Grad school in the mathematical sciences

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Updated Fall 2023

Recent SJSU math alums in doctoral programs

- **UC Davis:** Nicholas Cazet, Benjamin Godkin, Olga Zamoroueva, Sombo Koo, Alana Bailey
- **UC Santa Cruz:** Evan Burton, Alina Alt Lombardi
- **U. Maryland:** Jianlong Liu
- **U. Hawaii:** Mark Curiel
- **Cornell Univ.:** Joseph Fluegemann
- **Vanderbilt Univ.:** Kim Kondratieff
- **U. Ill. Urbana-Champaign:** Nicole Yamzon
- **U. Texas, Austin:** Luis Torres
- **U. Arizona:** Gabriela Perez-Villalobos
- **Colorado State Univ:** Trent Osland

Recent SJSU math alums who got Ph.D.'s and what they did afterwards

- Dr. Roy Araiza (Purdue Univ.): Postdoc, UIUC (U. Ill. Urbana-Champagne)
- Dr. Earvin Balderama (UCLA, Stats): Asst. Prof., Fresno State
- Dr. Marian Farah (UC Santa Cruz, Stats): Head of Data Science, Cana Technology
- Dr. Dash Fryer (UIUC): **Associate Prof., SJSU**
- Dr. Kate Isaacs (UC Davis, CS): Asst. Prof., U. Arizona
- Dr. Anh Nguyen (U. Iowa): Asst. Prof., U. Indianapolis
- Dr. Nida Obatake (Texas A&M): Researcher, CCR La Jolla
- Dr. Charles Petersen (UCSC): Project Engineer/Data Analyst, J. W. Bamford
- Dr. Robert Sanders (UC Davis): DataOps engineer, Tamr

Recent SJSU master's alums

Our master's program has had great success placing its students in teaching positions, especially recently, and, in my opinion, stands up to any program I know about for that purpose, or for the purpose of training to take on a tech job.

See: The math departments of many community colleges in this area (e.g., West Valley, Gilroy, Foothill, Hartnell, Evergreen, SJCC...) and elsewhere, and many local tech companies. (And many instructors here, both long-time and new!)

Why do you want to get a Ph.D.?

The hardest part about going to graduate school, especially to a doctoral program, is asking yourself the question:

Why do I want to go to (more) grad school?

If you're going to spend 5–7 years, or even 2–3 years, of your life doing this, you need to know the answer!

How much does it cost?

The easiest part of going to a doctoral program in any technical subject (math, CS, science, engineering) is paying for it.

PH.D. GRAD SCHOOL IS FREE

In fact, they pay you (nearly) a living wage to go to school!

And if you get a master's degree at SJSU? You can pay for all of your tuition/fees (up to the CA resident amount) and many of your expenses by working as a TA.

Things that are necessary to get in

To make sure your doctoral application doesn't go in the trash, you need, ideally:

- For a Ph.D. program, **straight A's** (more or less). Or, sometimes: Straight A's after some point in time when your life stabilized.
- For the SJSU master's programs, we like at least **A's and B's**.
- A record of **challenging coursework**.
- Some qualification beyond regular classroom work, esp. **research experience**.

Status unclear: Math subject GRE

Unlikely to be a requirement for applied math programs.

Many top-ranked pure math programs tried dropping this as a requirement because it has little predictive value and research seems to indicate that the test makes admissions *more* discriminatory instead of less.

However, some (maybe many?) programs are going back to the old system — it's not clear how this will shake out in the long run.

Upshot: Find out if your top choices require the math subject GRE, and if you need to take it, study the heck out of it — programs that use the subject GRE use it to eliminate some applications immediately, and it is **hard**.

The thing that gets you admitted

The most important factor is:

3–4 letters of recommendation from profs

- **Phrases you want in your letter:** "Best student in 5, 10, 20 years" "Better than X, who just finished your program and is now at U. Washington" (etc.)
- **Things that matter very little:** Whether you are a nice person or even a member of the human species.
- **A good test:** Ask your prof, "Where should I apply?" Get letters from the profs whose answers you like.

