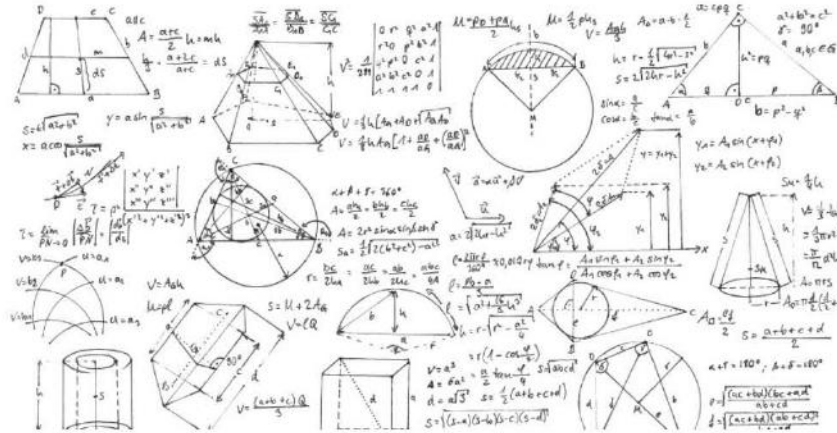


THE 8 UNDERGRADUATE MATHEMATICS MAJORS

DEPARTMENT OF MATHEMATICS
UNIVERSITY OF CALIFORNIA, SAN DIEGO

2017-11-21



PRESENTATION OBJECTIVES

- What you will learn:
 - 1) Name, major code, degree for each undergraduate major
 - 2) Questions to ask yourself when choosing a major
 - 3) Purpose of each major
 - 4) Some information about possible career paths
 - 5) Basic information about each major's curriculum

Do not expect this (nor any) presentation to tell you every possible thing there is to know about the topic



DEPARTMENT OF MATHEMATICS UNDERGRADUATE MAJORS, CODES, DEGREES

- (1) Major in Mathematics (“Pure Mathematics”); MA29; B.S.
- (2) Major in Applied Mathematics; MA27; B.S.
- (3) Major in Mathematics—Scientific Computation; MA34; B.S.
- (4) Major in Probability and Statistics; MA35; B.S.
- (5) Major in Mathematics—Applied Science; MA31; B.S.
- (6) Major in Mathematics—Computer Science; MA30; B.S.
- (7) Joint Major in Mathematics and Economics; MA33; B.S.
- (8) Major in Mathematics—Secondary Education; MA32; B.A.

Mathematics Honors Program open to anyone in above majors who qualifies

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FIRST BASIC QUESTIONS TO ASK

- **Do I enjoy upper division mathematics?**
- **Do I feel excited to study mathematics every day?**

- Do not choose a major whose subject(s) you are not passionate about
- Interest in calculus is insufficient indicator of how much you will like upper division mathematics
- Upper division mathematics (algebra, analysis, geometry, topology, probability, statistics) is far more abstract than lower division calculus; you may or may not enjoy it

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SECOND BASIC QUESTION TO ASK

- **Do I have an excellent aptitude for upper division mathematics?**
- Mathematics majors were designed with assumption that students excel in the subject
- Doing well in lower division mathematics does not guarantee strong aptitude for upper division mathematics
- Talk to faculty members and graduate students who teach upper division mathematics; ask for their comparisons of lower division versus upper division

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THIRD BASIC QUESTION TO ASK

- **What future can a particular major and degree help me attain?**
- Each major has different objectives
- For some majors, graduate school is the natural next step
- For some careers, at least one graduate degree is essential
- For other majors, going straight to industry is possible, but usually a meaningful internship is wise to complete in advance
- Before getting your hopes up for a certain career based on assumptions of what it would be like, talk to people who are (or have been) in that career and get their impressions

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FOURTH BASIC QUESTION TO ASK

