calculus I
- MATH 129 — Calculus II
- DATA 201 — Foundations of Data Science[3]
- MATH 263 — Introduction to Statistics & Biostatistics
- MATH 313 — Introduction to Linear Algebra[4]

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[1] *ISTA 131 will **not** substitute for CSC 120 as a prerequisite to future CSC courses for students selecting the Computing emphasis.*
[2] *MATH 122A and MATH 122B are a single-semester sequence of courses that cover Calculus I.*
[3] *DATA 201 is a new Building Connections Gen Ed. Up to 3 courses may count to fulfill General Education Exploring Perspectives or Building Connections requirements as well as major, pre-major, minor, and/or certificate requirements.*
[4] *Students who have transfer credit equivalent to MATH 215 may use it to fulfill this requirement, though they will not earn upper-division credit for the course.*

Applied Statistics Emphasis

- Core Courses (listed on p. 16)
- ISTA 322 — Data Engineering[1]
- DATA 363 — Introduction to Statistical Methods
- DATA 375 — Introduction to Statistical Computing
- DATA 467 — Introduction to Applied Regression and Generalized Linear Models
- DATA 474 — Introduction to Statistical Machine Learning
- DATA 498A — Capstone for Statistics & Data Science
- Choose one of the following 1-unit opportunities:
  - DATA 195M — Math and SDS Major Colloquium (see p. 38)
  - DATA 395M — Career Exploration in Mathematics and Data Science (see p. 38)
  - DATA 391 or 491 — Preceptorship (see p. 42)
  - DATA 393 or 493 — Internship
- Choose four (4) electives from the following:
  - MATH 223 — Vector Calculus (4 units)
  - ISTA 320 — Data Visualization
  - ISTA 321 — Data Mining and Discovery
  - DATA 367 — Statistical Methods in Sports Analytics
  - DATA 396T or 496T — Topics in Undergraduate Statistics & Data Science[2]
  - ISTA 410 — Bayesian Modeling and Inference
  - MCB 416 — Bioinformatics and Functional Genomic Analysis
  - DATA 439 — Statistical Natural Language Processing
  - SIE 440 — Survey of Optimization Methods
  - MCB 447 — Big Data in Molecular Biology and Biomedicine
  - DATA 462 — Financial Math
  - MATH 464 — Theory of Probability
  - DATA 492 — Directed Research[3]
  - DATA 498H — Honors Thesis[3]

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[1] *ISTA 322 is recommended for most students; CSC 460, GIST 470, and MIS 331 are also accepted, but may have additional enrollment requirements.*
[2] *DATA 396T and 496T are special topics courses. When available, they will usually be offered in spring, and topics covered will vary. Consult an advisor for details and availability.*
[3] *Three units of DATA 492 or 498H may apply to this requirement; 498H is restricted to Honors College members.*

Comprehensive Statistics Emphasis

- Core Courses (listed on p. 16)
- MATH 223 — Vector Calculus
- ISTA 322 — Data Engineering[1]
- DATA 363 — Introduction to Statistical Methods
- DATA 375 — Introduction to Statistical Computing
- MATH 464 — Theory of Probability
- MATH 466 — Theory of Statistics
- DATA 467 — Introduction to Applied Regression and Generalized Linear Models
- DATA 474 — Introduction to Statistical Machine Learning
- DATA 498A — Capstone for Statistics & Data Science
- Choose one elective from the following:
  - MATH 323 — Formal Mathematical Reasoning & Writing
  - DATA 367 — Statistical Methods in Sports Analytics
  - DATA 396T — Topics in Undergraduate Statistics & Data Science[2]
  - DATA 412 — Linear Algebra for Data Science
  - SIE 440 — Survey of Optimization Methods
  - DATA 462 — Financial Math
  - MATH 468 — Applied Stochastic Processes
  - DATA 496T — Advanced Topics in Undergraduate Statistics & Data Science[2]
  - DATA 498H — Honors Thesis[3]

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[1] *ISTA 322 is recommended for most students; CSC 460, GIST 470, and MIS 331 are also accepted, but may have additional enrollment requirements.*
[2] *DATA 396T and 496T are special topics courses. When available, they will usually be offered in spring, and topics covered will vary. Consult an advisor for details and availability.*
[3] *Three units of DATA 492 or DATA 498H may apply to this requirement; DATA 498H is restricted to students in the Franke Honors College.*

Computing Emphasis

- Core Courses (listed on p. 16)
- CSC 144 — Discrete Math for Computer Science I[(1)]
- CSC 210 — Software Development
- CSC 244 — Discrete Math for Computer Science II
- CSC 335 — Object-Oriented Programming and Design
- CSC 345 — Analysis of Discrete Structures
- CSC 380 — Principles of Data Science[(2)]
- DATA 375 — Introduction to Statistical Computing
- CSC 460 — Database Design
- CSC 480 — Principles of Machine Learning
- DATA 498A — Capstone for Statistics & Data Science

[(1)] *MATH 243 will also fulfill this requirement.*
[(2)] *DATA/MATH 363 will also fulfill this requirement.*

Molecular & Cellular Biology Emphasis

- Core Courses (listed on p. 16)
- MCB 181R — Introductory Biology I
- ISTA 322 — Data Engineering[(1)]
- MCB 330 — Critical Reasoning and Problem Solving in Biomedicine[(2)]
- DATA 363 — Introduction to Statistical Methods
- DATA 375 — Introduction to Statistical Computing
- MCB 404 — Bioethics
- MCB 416A — Bioinformatics & Functional Genome Analysis
- MCB 447 — Big Data in Molecular Biology & Biomedicine
- Choose one:
  - MCB 410 — Cell Biology
  - MCB 411 — Molecular Biology
- Choose one:
  - MCB 480 — Introduction to Systems Biology
  - MCB 489 — Foundations of Synthetic Biology
- Choose one capstone:
  - DATA 498A — Capstone for Statistics & Data Science
  - MCB 498 — Capstone

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(1) ISTA 322 is recommended for most students; CSC 460, GIST 470, and MIS 331 are also accepted, but may have additional enrollment requirements.

