



# Departments

## PRESIDENT'S MESSAGE

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### What math majors do after they graduate

—MICHAEL DORFF

**Suppose a student asks you “What jobs are available for math majors?”** What options, besides teacher and actuary, could you provide? Talking to students about career opportunities has been a successful way to recruit more math majors—could you name specific companies that hire math majors? Suppose the provost or president of your institution is dealing with budget cuts and is thinking of reducing the size of the mathematics department because she claims “There are not many jobs for math majors.” How would you respond?

I have talked with over a hundred previous math majors who now work in industry. Let me share with you some things I have learned during these discussions. First, there are a lot of careers in business, industry, and government (BIG) for math majors. The hottest career for math majors right now is data scientist ([bit.ly/2ApM9hq](http://bit.ly/2ApM9hq)), and this trend will not change in the near future. Suzy Weekes and I founded the MAA PIC Math program whose purpose is to better prepare undergraduate math and statistics students for working in industry—PIC stands for “Preparation for Industrial Careers.” In PIC Math, faculty members contact people in industry to find problems mathematics students can work on, and about 85% of the problems given us are data science problems. Data science involves using mathematics, statistics, and coding to analyze a large amount of data and answer some questions. There are many companies that have accumulated data. This data could be from online sales of clothes, homes, music, or

gift baskets. They could be collected from medical data, social media, sport statistics, nonprofits, or government data. I know data scientists at Google, Nike, Zillow, Amazon, hospitals, NBA basketball teams, and many smaller regional companies. An example of a data science problem comes from Kongregate which is an online video game website that ranks games based upon users’ reviews. Some users create fake accounts and submit a large number of bogus reviews in order to increase the ranking of certain games. The data science problem is to determine how to use the various dimensions of the user’s profile to classify accounts at Kongregate as real or fake.

Other major types of jobs include software engineer or programmer, financial analyst, technology consultant, medical scientist or researcher, operations researcher, and actuary. A recurring theme with these jobs is that STEM companies that once thought of hiring just one type of major (e.g., computer science, economics, engineering) are now hiring mathematics majors. There are many jobs for programmers, and while it is standard to think of programmers as computer science students, mathematics majors with very good coding skills are also in demand. I talked with a recruiter at a well-known software company and asked him why he wanted to hire mathematics majors as programmers. He confided to me that computer science majors can code faster than mathematics majors, but often the code that the mathematics majors write runs faster. One company that has hired mathematics majors as programmers is Epic. Epic is a company that manages much of the U.S. health care data and whose headquarters is in Madison, Wisconsin. Other large companies that I know employ mathematicians as software engineers are FAST Enterprises and Google, in addition to a lot of local companies that most people are not familiar with. Financial analyst is another type of job for mathematics majors. I know mathematicians working as financial analysts at such places as Goldman Sachs, Capital One, Jane Street, ING, and the Federal Reserve. Being a dual math and econ major is a good fit for such jobs. Technology consultant is a fourth ca-



*PIC Math students discussing a research problem from industry.*



*BYU statistics students interning as data scientists on NBA teams.*

- experience taking a complicated problem, breaking it down into smaller pieces, solving these smaller pieces separately, and then putting everything together to come up with a solution to the original problem,
- the knack for paying attention to small details while not losing sight of the big problem, and
- the ability to learn new ideas and material on their own.

Also, it is important to note that these employees have indicated that in order to get a job it is not enough just to have a degree in mathematics. They suggested that math majors should have experience in other fields, the most popular response being that students should know how to code or program, they should know how to communicate well, especially in speaking and writing, and that they should do an internship or have an undergraduate research experience.

If you want to learn more about careers in industry for mathematics majors, have your MAA Section invite mathematicians working in BIG to speak at your section meeting. I have visited some sections that are doing this. It would be great for both faculty members and undergraduate students if every section did this. I would be happy to help your section get started—just email me. Some other ways to learn more about BIG careers are to check out the BIG Math Network ([bigmathnetwork.org/](http://bigmathnetwork.org/)) or apply to participate in the MAA's PIC Math program. If you have any questions, feel free to email me at [mdorff@math.byu.edu](mailto:mdorff@math.byu.edu). ■

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reer option for mathematics students. Here mathematicians are working with engineers and scientists at such companies as Raytheon, General Dynamics, W. L. Gore, Lockheed Martin, Sandia National Laboratories, and Nevada National Security Site. Once I asked recruiters from Raytheon, which is an aerospace engineering firm, why they are interested in hiring mathematics students in addition to engineers. The recruiters responded that they have their employees work in teams, and it is effective if the team consists of people with different backgrounds—engineers, programmers, statisticians, mathematicians, etc. This is because each person brings a different perspective to solving problems and the combination of those different perspectives results in better solutions. Medical researcher is another career a mathematics student might pursue. Bristol-Myers Squibb, Center for Disease Control, and Pharsight Pharmaceutical have hired mathematics majors. They are especially interested if the students have a background and/or interest in medicine. Operations research is a career that tries to optimize a process in order to make a system more efficient. They help companies create more efficient plans for delivering a product (e.g., UPS, Walmart) and for scheduling activities (e.g., airlines, hospitals), I know mathematics majors who work as operations researchers at Lawrence Livermore Laboratories, the U.S. government, and medical hospitals.

You may have observed that these jobs descriptions don't say "mathematician." Instead they use terms such as analyst, data, technology, and researcher. The listed qualifications for these jobs are attributes that mathematics majors develop. These attributes include

- excellent problem-solving skills,
- the ability to approach solving problems in an abstract way allowing them to solve a new problem by applying a method used in solving a previous problem,

*Carol Meyers, Lawrence Livermore Laboratory*