- **Will the career I want still be around when I graduate?**
- Some careers are based on fads that will pass in a few years and/or funding that will not last indefinitely
- Have candid conversations now with advisors and career professionals who can give you their thoughts on future sustainability of the career path that you want
- In summary, plan ahead

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UC SAN DIEGO GENERAL CATALOG

- Every student should be familiar with the UC San Diego General Catalog:
<http://www.ucsd.edu/catalog/>
- The General Catalog contains:
 1. Curricula for all majors offered by the campus
 2. Descriptions for all courses offered by the campus
 3. Campus, college, and department academic policies
- When requesting to graduate, departmental advisor will review your completed coursework to see whether requirements of your major (per General Catalog when you started at UC San Diego or any Catalog published since then) have been met

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① MAJOR IN MATHEMATICS (MA29), B.S. (ALSO KNOWN AS “PURE MATHEMATICS”)

- Helps prepare for graduate study of mathematics
- Pursue undergraduate research if you want to go to graduate school
- Major has fewest specific course requirements of Department’s 8 majors
- A student can personally shape curriculum by taking 6 to 8 upper division mathematics electives of their choosing
- Suggest choosing electives that show intelligent planning, not taking whatever is easiest or fits into your schedule
- Required: At least 2 courses in abstract algebra and at least 2 in real analysis
- Advice: To prepare for graduate school, take both 3-quarter rigorous sequences in abstract algebra (MATH 100A-B-C) and in real analysis (MATH 140A-B-C)

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② MAJOR IN APPLIED MATHEMATICS (MA27), B.S.

- *Applied mathematics* can mean different things at different mathematics departments
- Applied mathematics here combines pure mathematics with at least 2 courses in probability, statistics, numerical analysis depending on student’s preference
- Can take up to 12 upper division units in approved mathematical area(s) from other department(s) such as computer science, engineering, economics, physics, chemistry, and cognitive science with approved petition
- Major can lead to graduate study in applied mathematics. (We recommend rigorous sequences in abstract algebra (MATH 100A-B-C) and real analysis (MATH 140A-B-C) and undergraduate research if student is planning on graduate school).
- Major can be partial preparation for data analysis working environment, actuarial work, depending on software packages and computing languages applicant is skilled in
- Internship strongly recommended if non-academic career desired

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③ MAJOR IN MATHEMATICS—SCIENTIFIC COMPUTATION (MA34), B.S.

- Combines pure mathematics with computing methods for solving scientific problems
- Required: Variety of courses in linear algebra, real analysis, numerical analysis, optimization, scientific computing
- Can take up to 12 upper division units in approved scientific computation area(s) from other department(s) in sciences or engineering with approved petition
- Major could be partial preparation for scientific or engineering working environment
- Should strive for stellar performance on project in MATH 179 “Projects in Computational and Applied Mathematics”; could lead to excellent letter of recommendation
- Internship strongly recommended if non-academic career desired

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④ MAJOR IN PROBABILITY AND STATISTICS (MA35), B.S.

- Required: Several courses in probability theory and statistics, and some in linear algebra, real analysis, numerical methods, computational statistics, computing
- Can take up to 8 upper division units in approved mathematical area(s) from other department(s) with approved petition
- Major can be preparation for graduate school in probability/statistics
- Recommended: Rigorous coursework in real analysis if planning on graduate study
- Major can lead to employment where statistics strongly needed if student is strong in advanced statistics and computing. Examples: Psychology, sociology, political science research setting, data science, actuarial professions
- Internship strongly recommended if non-academic career desired

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⑤ MAJOR IN MATHEMATICS—APPLIED SCIENCE (MA31), B.S.