(2) MCB 330 Critical Reasoning and Problem Solving in Biomedicine is a 1 unit course.

B.A.in Statistics and Data Science (SDS)

The information and requirements given here apply to the 2025–2026 catalog. For other catalog years, please consult the archive (`https://bit.ly/BABSArchive`).

Statistics and Data Science Supporting Requirements

The following language, science, minor, and programming requirements are part of the SDS B.A. degree, but as supporting requirements, do not count in the major units or GPA.

Language Requirement

Students must demonstrate *fourth semester proficiency* in a second language.

Minor Requirement

All SDS majors are required to complete a minor in any subject outside of the math department. A second major outside our department may fulfill this requirement, provided it is declared within the same B.A. degree.

Supporting Computer Science & Data Management

All SDS majors are required to complete a computer programming course in Python and a course in data management/SQL.[1]

- Choose one Python course:[2]
  - CSC 110 — Introduction to Computer Programming I
  - ISTA 130 — Computational Thinking and Doing
- And one data management course:[3]
  - ISTA 322 — Data Engineering

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[1] *Both MATH 129 and a Python course must be completed prior to taking DATA 363. Both MATH 313 and a data management course must be taken prior to or concurrently with DATA 363.*
[2] *One of these courses is recommended for most students. As an alternative, students may use either CSC 120, CSC 250, or both (ECE 101 or ECE 175) and (either BE 205 or CHEE 205 or AME 209) to fulfill the requirement.*
[3] *ISTA 322 is recommended for most students; CSC 460, GIST 470, and MIS 331 are also accepted, but may have additional enrollment requirements.*

Statistics and Data Science Major Required Courses

The following courses are required for all SDS majors:

- MATH 122A AND MATH 122B[(1)] or MATH 125 — Calculus I
- MATH 129 — Calculus II
- DATA 201 — Foundations of Data Science[(2)]
- MATH 263 — Introduction to Statistics & Biostatistics
- MATH 313 — Introduction to Linear Algebra[(3)]
- DATA 363 — Introduction to Statistical Methods
- DATA 375 — Introduction to Statistical Computing
- DATA 467 — Introduction to Applied Regression and Generalized Linear Models
- DATA 474 — Introduction to Statistical Machine Learning
- DATA 498A — Capstone for Statistics and Data Science
- SDS major electives: (See next page for options)
  - Two upper-division electives
  - One additional elective (upper or lower-division)

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(1) MATH 122A and MATH 122B are a single-semester sequence of courses that cover Calculus I.
(2) DATA 201 is a new Building Connections Gen Ed. Up to 3 courses may count to fulfill General Education Exploring Perspectives or Building Connections requirements as well as major, pre-major, minor, and/or certificate requirements.
(3) MATH 310 (Applied Linear Algebra) will also fill this requirement but is not currently offered at the U of A. MATH 313 replaces MATH 215, which is also no longer offered. Students who completed MATH 215 prior to fall 2015 or who have transfer credit equivalent to MATH 215 will still fulfill this requirement, though they will not earn upper-division credit for the course.

Statistics and Data Science Major Electives

The SDS major requires three elective courses, at least two of which must be upper-division (numbered 300 or higher). The courses that can count toward this requirement are listed below. Some of the options are also Gen Eds; students may apply up to three Gen Eds to major, minor, or other requirements.

- DATA 367 — Statistical Methods in Sports Analytics
- DATA 396T — Topics in Undergraduate Statistics & Data Science[(1)]
- DATA 412 — Linear Algebra for Data Science
- DATA 439 — Statistical Natural Language Processing
- DATA 462 — Financial Math
- DATA 468 — Applied Stochastic Processes
- DATA 496T — Advanced Topics in Undergraduate Statistics & Data Science[(1)]
- DATA 498H — Honors Thesis[(2)]
- GEOG 457 — Statistical Techniques in Geography, Regional Development and Planning
- INFO 402 — Data Ethics
- ISTA 320 — Applied Data Visualization
- ISTA 321 — Data Mining & Discovery
- ISTA 410 — Bayesian Modeling & Inference
- MATH 223 — Vector Calculus
- MATH 464 — Theory of Probability
- MATH 466 — Theory of Statistics
- PHIL 206 — Ethics of AI[(3)]
- PHIL 346 — Minds, Brains & Computers
- PHIL 455 — Philosophy and Artificial Intelligence
- SIE 440 — Survey of Optimization Methods
- WFSC 223 — Dealing With Data in the Wild[(3)]

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(1) DATA 396T and 496T are special topics courses. When available, they will usually be offered in spring, and topics covered will vary. Consult our website (`math.arizona.edu/academics/courses/ugtopics`*) for details and availability.*

(2) For Honors students, one semester of DATA 498H may be used toward SDS major requirements.

(3) Up to 3 courses may count to fulfill General Education Exploring Perspectives or Building Connections requirements as well as major, pre-major, minor, and/or certificate requirements.

