

CAREERS IN MATHEMATICS

What SDSU Can Do To Help You Prepare For Your Best Career

Are there good careers available to mathematics majors?

- ◎ From the Wall Street Journal, January 5 2009, the three top-rated jobs are:
 - Mathematician (Applied)
 - Actuary
 - Statistician

How do those careers match up against opportunities in the SDSU Math/Stat Department?

◎ Pretty well!

Career choice	SDSU Math/Stat track
Applied Mathematician	Computational Science
Actuary	Financial Engineering
Statistician	Statistics

What characteristics should you have to pursue a career in mathematics?

- ① You should enjoy solving problems and figuring things out (not just mathematically)
- ① You should enjoy math and be good at it.
- ① You DON'T have to be a math genius!
- ① You should be persistent and able to work hard.
- ① You should have good communication skills (verbal and written).

What are the salary ranges for careers in mathematics?

- Salaries vary significantly by career choice.
- K-12 math teacher salaries are \$25K - \$50K
- Financial engineer salaries are \$50K - \$200K, and in some cases MUCH higher
- Typical non-teaching salaries after a few years experience are \$60K - \$80K
- With a Master's Degree in Math, Statistics, or Financial Engineering the typical range rises to \$70K - \$120K or slightly above.

What are the prospects for getting a job in mathematics today and in the future?

- ⦿ There has been a shortage of quantitatively skilled people in the U.S. for years.
- ⦿ The shortage is growing as new industries and scientific fields discover the value of mathematics and statistics.
- ⦿ This creates very positive employment prospects for people with degrees in mathematics and statistics.

Five Concentration Areas of the SDSU Math/Stat Department

- ⦿ Computational Science
- ⦿ Financial Engineering
- ⦿ Mathematics Education
- ⦿ Statistics
- ⦿ Other (pure math, double major, ...)

Computational Science

What is it?

- Computational scientists use high-performance computers to solve the large, complicated problems that arise when mathematics and statistics are applied in modern science, engineering, medical, and business settings.

Computational Science

What kind of problems are solved?

- ⦿ Maximizing reward/risk ratios in investments
- ⦿ Designing drugs for pharmaceutical companies
- ⦿ Designing an improved mechanical hand
- ⦿ Predicting disease spread after bioterrorism attack
- ⦿ Optimizing traffic flow patterns in a city
- ⦿ Creating more realistic movie animation techniques
- ⦿ Optimizing production in an automobile factory
- ⦿ Analyzing global climate change
- ⦿ Determining best forest management strategy
- ⦿ Creating alternative biofuel production methods

Computational Science

Who hires computational scientist?

- Government labs like Oak Ridge National Lab and Argonne
- Government agencies like the NSA, CIA, and NASA
- Large state and municipal governments
- Computer service and software firms like Adobe and Microsoft;
- Computer animation firms like Industrial Light and Magic
- Energy systems firms like Lockheed-Martin Energy Research Corp
- Electronics and computer manufacturers like IBM, Philips, Motorola.
- Aerospace firms like Boeing
- Auto manufacturers like Ford and GM
- Financial services firms like Citibank, Morgan Stanley, and Prudential
- Communications services providers like AT&T, Verizon, and Qwest
- Chemical or pharmaceutical firms like Kodak, DuPont, and Merck
- Petroleum producers like Amoco and Exxon
- Consumer product manufacturers like Proctor and Gamble

Computational Science

Are internships available?

- **Corporate**

- AT&T Laboratories – Research

- Bell Labs, Alcatel-Lucent

- The Boeing Company

- Birkhäuser

- Booz Allen and Hamilton

- General Motors Corporation

- Hewlett-Packard

- IBM Corporation

- Lockheed Martin

- Mentor Graphics

- Merck & Co

- NEC Laboratories America, Inc.

- Palo Alto Research Center

- Philips Research

- Proctor and Gamble

- Schlumberger-Doll Research

- SIAC

- Springer

- **Government and Non-Profits**

- The Aerospace Corporation

- Air Force Office of Scientific Research

- American Institute of Mathematics

- Argonne National Laboratory

- Institute for Defense Analyses

- Johns Hopkins Applied Physics

- Lawrence Livermore Laboratory

- Los Alamos National Laboratory

- Mathematical Sciences Research

- Institute

- The MITRE Corporation

- NASA

- NIST

- National Security Agency

- Naval Surface Warfare Center

- Oak Ridge National Laboratory

- Sandia National Laboratories

- United States Department of Energy

- U.S. Army Corps of Engineers

Computational Science

How do I get a job?

- ⦿ Start with a Bachelor's Degree in Mathematics
- ⦿ Add additional computational science and applied mathematics courses as recommended by the Math/Stat Dept
- ⦿ Get an internship
- ⦿ Get a job!

Financial Engineering

What is it?

- Financial engineers use mathematical, statistical, and computational tools to solve problems originating in the world of finance.

Financial Engineering

What problems are solved?

