



TPSE Math

Transforming Post-Secondary Education in Mathematics

Careers Outside Academia

In response to a shifting job market, TPSE Math and its partners work to provide helpful resources and insights for both university departments and students, alike.

A TPSE primer on careers for mathematicians outside of the academy prepared by a working group from the TPSE Graduate Education Math Advisory Group.



Introduction

Training in mathematics prepares us to generate, process, and analyze information: skills in high demand. The following guide – for graduate students, their mentors, and directors of graduate studies – supports graduate students planning to include non-academic positions in their job applications. The document shares the various excellent available resources and communicates that a career search is much more than submitting your resume.

Most of us entered graduate school in mathematics because we valued and enjoyed our classes as undergraduates. Perhaps we also were able to conduct research with faculty mentors or as part of an REU program and were drawn in by the beauty and mystery of abstraction. At the same time, the past decade has seen an explosion of opportunities for individuals with the very strengths that mathematics selects for and cultivates. This resource aims to provide mathematicians, especially graduate students, with a starting point to help you identify career paths and prepare for a successful job search at the end of your graduate education. A job search is an exploration process; we wish to jump start your search. What is included here is not original; rather, our aim is to curate the best resources available and contextualize them for mathematicians at various stages of preparation.

We often create artificial dichotomies in the mathematics profession – between abstract and applied areas, between academia and industry, and so on. The underlying assumption in this resource is that you can and should prepare to cast a wide net as you search for your first job after graduate school. Just as chemists might apply for a variety of jobs with corporations, nonprofits, government entities, think tanks, or universities, mathematicians are in high demand across a wide variety of fields. We will help you integrate your career formation with your educational training. Ideally you will explore career information throughout your graduate studies, by participating in your department's career talks, panel discussions and open houses.

Graduate school in any branch of mathematics is a journey of discovery, disappointment, excitement, tedium, and joy. As you progress in your study and research, pay attention to yourself.

Who are you? What do you enjoy? What do you avoid? What absorbs you so fully that you lose track of time? Where do you want to make an impact?

These observations will be useful as you look for your first job. They will help you to identify what your strengths are and what industries and roles will help you to thrive. The ability to stand out by highlighting your unique assets, showcasing your personality, and making a case for how you will add to the team is critical to landing the desired job. As you complete your graduate career and start looking for jobs, consider the skills and duties required for the jobs that you find. Where do you see yourself contributing and thriving?

Jobs Beyond Academia

Mathematicians are now employed in a very wide range of positions — a small sample includes Analytics Consultants, Data Scientists, Geolocation Engineers, Investment Analytics Quants, Cyber-Security Professionals, Modeling Engineers, Product Managers, Quantitative Pharmacologists, Research and Development Engineers, and Supply Chain Analysts. The SIAM links below include samples of the enterprises hiring mathematicians and samples of the position titles.

Skill Building

Skills are abilities that can be taught, practiced, and mastered. Mathematicians are in high demand in part because of our mastery of and ability to acquire technical skills. For example, linear algebra, probability, statistics, and coding are valuable technical skills. Graduate school is an ideal time to add to your own toolbox of skills, technical and otherwise. Below, we list several categories of skills that will be useful in your professional life, along with examples. Familiarity with computational tools is helpful in many industries. Python and SQL are two widely used languages, but any language that is used for computation in your current field of study will be useful practice.

The Job Search

The search process requires dedicated work and a bit of creativity, but with sufficient focus, you'll be able to land a great position. Applying to jobs is a skill in itself, and like any other skill, you can learn it! Make sure you are putting in regular, dedicated hours into your search, with a set regular schedule. LinkedIn is a critical resource for networking, finding opportunities and resumé promotion. Indeed's Career Guide includes searching, applying, resume writing, interviewing and salaries – especially note the materials on interviewing. The Glassdoor describes work environments

Networking your Brand

Your professional network is a continuing resource for all career decisions and job searches. Many opportunities come by personal referral. Outside of academia, many job tenures are now remarkably short. Developing and maintaining a robust professional network is essential to navigating your career path now and in the future. A personal brand has become very important as potential employers can often begin their assessment of you with an internet search on your name.