B.A./B.S. in Mathematics

The information and requirements given here apply to the 2025–2026 catalog. For other catalog years, please consult the archive (`https://bit.ly/BABSArchive`).

Comparing the B.A. and the B.S.

As far as the mathematics coursework is concerned, the B.A. and B.S. are identical. The two degrees differ only in the language proficiency requirements and the supporting science and application course requirements as described below. The language, science, and application requirements below are part of the math degree, but as supporting requirements, do not count in the major units or GPA.

Math B.A. Requirements

- **Language Requirement:** Students must demonstrate *fourth semester proficiency* in a second language.
- The degree is not science-intensive. Students need to complete only the Exploring Perspectives: Natural Scientist course, as specified in the University General Education requirements (`https://catalog.arizona.edu/policy/general-education-curriculum`).

Math B.S. Requirements

- **Language Requirement:** Students must demonstrate *second semester proficiency* in a second language.
- **Laboratory Science Requirement*:** The degree is science-intensive and requires two of the following lab science courses:
  - First-semester courses (no prerequisites other than mathematics): PHYS 141, PHYS 161H, CHEM 151, CHEM 141 & 145(**), CHEM 161 & 163(**), CHEM 181, MCB 181R & 181L(**), ECOL 182R & 182L(**), PSIO 201, GEOS 251, HWRS 350
  - Courses that require one or more science prerequisites: PHYS 142, PHYS 241, PHYS 162H, PHYS 261H, CHEM 152, CHEM 142 & 146(**), CHEM 162 & 164(**), CHEM 182, PSIO 202, GEOS 255, GEOS 302, GEOS 304, GEOS 308, GEOS 322

(*) *CHEM 151, CHEM 161, MCB 181R, PHYS 141, and PHYS 161H are also approved to fulfill the Exploring Perspectives: Natural Scientist gen ed requirement.Students may apply up to three (3) Gen Eds to major, minor, or other requirements.*

(**) *Lecture and lab must both be taken to constitute one lab science course.*

- **Application Coursework Requirement:** (This requirement does not apply to the Mathematics Education Emphasis.) Students must complete at least three units of coursework that applies advanced mathematics to other academic fields.

Choose from the following courses with a pre- or co-requisite of at least Calculus I (MATH 122B or higher):
BE 201, 284, 428, 481A; AREC 304, 464, 479; ASTR 250; ATMO 430, 436A, 469A, 469B; BIOC 462A, 462B, 466; BME 214, 481B; CE 214; CHEE 201, 202, 270, 297, 481A, 481B; CHEM 161, 162, 325, 404A, 480A, 480B, 481; CSC 345, 355, 422, 433, 436, 437, 444, 445, 453, 460, 477, 483; CSCV 345; ECOL 302, 447, 496N; ECON 332, 361; ENGR 211C, 211E, 211P; ENVS 420, 470, 479; GEOG 463; GEOS 322, 356, 419, 432, 434A, 440, 469, 479; HWRS 349A, 350, 421, 431, 460A; ISTA 320, 421, 450; MATH 493 (maximum of 3 units); MCB 480; MSE 222, 345, 404, 415; OPTI 201R, 303, 495B; PHYS 140, 141, 142, 143(*), 161H, 162H, 240, 241, 261H; PSIO 303, 305, 472; PTYS 407; RCSC 216; SIE 250, 265; WFSC 444, 445 WSM 460A; or courses approved by your academic advisor.

(*) PHYS 143 is a 2-unit course and will not complete the application coursework requirement on its own.

Note: B.S. math majors may satisfy both the Application Course Requirement and one of the Laboratory Science Courses by completing PHYS 141 or HWRS 350 (for example). Some courses may require a major or minor in the subject area and/or additional prerequisites to enroll. Check the course catalog for details.

Supporting Computer Science Requirement

All math majors are required to complete a computer programming course, regardless of the degree and emphasis selected. Choose one course:(**)

- CSC 110 — Introduction to Computer Programming I
- ISTA 130 — Computational Thinking and Doing
- ECE 175 — Computer Programming for Engineering Applications
- CHEE 205 — Introduction to MatLab and Python

(**) CSC 110, ISTA 130, ECE 175, or CHEE 205 is recommended for most students. Other courses that can be used to satisfy the programming requirement are: CSC 127A, CSC 120, CSC 227, CSC 250, BME 225, GEOS 280, MIS 301, NSCS 311, and PHYS 305. These latter courses may require prior programming experience, additional prerequisites and/or a major or minor declared in another subject.

Math Major Emphases

Both the Bachelor of Arts (B.A.) and the Bachelor of Science (B.S.) in Mathematics require a core of basic courses (listed on p. 27) followed by additional courses specific to one of seven possible emphases:

- **Applied Mathematics Emphasis:** This emphasis is for students who intend to enter the job market upon graduation, but may also be appropriate for students who plan to go on to graduate school in a field of science or engineering. (see p. 28)
- **Comprehensive Mathematics Emphasis:** This emphasis prepares students for graduate study in mathematics, applied mathematics, or most scientific fields. (see p. 29)
- **Probability and Statistics Mathematics Emphasis:** This emphasis is for students considering a career as an actuary or statistician, as well as for students wanting to attend graduate school in statistics. (see p. 30)
- **Mathematics Education Emphasis:** This emphasis prepares students for teaching mathematics at the secondary school level with professional licensure from the Arizona Department of Education. The emphasis has three main components: a set of courses in mathematics, a set of courses in teaching and learning mathematics in secondary schools, and a set of courses in education from the College of Education. (see p. 31)
- **Computer Science Mathematics Emphasis:** This emphasis is for students interested in applications of computers to mathematical problems, including math majors who plan to attend graduate school in computer science. (see p. 32)
- **Economics or Business Mathematics Emphasis:** This emphasis is for students with a particular interest in business applications of mathematics, especially those preparing for graduate school in economics or finance. (see p. 33)
- **Life Sciences Mathematics Emphasis:** This emphasis is for students considering a career in medicine, as well as for students wanting to attend graduate school in the biological sciences. (see p. 34)

Each emphasis requires at least 15 units of 400-level mathematics course work, and each emphasis, except Mathematics Education, requires the student to complete a minor outside of the Math Department. Courses in minors must be distinct from those in the major.

