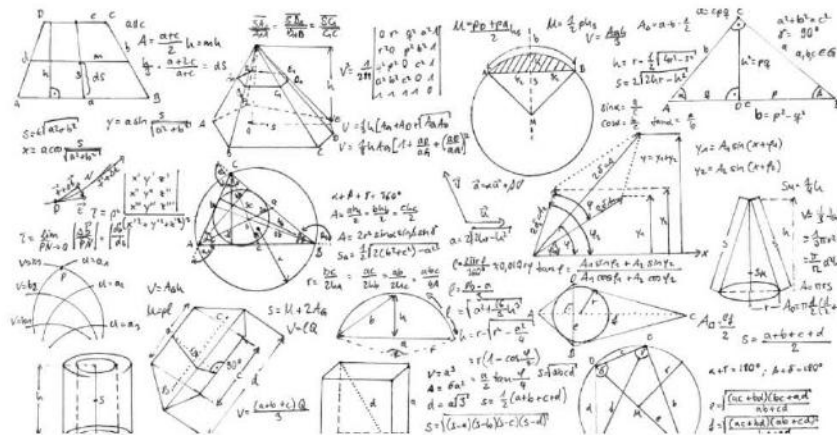


# MAJOR IN MATHEMATICS—COMPUTER SCIENCE

DEPARTMENT OF MATHEMATICS  
UNIVERSITY OF CALIFORNIA SAN DIEGO

2017-05-01 (REVISED 2017-05-02)



## PRESENTATION OBJECTIVES

- 1) Purpose of Major in Mathematics—Computer Science (B.S.; MA30)
- 2) Summary of major's curriculum
- 3) Possible graduate school and career path options

*Do not expect this (nor any) one presentation to cover every possible thing there is to know about a topic*



## BASIC QUESTIONS TO ASK WHEN CONTEMPLATING THIS MAJOR

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- **Am I excited to study mathematics and computer science every day?**
  - Bad to choose major whose subject you are not passionate about
  - Interest in calculus is insufficient indicator of liking for upper division mathematics
  - Abstract algebra, probability/statistics, combinatorics, numerical methods are far more abstract than lower division mathematics; you may or may not enjoy them
  
- **Do I have excellent aptitude for upper division mathematics and computer science theory (not just computer programming)?**

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## MAJOR IN MATHEMATICS—COMPUTER SCIENCE (B.S.; MA30)

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- Objective of major: Prepare students for graduate study in computer science. (Most students pursue employment in computer science, data science, rather than graduate school.)
- For graduate study in computer science, we suggest...
  - Taking MATH 100A-B-C and, if able to do well in them, relevant graduate level courses
  - Applying to Department of Mathematics Honors Program (see <http://www.math.ucsd.edu/programs/undergraduate/>)
  - Doing a reading (MATH 199) with a faculty member
- For career preparation in computer science, we recommend...
  - An internship; the longer the assignment and more meaningful the work, the better
  - Making your projects in coursework worth showcasing to potential employers. (Some employers assign applicants a project before deciding whether to hire.)
- Languages, software, operating systems to be used in major's coursework: Java, UNIX, C, C++, Assembly languages, STL, Haskell (optional), Ada, PROGLOG, ML, Matlab

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## GENERAL CAREER POSSIBILITIES

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- B.S. in Mathematics–Computer Science is good start for basic understanding of mathematical theory used with computers to solve problems
- Master's in computer science is good preparation for more employment options and where greater computational theory is valued
- Some hiring personnel not concerned with applicants' majors. Why? Big difference between most classroom work and real life applications.
- Important to show hiring personnel that...
  - You bring practical experience with mathematical methods, languages, software
  - You have completed projects and can show results
  - You did more than minimum in coursework assignments
  - You are useful in specific sectors (example: you took MATH 187A-B and understand mathematics behind cryptography)

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## CURRICULUM (1/2)

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- **Official source for all Department of Mathematics curricula is UC San Diego General Catalog:** <http://www.ucsd.edu/catalog/curric/MATH-ug.html>
- When requesting to graduate, department advisor will review your completed coursework to see whether requirements of major (per General Catalog when you started at UC San Diego or any Catalog published since then) have been met
- **Lower Division Coursework**
  - Calculus (MATH 20A-B-C-D-E)
  - Linear algebra (MATH 18 or MATH 20F)
  - JAVA Programming (CSE 8A-B or CSE 11 or ECE 15)
  - Basic Data Structures and Object-Oriented Design (CSE 12)
  - Software Tools and Techniques Laboratory (CSE 15L)
  - Computer Organization and Systems Programming (CSE 30)

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## CURRICULUM (2/2)

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- **Upper Division Coursework**

- Mathematical Reasoning (MATH 109)
- Abstract Algebra (MATH 103A-B or MATH 100A-B)
- Introduction to Probability (MATH 180A) or Statistical Methods (MATH 183)
- Combinatorics (MATH 184A) or Discrete Mathematics and Graph Theory (MATH 154)
- Theory of Computability (CSE 105)
- Computer Implementations of Data Structures (CSE 100)
- Design and Analysis of Algorithms (CSE 101)
- 8 units from list of numerical analysis courses. (Note: MATH 179 is project-based). By petition, MATH 171A-B are acceptable.
- 8 units from list of mathematics and computer science courses. (MATH 187A-B are ok.)
- 8 units from additional list of mathematics courses or from last two lists

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## DEPARTMENT OF MATHEMATICS HONORS PROGRAM

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- Open to high-achieving students in any mathematics major
- Great preparation for graduate school
- Honors calculus sequence (MATH 31AH-BH-CH) *not* required for 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 (MATH 196); 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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## INTERNSHIPS

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- When hiring for a career position, company representatives want to know that candidate...
  - Is capable of practical work, not just academic study
  - Enjoys the practical side of an area of study
  - Is easy to work with
- A meaningful internship...
  - Allows employer to try you out without making long-term commitment
  - Is chance for you to show character, skills, aptitude, whether you like practical applications
  - Should result in at least one excellent letter of recommendation
  - Might lead to career employment through same employer
- You can look for internships on own at “careers” or “jobs” links at company web sites, via UC San Diego’s Port Triton, or in UC San Diego Academic Internship Program (AIP) database. (AIP internships get noted on student’s transcript.)
- Company representatives come to campus career fairs; have also been invited to Department of Mathematics for special presentations on internships/careers

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## MORE ON CAREER CONSIDERATIONS

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- Students frequently ask, *What job can I get if my major is \_\_\_\_\_ ?*
- No easy answer to that question
- Hiring managers and other employer representatives have different motivations, interests
- Some do not care what undergraduate major a candidate has, nor how high GPA is
- Others are on other end of spectrum, where major and GPA are paramount
- Some greatly value extra-curricular accomplishments
- Definitely valued by employers are (1) meaningful internships, and (2) character issues
- During schooling, ask yourself,
  - What skills/character am I developing that an employer might value?
  - What knowledge (mathematical methods, languages, software) am I *mastering*?
  - What professional relationships am I establishing and maintaining while in school that could help me when I need an internship or career position?

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## FINAL ADVICE

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- 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?
- Consult reputable sources for information rather than guessing. (Example: Data science might be popular, but do you really understand what it is? What qualifications necessary to become data scientist? What types of problems do data scientists solve?)
- If planning on graduate school, you may be more attractive applicant if involved in research as undergraduate student
- Make the most of time at uc San Diego
  - Get to know professors, advisors, teaching assistants
  - Establish great reputations and professional relationships with above people and others long before requesting letters of recommendation

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