- ⦿ Business strategy development
- ⦿ Financial product development
- ⦿ Financial scenario simulation
- ⦿ Forecasting
- ⦿ Risk management
- ⦿ Portfolio structuring and management
- ⦿ Derivative securities valuation
- ⦿ Reserves management

Financial Engineering

Who hires financial engineers?

- ⦿ Consumer Banks
- ⦿ Commercial Banks
- ⦿ Credit and Prepaid Card Companies
- ⦿ Hedge funds
- ⦿ Insurance companies
- ⦿ Investment firms
- ⦿ Government agencies
- ⦿ Corporate and business finance divisions

Financial Engineering

Are internships available?

- ◎ Yes, both nationally and locally
- ◎ Local internship providers include:
 - First Bank and Trust (Brookings)
 - Daktronics (Brookings)
 - CAPITAL Card Services (Sioux Falls)
 - Wells Fargo (Sioux Falls)
 - Meta Payment Systems (Sioux Falls)
 - Cortrust Bank (Mitchell)
 - ...and many others

Financial Engineering

How do I get a job?

- Start with a Bachelor's Degree in Mathematics
- Add additional financial mathematics and statistics courses
- Add software tools, Econ, Accounting, Business and Finance courses as recommended by the Math/Stat Department
- Get an internship
- Get a job!

Mathematics Education

Why should I become a math teacher?

- ⦿ Q: If math teaching salaries are lower than salaries in other mathematics careers, why should anyone want to be a math teacher?
- ⦿ A: Over the course of a career as a math teacher, you can have a positive impact on the lives of hundreds or even thousands of young people. If this is important to you, no amount of extra money associated with choosing a different mathematics career can replace it.

Mathematics Education

How do I become a math teacher?

- Start with a Bachelor's Degree in Mathematics
- Take Education courses leading to a Specialization in Mathematics Education
- Complete a Student Teaching experience
- Get a job!

Statistics

What is it?

- Statisticians use mathematical and computational techniques to draw useful information and conclusions from large data sets.

Statistics

Who hires statisticians?

- ⊙ Anybody who has data, which means practically everybody!
- ⊙ Business
- ⊙ Industry
- ⊙ Government
- ⊙ Research organizations
- ⊙ Especially prevalent in the biological, biotech, and health sciences, and the financial services industry.

Statistics

Are internships available?

Local/Regional

- Financial services firms (1st Bank & Trust, Wells Fargo, ...)
- Businesses (Daktronics, ...)
- Mayo Clinic
- National Agricultural Statistics Service (Sioux Falls)

National

- U.S. Census Bureau
- NASA
- National Institute of Standards and Technology
- DOE

Statistics

How do I get a job?

- Start with a Bachelor's Degree in Mathematics.
- Add additional statistics courses as recommended by the Math/Stat Department.
- Get an internship.
- Get a job!

Other Career Tracks

- ⦿ Graduate school
- ⦿ Pure mathematics
- ⦿ Double Major

Graduate School

- ⊙ Two types of graduate school:
 - Applied MS/PhD Math/Stat programs
 - Pure MS/PhD Math/Stat programs
- ⊙ Very roughly speaking:
 - Applied math & stat focuses on the use of existing knowledge to solve new problems.
 - Pure math & stat focuses on the creation of new knowledge without regard to applicability.
- ⊙ Practically speaking, there is much overlap between these two types of math.

Pure Math/Stat Graduate School

- ◎ Who hires pure mathematicians/statisticians?
 - Universities
 - High-Tech firms (Google, Microsoft, ...)
 - Government agencies (NSF, NIH, DOE, ...)
 - Large-scale business and industry
 - National laboratories (Argonne, Oak Ridge,...)

Pure Math/Stat Graduate School

- ① Undergraduate internships are not common.
- ② REU's (Research Experience for Undergraduates) and on-campus undergrad research opportunities ARE available.
- ③ Also, research oriented graduate programs offer graduate research or teaching assistantships that serve somewhat the same purpose as internships.

Pure Math/Stat Graduate School

- Start with a Bachelor's Degree in Mathematics
- Take plenty of extra upper level mathematics and statistics courses as recommended by the Math/Stat Department
- Get an MS & PhD in either Math or Stat
- Possibly obtain a post-doctoral position
- Get a job?
- These jobs are rare and highly competitive.

Applied Math/Stat Graduate School

- ◉ Who hires applied MS/PhD level mathematicians/statisticians?
 - Everybody who hires in our three undergraduate Concentration Areas, but for higher-level positions and at higher salaries.

Double Major

- ⦿ Math plus a second major can be an excellent career prep path
- ⦿ Good second majors are:
 - Engineering (EE, ME, CE, ...)
 - Computer Science
 - Physics
 - Economics
 - Others are possible

Last thoughts:

How to get and keep a job.

- ① Develop a reputation for reliability and getting things done. Once you are out of college and/or grad school and into the workplace, this becomes your most valuable credential.

Questions?

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