Mathematics Core Courses

All seven emphases for the B.A./B.S. in Mathematics require the following core courses, which should ideally be completed by the end of the sophomore year.

- MATH 122A AND MATH 122B [(1)] or MATH 125 — Calculus I
- MATH 129 — Calculus II
- MATH 223 — Vector Calculus
- MATH 313 — Introduction to Linear Algebra [(2)]
- MATH 323 — Formal Mathematical Reasoning and Writing [(3)]
- MATH 355 — Analysis of Ordinary Differential Equations [(4)]

[(1)] MATH 122A and MATH 122B are a single-semester sequence of courses that cover Calculus I.
[(2)] MATH 313 replaces MATH 215, which is no longer offered. Students who completed MATH 215 prior to fall 2015 or who have transfer credit equivalent to MATH 215 will still fulfill this requirement, though they will not earn upper-division credit for the course.
[(3)] MATH 323 is a writing-emphasis course that is the foundation for many of the advanced courses taken by any math major. It is prerequisite for more theoretical 400-level courses in the major. Students who earn less than a B in MATH 313 may be required to complete extra pre- or co-requisites to MATH 323, including MATH 396L, a 1-unit supplement to 323.
[(4)] MATH 355 is the differential equations course that all mathematics majors are expected to take. This course emphasizes the ideas of dynamical systems and makes use of a more sophisticated approach to differential equations. MATH 254 is a differential equations course that is aimed at engineering and science majors. Students with an additional major in engineering or science may ask their math faculty advisors for permission to substitute MATH 254 course for MATH 355 if a scheduling issue arises.

Applied Mathematics Emphasis

A minor in any subject outside of the math department is required with this emphasis.

- Core Courses (listed on p. 27)
- MATH 422 — Advanced Applied Mathematics
- One of the following three sequences:

  1. MATH 454 — Ordinary Differential Equations and Stability Theory
  2. MATH 456 — Applied Partial Differential Equations

  or

  1. MATH 464 — Theory of Probability
  2. MATH 466 — Theory of Statistics

  or

  1. MATH 475A — Mathematical Principles of Numerical Analysis
  2. One course from: MATH 413, 424, 443, 445, 447, 454, 456, 464, 481, 485, or 475B

- One modeling course(*): Either
  - MATH 485 — Mathematical Modeling or
  - MATH 481 — Mathematical Modeling of Fluid Flow through and around Organs and Organisms
- A 5th 400-level MATH course, to be selected with approval from your math faculty advisor. You may choose from the pre-approved list: MATH 412, 413, 424, 454, 456, 464, 468, 475A, 481, 485, 488. If you prefer to select another course, you may do so ONLY if approved by your math faculty advisor.

(*) *MATH 481 is offered only in fall, MATH 485 only in spring. In addition to more typical prerequisites, MATH 485 requires completion of at least one 400-level MATH course (422, 454, 456, 464, or 475A). Prerequisites also include linear algebra (313), differential equations (254 or 355), and a programming course.*

Comprehensive Mathematics Emphasis

This emphasis covers the minimum requirements for admission to most graduate programs in mathematics or applied mathematics. We have separate information on selecting the appropriate emphasis and courses to prepare for various types of graduate programs (see `https://bit.ly/MSciGradPrep`). Students selecting the comprehensive emphasis should consult with a Mathematics Department faculty advisor in choosing additional course work to ensure that they are prepared for the graduate school of their choice. A minor in any subject outside of the math department is required with this emphasis.

- Core Courses (listed on p. 27)
- MATH 413 — Linear Algebra
- MATH 424 — Theory of Complex Variables
- MATH 425A — Real Analysis of One Variable
- MATH 425B — Real Analysis of Several Variables
- One of the following two pairs:

    1. MATH 415A — Introduction to Abstract Algebra
    2. MATH 415B — Second Course in Abstract Algebra

  or

    1. MATH 454 — Ordinary Differential Equations and Stability Theory
    2. MATH 456 — Applied Partial Differential Equations

Students completing this emphasis are expected to be proficient in proof writing before beginning most of the 400-level courses above. It is recommended that students who do not earn an A or B in MATH 323 speak with an advisor about their selected math major emphasis before enrolling in proof-intensive 400-level courses.

Probability and Statistics Mathematics Emphasis

A minor in any subject outside of the math department is required with this emphasis. The math major with probability and statistics emphasis differs from the SDS major in that it gives more theoretical background. Students who wish to attend graduate school in statistics, economics, or another related field are advised to choose this option instead of (or in addition to) the SDS major.
In association with the Graduate Interdisciplinary Program in Statistics and Data Science, we offer an Accelerated Master's Program in Statistics and Data Science. See `math.arizona.edu/academics/undergraduate/requirements/amp` for information.