- Like a joint major (effectively two half majors) in mathematics and 1 or 2 scientific fields of student's choice such as physics, biology, chemistry, biochemistry, cognitive science, computer science, economics, management science, engineering
- Required upper division mathematics: 28 units including in linear algebra, real analysis
- Required upper division applied science: 28 units from 1 or 2 other department(s). (At least 12 units must have calculus as prerequisite.)
- *Applied science* courses should be selected thoughtfully based on career goals, not according to what is easiest and/or will allow fastest graduation
- All coursework from outside department must have undergraduate advisor approval
- Internship strongly recommended if non-academic career desired
- Major is not good preparation for graduate school

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⑥ MAJOR IN MATHEMATICS—COMPUTER SCIENCE (MA30), B.S.

- Study mathematical theory and methods behind using computer science to solve problems
- *Although some overlap with computer science curricula, this major not equivalent to Computer Science and Engineering Department majors*
- Required: Lower division programming courses, abstract algebra, introduction to probability/statistics, combinatorics, at least 3 upper division computer science courses
- Can take additional 16 units of upper division computer science electives from short list (see curriculum for major in General Catalog!) so that 28 of upper division units are in mathematics and 28 are in computer science; then would be like joint major
- Recommended: Learn more on your own about software and programming languages than limited content learned in classes
- Internship strongly recommended
- When applying for jobs, emphasize in cover letter what programming languages you are proficient in and how you can contribute mathematical value to a computing job setting. Cryptography, for example, uses mathematical techniques.

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⑦ JOINT MAJOR IN MATHEMATICS AND ECONOMICS (MA33), B.S.

- Duplicate major (code EN28) exists in economics department. Difference is which department your advisors are in and which department you receive general email from. (Example: We mail information about jobs, scholarships, internships, etc. only to students in mathematics department).
- Major requires 15 upper division, 4-unit courses, with minimum 7 in each of mathematics and economics departments
- For upper division mathematics: Minimum 28 units required; lots of choices
- For upper division economics: Minimum 28 units required; some choices
- Major's purpose: Provide foundation for graduate study in economics
- *Not* equivalent to double major in mathematics and economics. (Note: Some students double major in applied mathematics and economics in preparation for graduate school.)

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⑧ MAJOR IN MATHEMATICS—SECONDARY EDUCATION (MA32), B.A.

- Provides foundation for becoming high school teacher
- Do not select this major because you want an “easy math degree”
- *Caution: This major/degree alone will not qualify you to teach in California public schools*
- See uc San Diego Department of Education Studies for more details about education needed to become teacher: www.eds.ucsd.edu.
- For full details on qualifications to become high school teacher in California, go to California Commission on Teacher Credentialing:

<http://www.ctc.ca.gov/credentials/teach-secondary.html>

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DEPARTMENT OF MATHEMATICS HONORS PROGRAM

- Program is open to high-achieving students in any mathematics major
- Taking honors calculus sequence (MATH 31AH-BH-CH) is *not* required for honors program
- Qualifications for honors program include:
 1. Junior or senior standing; and
 2. Completing mathematical reasoning (MATH 109) and at least one course in abstract algebra (MATH 100A or 103A) or real analysis (MATH 140A or 142A); and
 3. Overall GPA 3.0+ and major GPA 3.5+.
- Attend colloquium; complete honors thesis (over 2 quarters under faculty supervision) to be presented at student conference or on other suitable occasion
- Joint Mathematics/Economics majors must also take economics honors course
- See Department of Mathematics undergraduate website for full details and PDF's of past theses: <http://www.math.ucsd.edu/programs/undergraduate/>

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FINAL ADVICE

- Choose a major not based only on what sounds interesting, or on what you enjoyed in high school, but on what you can excel at in upper division coursework and will help you reach career goals
- Look for job advertisements at companies in your field of interest. What are major/degree qualifications?
- A meaningful internship may greatly impress potential future employers; internships completed through uc San Diego Academic Internship Program (AIP) are noted on student's transcript
- If planning on graduate school, you may be more attractive applicant if involved in research as undergraduate student
- Make most of time at uc San Diego. Get to know professors, advisors, teaching assistants. Establish great reputations and professional relationships long before requesting letters of recommendation.

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