Other things that can be very helpful

- A published research paper (prob. co-authored)
- REU (Research Experience for Undergraduates); see list at NSF
- Experience as a TA, facilitator, or tutor
- A focused research statement
- A good personal statement (a.k.a. goat-herding story)

Let's focus briefly on the two essays to write: a research statement and a personal statement. (Some places require both; others will need some linear combination of the two.)

Your research statement

- Answers the questions: "What area of math/stats do you want to study in grad school? Are there specific faculty members at University X whose work you find interesting? Is there a specific type of research, or even a specific problem, you want to work on? How have you prepared to do work in your chosen area?"
- Typical excerpts: "I am interested in studying combinatorics at University X. I am particularly interested in the research of.... As background, I have previously done work on...."

Your research statement (cont.)

This is a great place to describe any research experience you have in some detail. For each such project, answer the following questions:

- What did your project achieve?
- What did you specifically do on your own?
- How independent was your work? (Make sure your supervisor agrees with your assessment!)
- How significant/well-received were your results? (Try to stick to relatively objective measures: was it published in a research journal, is someone else actually using your software or relying on your results, etc.)

Your personal statement

- Answers the questions: "Why do you want to go to graduate school? How can you demonstrate that you have the personal strength to persevere in our program for 5–7 years?"
- Some effective excerpts (none are really typical): "Math hasn't always been easy for me. . . . After high school, I couldn't afford college, so I worked construction in the day and UPS at night. . . . Having escaped from a war-torn country, I really appreciate the opportunity to pursue a life in academia. . . ."
- Remember, this isn't a "sob story"; the point is to show that you can overcome life difficulties, a genuine qualification for succeeding in grad school.

Your personal statement (cont.)

- If you belong to an underrepresented group, this is a good place to mention that you are proud to represent that group, especially if you have done work to promote equity, diversity, and inclusion.
- It's even better to have a plan to promote equity, diversity, and inclusion in your future career; if you have one, explain it!
- If you have an unusual gap or hole in your resumé, this is the place to explain it: "It was during the year I served in Federal prison for an anti-nuclear protest that I first became interested in math. . . ."

Your personal statement (cont.)

Many of you, being SJSU students, have more to write about than the average grad school applicant.

- Lots of grad school applicants have gone to fancy schools, have parents who are professors, etc.
- Lots of grad school applicants have been in school continuously since they were in kindergarten, and have led relatively comfortable lives.
- Very few grad school applicants have parents who are truck drivers or construction workers; very few applicants have had to work at a gas station or manage a McDonald's to make a living, or work their way through school by working as a short-order cook or managing a movie theater.

  Those experiences show that you can persevere through difficulty.

How to build your portfolio

Again, the core things to do are:

- Take hard classes and get A's
- Impress 3–4 profs who will write you great letters

Get research experience

- REU: Summer program at another university, 6–8 weeks. Start by taking short intense classes, finish with a co-authored research paper.
- CAMCOS (Math 203) at SJSU: Work in a student team on an applied problem from business, industry, or government.
- Work on a problem with an SJSU faculty member.

If you have the chance, present your work at conferences, in talk or poster form. For undergraduates, No Cal Undergrad Math Conf (Spring 2024?) is a great opportunity; for that conf, doesn't have to be a research presentation. (Status unclear.)

And come to the Joint Math Meetings in San Francisco, Jan 3–6, 2024! We'll be leading a delegation of students there if you're interested. ($92 registration fee for students, but maybe we can have a bake sale or something?)

Attend conferences and talks

At SJSU, we go to lots of conferences together.