- Core Courses (listed on p. 27)
- MATH 425A — Real Analysis of One Variable
- MATH 464 — Theory of Probability
- MATH 466 — Theory of Statistics
- One of the following two courses:
  - MATH 468 — Applied Stochastic Processes
  - MATH 413 — Linear Algebra
- A 5^{th} 400-level MATH course, to be selected with approval from your math faculty advisor. You may choose from the pre-approved list: MATH 412, 413, 422, 425B, 454, 456, 462, 468, 485. If you prefer to select another course, you may do so ONLY if approved by your math faculty advisor.

Students completing this emphasis are expected to be proficient in proof writing before beginning their 400-level course work. It is recommended that students who do not earn an A or B in MATH 323 speak with an advisor about their selected math major emphasis before enrolling in 400-level courses.

Mathematics Education Emphasis

This emphasis is for students preparing to teach mathematics at the secondary school level. This emphasis does not require a minor. See the Secondary Math Education Program website (`https://sites.arizona.edu/sme-program/`) for additional information.

- Core Courses (listed on p. 27)
- Courses in Mathematics:
  - MATH 315 — Introduction to Number Theory and Modern Algebra
  - MATH 330 — Topics in Geometry
  - MATH 361 — Elements of Statistics using Calculus
  - MATH 404 — History of Mathematics
  - MATH 407 — Synthesis of Mathematical Concepts
- Courses in Teaching and Learning Mathematics (Pedagogy):
  - MATH 205 — Teaching Secondary Mathematics
  - EDP 301 — Educational Psychology and Child and Adolescent Development
  - SERP 400 — Survey of Exceptional Students
  - TLS 416 — An Introduction to Structured English Immersion(*)
  - TLS 435 — Content Area Literacy in a Multicultural School
  - MATH 406A — Curriculum and Assessment in Secondary School Mathematics
  - MATH 406B — Methods of Teaching Mathematics in Secondary Schools
  - MATH 494C — Student Teaching
- Constitution Requirement for AZ certification — complete one: POL 210 or equivalent; AEPA Constitution exam
- GPA requirements:
  - GPA $\geq$ 2.5 in MATH 122A&B/125, 129, 223
  - Pedagogy GPA $\geq$ 2.5
  - Major GPA and Cumulative UA GPA $\geq$ 2.0

(*) *LCEV 408 — Methods of Teaching English to English Language Learners also fulfills this requirement, but is not currently available to SMEP students at UArizona.*

Computer Science Mathematics Emphasis

A minor in computer science (`https://www.cs.arizona.edu/minor-cs`) is required with this emphasis.

- Core Courses (listed on p. 27)
- One of the following three sequences:

  1. MATH 415A — Introduction to Abstract Algebra
  2. MATH 415B — Second Course in Abstract Algebra

  or

  1. MATH 464 — Theory of Probability
  2. MATH 466 — Theory of Statistics

  or

  1. MATH 475A — Mathematical Principles of Numerical Analysis
  2. One course from: MATH 422, 424, 454, 456, 464, 485, 475B

- One of the following linear algebra courses:

  – MATH 412 — Linear Algebra for Data Science
  – MATH 413 — Linear Algebra

- Two additional 400-level MATH courses from the list, for a total of five distinct courses in the emphasis: MATH 401A, 401B, 402, 412, 413, 415A, 415B, 422, 424, 432, 443, 445, 446, 447, 454, 456, 464, 466, 468, 475A, 485, CSC 473[(*)].

[(*)] *Students minoring in computer science may not double-dip courses with their math major. Students with a double major in C.S. and math may be able to double-dip additional courses between the two majors,* within reasonable limits. *Consult with advisors from both majors when planning your coursework to avoid graduation delays. CSC 473 was formerly cross-listed as MATH 473.*

Economics or Business Mathematics Emphasis

This emphasis requires one of the following:

- one of the following minors from the Eller College of Management: Business Administration, Economics, Finance, Entrepreneurship & Innovation, Marketing, or Sports Management (`https://eller.arizona.edu/programs/undergraduate/academics/minors`), or
- a Personal and Family Financial Planning Minor (`https://cals.arizona.edu/fcs/pffp/minor`), or
- a Thematic Minor (`http://registrar.arizona.edu/academics/thematic-minors`) emphasizing courses from two or more disciplines/subject areas such as Economics, Business, and Finance.
- a second major in any of the above *may* be used to fulfill the minor requirement.(*)

- Core Courses (listed on p. 27)
- MATH 425A — Real Analysis of One Variable
- MATH 464 — Theory of Probability
- Two of the following five courses:
  - MATH 413 — Linear Algebra
  - MATH 425B — Real Analysis of Several Variables
  - MATH 462 — Financial Math
  - MATH 466 — Theory of Statistics
  - MATH 468 — Applied Stochastic Processes
- A 5^{th} 400-level MATH course, to be selected with approval from your math faculty advisor. You may choose from the pre-approved list: MATH 412, 413, 422, 425B, 432, 454, 456, 462, 466, 468, 485. If you prefer to select another course, you may do so ONLY if approved by your math faculty advisor.

Students completing this emphasis are expected to be proficient in proof writing before beginning their 400-level course work. It is recommended that students who do not earn an A or B in MATH 323 speak with an advisor about their selected math major emphasis before enrolling in 400-level courses.

(*) Note that if this major is in a separate degree, you will need a corresponding minor declared in your math degree. Ask your advisor for more information.

Life Sciences Mathematics Emphasis

A minor or major in the biological sciences is required for this emphasis. Possibilities include Astrobiology, Biochemistry, Bioinformatics, Biology, Biosystems Engineering, Ecology & Evolutionary Biology, Environmental Sciences, Medicine, Molecular & Cellular Biology, Pharmaceutical Sciences, Physiology, Physiological Sciences, and Pre-Health Professions, or a thematic minor (`http://registrar.arizona.edu/academics/thematic-minors`) with a life sciences emphasis.