Thoughts from Mentors

As we assembled these resources, we were struck by the observation that others might be better suited for the task. What do we know about preparing for non-academic careers? It is intimidating to prepare students for a career path that you have only minimally considered or never taken. Fortunately, these resources are just a sample of the excellent materials widely available. SIAM offers excellent materials on careers in the mathematical sciences, and the Parachute book provides end-to-end guidance on managing the search process. PhD advisors play a key role by encouraging their students to take full advantage of the available resources and by reminding their students that they are searching for a career, not just a job.

Resources

ERDOS INSTITUTE

Founded in 2017, the Erdős Institute has helped over 4000 graduate students, postdocs, and PhD alumni find fulfilling jobs at every stage of their careers. Programs and Services include: bootcamps, job application assistance, interview prep, and connections with alumni and industry partners at top companies.

INSTITUTE FOR MATHEMATICS & ITS APPLICATIONS

The six-week summer IMA Math-to-Industry Boot Camp, provides training for employment. Courses provide the basics of programming, data analysis, and mathematical modeling. Students work in teams and are provided with soft skills training.

MATHEMATICAL ASSOCIATION OF AMERICA

A website including many aspects of job and career search. Job database with 8,000 positions available, including teaching. Information on resume writing, interviewing, social media, and negotiating. Career coaching (A fee service).

SOCIETY FOR INDUSTRIAL & APPLIED MATHEMATICS

Descriptions of the types of non-academic jobs and work that mathematicians professionally do. Includes a listing of potential employers and a limited listing of available positions. Job search materials directly overlap with the MAA materials.

Examine the profiles of professional mathematical scientists in the [SIAM Careers Brochure](#). Watch the [SIAM Video](#) - How to prepare for a job interview or career fair an introduction to the range of positions, presenting yourself, investigating opportunities, resume building, networking and search resources.

BIG MATH NETWORK

Listings for internships, online coding courses, plus job search tips and references for employment in business, industry and government. Industry Connection Series - online panels connecting students to industry professionals.

PATHWAYS TO SCIENCE

For undergrads and grads in STEM, professional development materials and webinars, over 1,000 programs, fellowships and postdoc positions. Information on mentoring, applying for positions and diversity materials.

MATH JOBS

The AMS Mathjobs website is the primary source for academic positions and is starting to include a small number of business, industry and government positions.

USA JOBS

A centralized listing for Federal government positions. Enter "math" or "statistic" in the search bar to pull up the broadest lists.

Further Reading

The following books are especially valuable:

BIG Jobs Guide by Rachel Levy, Richard Laugesen, Fadil Santosa The math in business, industry and government career guide with what to study, rewarding internships, finding career mentors, assessing your skills, the range of available positions and developing a resume. For faculty: how to assist students and building institutional relationships.

What Color is Your Parachute? by Richard Bolles

A career guide on developing search confidence, identifying strengths, building a resume, matching your skills & interests to career choices and navigating the job search, interviews & salary negotiations. Here is a link to a summary of Parachute.

101 Careers in Mathematics by Deanna Haunsperger and Robert Thompson What can you do with a degree in math? Describes the wide range of careers possible and includes tips on job searches.

Ace the Data Science Interview: 201 Real Interview Questions Asked By FAANG, Tech Startups, & Wall Street by Kevin Huo and Nick Singh. The title basically says it all.

Quant Job Interview Questions and Answers by Mark Joshi, Nicholas Denson, and Andrew Downes What to expect in a quants interview.

TPSE-REERC Department Enhancements

The TPSE-Rutgers Education and Employment Research Center (REERC) report Career Preparation in Math Graduate Programs presented enhancements and recommendations for graduate programs

- Partnering with industry: forming partnerships with industry benefits a department by creating opportunities for internships, finding members of industry to serve on a department's advisory board, and having industry representatives on some doctoral committees.
- Providing professional development around non-academic careers: It is helpful to provide resources both for faculty and for students that outline career opportunities in industry.
- Integrating real-world problems in the curriculum: there are benefits in having students work on mathematics problems that are from today's industries. While individual faculty in some departments are successful in introducing real-world problems into courses, expanding the effort benefits students.
- Leveraging alumni: having a stronger network of alumni in industry connects students with contacts and potential careers in industry.