- Bay Area Discrete (BAD) Math Day, Fall 2023? (Status currently unclear)
- **CSU Math Conference in Bakersfield**, Nov 10–11, 2023
- Joint Math Mtgs, Jan 3–6, 2024, in San Francisco
- MAA Section Mtg, Spring 2024
- BAD Math Day, Spring 2024?
- No. Cal. Undergrad Math Conf, Spring 2024?
- Coll of Sci Research Day (posters), May 2024, SJSU

And SJSU Math Colloquium, Wed 3:00-4:00, MH320! First colloquium of the semester next week right here in MH320:

Wed Sep 14: Naomi Andrew (Oxford Univ.)
Automorphisms of Free-by-Cyclic Groups

Things to do before applying

- Learn about graduate school programs (websites)
- Colloquium Wed Nov 15 and possibly one other time this semester: Speakers recruiting for UC Santa Cruz stats, applied math
- Talk to faculty and graduate students, here and at schools you're looking at
- Consider interdisciplinary programs: e.g., data science, mathematical engineering, math finance
- Get a master's degree at SJSU (not necessary but may be helpful in some cases)
- Teach or TA at least once

US News and World Report Rankings

Use these links:

- Pure math
- Applied math
- Statistics

Warnings: (a) These rankings are silly and meaningless and (b) Everyone uses them and takes them very seriously.

Overview of the fall application semester

- At some point, if necessary: take general GREs (study!)
- **Oct/Nov:** Draft essay, get feedback
- Prepare packet for letter writers
- Fill out the applications ($50-100 each, but can apply for fee waivers)
- Identify and apply for fellowships and scholarships: NSF Graduate Research Fellowship deadline is **Fri Oct 20, 2023**; you can apply up through beginning of 2nd year of graduate study

The GREs: General exam

Make sure this is required for the places you want to go before you spend time studying and money paying for registration(s).

- Test is automated
- Sections: Analytic (writing), Verbal, Quantitative

What do you do once you get in?

- Visit schools (or email current grad students). What to find out:
  - How much attention do grad students get from faculty?
  - How much teaching do grad students do?
  - What kind of jobs are students getting after they finish their degrees?
  - How miserable are the grad students?
- Consider summer prep/boot camp programs, e.g., at the grad school you'll attend.

What kind of jobs and salaries are possible after a Ph.D.?

See the most recent reports on employment and starting salaries:

Report on new doctoral recipients

Note that the academic economy lags a few years behind the general economy, so the job market for when you finish your Ph.D. will probably be like the general job market is right now.

What kind of jobs and salaries are possible with a master's degree?

- **MS Stats** graduates are working as data scientists all over the Bay Area. (So are a lot of MS Math and MA Math graduates, for that matter.)
- **MS (Applied) Math** graduates often get jobs in tech or defense. (Not clear what the latter are doing, but they seem satisfied with their work.)
- **MA Math** graduates sometimes fall into the above two categories, but majority end up teaching at local community colleges, or sometimes as lecturers at SJSU.

Recap of fall calendar

Sep:

- Start writing your statement of purpose
- Narrow down your list of universities
- Find 3–4 profs who will write excellent letters of recommendation
- Review for the GRE
- Look for scholarships

Sep–Oct: Take the GREs: general and math subject
Fri Oct 20: Application deadline for NSF Graduate Fellowship
Nov–Jan: Submit applications (check university and department sites for deadlines)

What does it take to finish?

- Hard work
- Talent
- Passion
- Perseverance
- Patience
- Support from friends and family

Any more questions?

Email or contact:

- Tim Hsu, `tim.hsu@sjsu.edu`
- Wasin So (SJSU master's program), `wasin.so@sjsu.edu`
- Daniel Brinkman (SJSU master's program), `daniel.brinkman@sjsu.edu`
- Martina Bremer (stats), `martina.bremer@sjsu.edu`

And check out:

https://phdcomics.com/comics/archive.php?comicid=1

https://legogradstudent.tumblr.com

For what it's worth, those give a pretty good idea of what life in grad school, especially in a doctoral program, is like.