- Core Courses (listed on p. 27)
- MATH 422 — Advanced Applied Mathematics
- One of the following two courses:
  - MATH 454 — Ordinary Differential Equations and Stability Theory
  - MATH 456 — Applied Partial Differential Equations
- MATH 464 — Theory of Probability
- One of the following two courses:
  - MATH 466 — Theory of Statistics
  - MATH 468 — Applied Stochastic Processes
- One modeling course[(*)]: Either
  - MATH 485 — Mathematical Modeling or
  - MATH 481 — Mathematical Modeling of Fluid Flow through and around Organs and Organisms

[(*)] *MATH 481 is offered only in fall, MATH 485 only in spring. In addition to more typical prerequisites, MATH 485 requires completion of at least one 400-level MATH course (422, 454, 456, 464, or 475A). Prerequisites also include linear algebra (313), differential equations (254 or 355), and a programming course.*

Accelerated Masters Programs

Accelerated Masters Programs (AMPs) offer exceptional students the opportunity to begin taking courses toward a Master's degree during their Senior year, while simultaneously finishing off the Bachelor's degree. One additional year of graduate-level course work is needed to complete the M.S.

Applied Mathematics AMP

NEW as of Fall 2024: In association with the Graduate Interdisciplinary Program in Applied Mathematics, we offer an Accelerated Master's Program in Applied Math. See `https://bit.ly/AM_AMP` for details.

Statistics & Data Science AMP

In association with the Graduate Interdisciplinary Program in Statistics & Data Science, we offer an Accelerated Master's Program in SDS. See `https://math.arizona.edu/academics/undergraduate/requirements/amp` for information.

Advising, Activities, and Events

The Math Center

The Math Center supports our undergraduate mathematical sciences degree programs. The Math Center provides advising to math and statistics majors and minors on course selection and program requirements. Additionally, we organize events for undergraduates and provide facilities for undergraduate activities including the MathCats student club.

Be sure to watch for a weekly news email from the Math Center (`math-mcenter@arizona.edu`) that will announce these and other events that may be of interest to you, as well as important academic announcements that you need to be aware of. It may be helpful to add the Math Center email address to your contacts to ensure these messages do not end up in your junk folder. Weekly messages are also archived online (`https://uamathstatmajors.wordpress.com`).

Faculty Advisors

To help you create a course of study best suited to your talents, interests, and goals, faculty members from the Mathematics Department have volunteered to act as advisors for math and statistics majors.

The Math Center sends a special notification twice per year to make sure every one of our majors is aware of their faculty advisor assignment, current GPAs, academic level, and other information pertinent to priority registration. Watch for messages around the end of September and end of February.

As students progress in their major, they are assigned faculty advisors based on the major or emphasis that has been selected. Your advisor will then - and each term thereafter - discuss your educational plans with you and help you set up a program of study. They can provide more helpful information regarding the content and difficulty level of the specialized upper-division courses that you will be taking. For students who have selected a math major emphasis that has a flexible fifth 400-level course, the course selection must be approved by the faculty advisor if not on the pre-approved list. They will also be the one to verify that your math or statistics major is complete when it comes time to graduate.

Your faculty advisor is also a source of information about careers and/or grad-

uate school, and may know of research and internship opportunities within the University and across the country.

College of Science Advising Office

The College of Science Advising Office is also available to assist math and statistics majors. Some of the issues they assist with include: starting (and ending) degree checks, possible granting of the Dean's permission to withdraw from a course after the deadline, assistance with university petitions, or if an urgent matter arises and the Math Center Advising Staff are not available. The College of Science Advising Office is located in the Bartlett Academic Success Center (BASC) Room 417. See `http://science.arizona.edu/academics/academic-advising` for hours and contact info. If your primary major is not in the mathematics department, please consult with your primary college's advising office for assistance with these issues.

Online Knowledge Base

The Math Department has created a knowledge base with answers to many commonly asked advising questions: `https://mathcenter.math.arizona.edu`. If your question isn't answered here, the links at the top of the page may be used to submit questions or request appointments (a response from math-mcenter@arizona.edu can usually be expected within about one business day - sometimes much faster).

Events

The Math Center sends out details about events of interest to our majors through the Weekly News message sent out each Monday during the Fall and Spring semesters. Some of these events are put on *specifically for mathematical sciences majors* – some of them are even organized or sponsored by the Math Center itself, and may be listed on our departmental events page (`https://www.math.arizona.edu/calendar/`). But we also share other events that we believe to be of special interest to our majors. Weekly News messages are archived here (`https://uamathstatmajors.wordpress.com/`). If you have an event that may be of interest to other undergraduates, feel free to submit it to `math-mcenter@arizona.edu` for possible inclusion in the calendar.

The MathCats Club

MathCats is the undergraduate club for students of all majors who are interested in mathematics. It provides opportunities for students to get to know each other, share experiences, have fun, and help each other succeed. `https://sites.google.com/arizona.edu/mathcats`

The Risk Runners Actuarial Club

Risk Runners is the undergraduate club for students of all majors who are interested in actuarial science and careers. The purpose of the club is to connect members to the broader actuarial community and help members pass actuarial exams. `https://math.arizona.edu/academics/undergraduate/opportunities-undergrads/student-clubs-and-organizations`

New Major Colloquium

New Freshmen/first-year students may benefit from enrolling in DATA or MATH 195M, the 1-unit colloquium designed for new majors in Mathematics or Statistics and Data Science. It is a seminar-style course designed to introduce math department majors to the mathematical community at large and build students' written and oral communication skills, especially on math-related topics. Students will learn the typesetting program LaTeX , which is used by mathematicians and statisticians when writing papers and articles, and many of our advanced undergraduates like to use it for their homework. Interested? Ask the Math Center for more information!

Career Exploration Seminar

The *Career Exploration in Mathematics and Data Science Seminar*, MATH 395M is a 1-unit course designed to introduce math department majors to undergraduate research, the application process for research, internships, and graduate school, and career preparation. Students in this course will be exposed to current topics of research interest in math and data science, understand how to apply for research and internship opportunities, learn about various types of graduate programs in the mathematical sciences and how to apply, and more.
The seminar is open to all undergraduates who have completed at least one course from MATH 323, MATH 355, or DATA 363. MATH 395M carries one unit of

upper-division elective credit.
Students considering writing an honors thesis in math or statistics are encouraged to enroll in the research seminar prior to or during the term in which they will plan their honors thesis.
For further information about the seminar, please contact the Math Center.

Mu Sigma Rho

Mu Sigma Rho is a statistics honor society whose purpose is to celebrate those who have made significant academic achievements within the field of statistics. Students who meet the eligibility requirements can join the society for free thanks to sponsorship by our Graduate Interdisciplinary Program in Statistics & Data Science. `https://sites.google.com/math.arizona.edu/ua-mu-sigma-rho/home`

Putnam Competition

The first Saturday in December, some UA undergraduate students participate in the William Lowell Putnam Mathematical Competition (`http://math.scu.edu/putnam/`), a national contest sponsored by the Mathematical Association of America (MAA). The competition consists of two 3-hour sessions, during each of which each student individually attempts to solve six problems. The exam is designed to test originality and creativity in mathematical thinking. The MAA maintains a list of top participants (`http://maa.org/awards/putnam.html`) from past competitions.

Problem–Solving Laboratory

The *UA Mathematics Problem–Solving Laboratory* meets informally once a week to ponder challenging mathematical problems and learn important techniques for solving them. A knowledge of calculus is necessary for some problems, but many problems require only insight and ingenuity.
All UA undergraduate students are welcome to participate. For Fall 2024, we anticipate that the group will not be meeting. Watch for announcements for future semesters!

Mathematical Sciences Colloquia

The School of Mathematical Sciences organizes various colloquia, seminars, and other talks throughout each semester. Whenever such an event is specifically aimed at undergraduate majors, it is well-publicized and listed on our calendar. However, in general, the colloquia series are always aimed at a wide audience, and undergraduates should consider attending these talks. `https://math.arizona.edu/calendar`

Mathematics / Applied Mathematics / Statistics Colloquia

At least twice a week, talks are presented by distinguished mathematicians from the University of Arizona and other institutions around the world. Coffee, tea, and cookies are usually served beforehand. These events provide an opportunity to rub shoulders with faculty members and to see famous mathematicians in action.

TRIPODS Seminars

TRIPODS is a set of research groups dedicated to developing theoretical foundations in data sciences. They hold weekly talks on relevant projects and research, which are often accessible to undergraduates. Pizza is usually served. These talks can give students an idea of the most recent research being conducted in interdisciplinary data sciences. See `http://tripods.arizona.edu` for more information.

Math Instruction Colloquium

This is a colloquium for anyone interested in mathematics education, which includes mathematics undergraduates, graduate students, post-docs, faculty, and local school teachers. Techniques, strategies, and course content in the teaching of mathematics are discussed by participants and by leading educators invited from the outside.

Graduate Student Colloquium

The math department graduate students organize a weekly colloquium, often on topics accessible to undergraduate students. The speakers are usually graduate students presenting aspects of their own research. The atmosphere is generally rather informal.

Applied Mathematics Brown Bag Colloquium

The graduate students in the Interdisciplinary Program in Applied Mathematics organize a weekly colloquium, often on topics accessible to undergraduate students. The speakers are usually graduate students presenting aspects of their own research. The atmosphere is generally rather informal.

Daniel Bartlett Memorial Lecture

The annual Bartlett Memorial Lecture gives the public a window into the nature of mathematics by illustrating the work of renowned mathematicians to general audiences. Learn more and view past presentation at `https://math.arizona.edu/engagement/general-public/bartlett`

Opportunities for Mathematical Sciences Majors

Getting involved in activities outside of the classroom will help you make the most of your university experience. Whether you choose research, volunteer activities, clubs, internships, teaching or tutoring, other activities, or a combination of these, these experiences are not only resume builders, but also aid in forming and clarifying future goals.

Department-level Opportunities

See `https://math.arizona.edu/academics/undergraduate/opportunities` for details.

Undergraduate Research

Our Undergraduate Research Assistant (URA) program provides opportunities to earn money or credit while engaging in research. You might furthermore have an opportunity to present your research at a conference such as SUnMaRC (`http://sunmarc.org/`).

Undergraduate Teaching Opportunities

Our Undergraduate Teaching Assistant (UTA) programs provide opportunities to earn money and/or preceptorship credit (DATA/MATH 391 or 491) while engaging in teaching-related activites. The department also runs an Undergraduate Learning Assistant (ULA) program to support lower-division courses, as well as a Grader program.

Peer Mentorship

Peer mentors are upperclass majors in our department who meet with a small group of incoming students throughout their first year to support their transition to the University. Mentors are paid for their time.

Tutoring Jobs

The Center for Recruitment and Retention of Mathematics Teachers (`http://crr.math.arizona.edu/`) offers an opportunity to observe dynamic teaching, attend tutor preparation classes for a credit, and tutor middle and high school students for pay. Other locations on campus that offer tutoring services might also have job opportunities. For a current listing, see the math department tutoring page (`http://math.arizona.edu/academics/tutoring`).

Honors

The Franke Honors College (`https://frankehonors.arizona.edu/`) administers an honors program where students can graduate with honors in a major or minor field. Graduating with honors requires acceptance to the Honors College, a minimum number of units of honors course work, and successful completion of an honors thesis.

Honors Course Work: 30 units of honors course work are usually required; consult an Honors Advisor for more information.

Due to Honors College restrictions, we have very few honors classes available in the Math Department. Students may choose to contract for honors in DATA/MATH courses; in addition, Juniors and Seniors in the Honors College may also (with appropriate approvals) take 500-level graduate courses for undergraduate honors credit. Non-honors Seniors with strong GPAs may also be able to take 500-level courses. Talk to your advisor for more information.

Honors Thesis: Students considering an honors thesis in mathematics or statistics/data science should consult with the Math Center early on for suggestions to find a project idea and help connect with a faculty member to supervise your research. Taking DATA/MATH 395M (see p. 38) can be a good way to find a thesis topic and mentor.

University-level Opportunities

There exist many research-related and teaching-related opportunities on the UA campus. This section lists some of the more prominent of such activities.

The University of Arizona Office of Undergraduate Research website (`http://ur.arizona.edu/`) can help you find research opportunities around the U of A, and will help you connect with projects in your area of interest.

Undergraduate Biology Research Program

To learn more, please visit the Undergraduate Biology Research Program website (`http://ubrp.arizona.edu/`).

UA NASA Space Grant Program

To learn more, please visit the NASA Space Grant Program website (`http://spacegrant.arizona.edu/opportunities/internships/`).

UA Summer Research Institute

This program, although run by the UA Graduate College, offers opportunities for undergraduate students. To learn more, please visit the Summer Research Institute website (`http://grad.arizona.edu/sri/`).

Teaching Teams Program

The primary goal of the Teaching Teams Program (TTP) is to improve learning on the campus of the University of Arizona. They do this through the creation of a Teaching Team which includes Instructors, Graduate Teaching Assistants (GTAs), and student peer assistants. These student peer assistants are called Preceptors. To learn more about becoming a Preceptor, see the Teaching Teams Program website (`https://teachingteams.arizona.edu/about`).

UA Student Engagement and Career Development

UA's Office of Student Engagement and Career Development (`http://www.career.arizona.edu/`) assists current UA students and alumni in their transition to life outside the university. This includes preparation for careers or graduate school, help finding and landing internships and other career-related experiences, and career exploration. The LifeLab holds open office hours where students can drop in for career exploration, resume review, interview practice, and more. See `https://career.arizona.edu/lifelab` for details.

College of Science Career Center

The College of Science Career Center (`http://science.arizona.edu/academics/career-center/`) provides the resources and support to address the unique and changing

needs and opportunities of all students in the College of Science. They work with University, employer, community, and alumni partners to offer career and professional development opportunities to enable students to pursue their career goals.

Internships and Outside Programs

Internships

UA Career Services is the most up-to-date source for information on internships available to students. They can also help critique your resume, hone your interview skills, and more. Internships are a great way to gain work-related experience prior to graduation, and in some cases, they have led to offers of permanent jobs for our students after they graduate.
Students who already have an internship lined up may earn credit for the experience through the A Center internship program: `https://theacenter.arizona.edu/internships/information-session`.

Summer Programs

A wide variety of summer research programs, known as Research Experiences for Undergraduates (or REUs), exist for mathematical sciences majors. Many of these programs not only provide experience that can help students land a job (or graduate school offer) after graduation, they frequently also pay students to participate! Many of the programs require computer programming experience, so it is recommended that students fulfill their math major computer programming requirement early on in their undergraduate careers. For more information about the types of programs available, see our website (`https://math.arizona.edu/research/undergraduates`).

Semester Programs

Opportunities also exist for mathematical sciences majors to spend a term studying at another institution, either in the United States or abroad. A list of some programs with a strong mathematical focus can be found on our website (`https://math.arizona.edu/research/undergraduates`).

Scholarships and Financial Aid

Scholarships

Continuing mathematical sciences majors may be able to apply for a scholarship from the Department of Mathematics. Amounts vary from year to year and may depend on academic performance, financial need, and availability of funds. Past awards have ranged from $100 to $2000. When scholarships are available, information about how and when to apply will be sent out to our majors and posted on our website (`https://math.arizona.edu/academics/undergraduate/scholarships`). Students are also encouraged to check the University's Scholarship-matching program frequently for additional scholarship opportunities (`https://scholarshipuniverse.arizona.edu`).

Scholarships for Mathematics Education students

Some special scholarships are available specifically to students in the Secondary Mathematics Education Program. In particular, the Arizona Teachers Academy fully funds teacher education with a commitment to teach full-time in a public or charter school in Arizona for as many years as they received Academy funding.

Financial Aid

The Office of Scholarships and Financial Aid (`http://financialaid.arizona.edu/`) has the most complete information about scholarships, grants, loans, and other ways to help finance your education.

For More Information
Contact the Math Center:
math-mcenter@arizona.edu
math.arizona.edu/academics/undergraduate/advising

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