

The math
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application
process

Garrett

What is
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school like?

Getting in

When you're
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The NSF
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Fellowship

Additional
resources

The math graduate school and NSFGRFP application processes

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The Ohio State University

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Is graduate school right for me?

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You need to answer this question for yourself, but others can help you decide. Questions to ask yourself:

- * How much do I really like school?
- * Do I like my more abstract and difficult coursework?
- * Do I enjoy reading and learning about new math on my own in my free time?
- * Am I willing to wait a few years to have solid job income?
- * Do I want to be in school for another 2-6 years?
- * What are my ultimate career goals? How can graduate school help me achieve them?

What you're signing yourself up for

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- * 1 to 6+ more years of school; VERY hard but VERY interesting school
- * Masters degrees: 1-3 years, Ph.D.: 5+ years.
- * research and teaching (typically, even for Masters students)

A rough timeline

“Basic” qualifying exam(s) upon arrival (some programs)



1-2 years of core courses and corresponding qualifying exams
(can vary between programs; Masters students end here)



Participation in seminars and independent study to decide on concentration; begin learning the core content for the field of your dissertation which is tested in the oral qualifying exam



Begin “real research” and formulating dissertation problem



Work on dissertation problem, write dissertation



Defend dissertation, then you are Doctor if everything works out!

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- * An advanced degree is a great resumé booster while you're avoiding the current bad job market.
- * You can get paid to go to school and have living expenses covered (fellowships and teaching assistantships).
- * You will learn some REALLY interesting stuff and your homework will be more fulfilling to do.
- * You will learn how to do research and teach.
- * You will learn how to read and write (difficult) mathematics well.

Financing graduate school

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- * Masters degrees: not typically funded, but at some places teaching assistantships can pay for your school and cover living expenses.
- * Ph.D.'s: almost always funded. Tuition is covered with teaching assistantship or fellowship, plus a stipend ranging from \$10,000 to \$30,000 per year. Typically, unfunded programs aren't worth the trouble.
- * typically need a 3.0 cumulative GPA as a grad student to keep funding and stay in a program
- * unfunded cost: about \$15,000 annually for just tuition.

What do I need to do to prepare?

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- * Coursework: Take all the important Pure Math coursework like Linear Algebra, Set Theory, Topology, Abstract Algebra, Real Analysis, Complex Analysis - it will expedite the process of obtaining your graduate degree (even as a Masters student) and make you more competitive. If you want to go into a competitive, high-ranked Ph.D. program or be selected for competitive fellowships, take more difficult courses, especially graduate courses.
- * GRE General Exam and GRE Subject Test (for more competitive programs)
- * research experience (recommended): senior thesis project or Research Experience for Undergraduates (REUs)

GRE Exams

- * Administered by the Educational Testing Service (ETS), the same soulless company that made you suffer through the SAT and AP tests in high school
- * register online at ets.org/gre
- * can select 4 score recipients for free when/before taking the test, but additional score reports or score reports after the test date cost \$25 each.
- * The General GRE Exam:
 - usually computer-based, costs \$175 per exam, offered regularly all over the place closeby
 - content: 2 short essays, verbal section like the SAT in high school but with tougher vocabulary, quantitative section (math up to Algebra 1 in high school)
 - arguably the least important factor in the graduate school application process
 - little reason not to take early

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GRE Exams (ctd.)

* The Subject Exam:

- costs \$150 per exam, paper-based, offered 3 times annually in mid April, mid October, and mid November
- very difficult: 66 questions in 2 hours and 50 minutes, covers nearly the entire undergraduate math major curriculum (emphasis on first two years of calculus). Give yourself a few months to study.
- not required for most Masters programs and less competitive Ph.D. programs. Required for nearly all of the top 50 Ph.D. programs - high scores (> 80 th percentile) almost necessary for serious consideration for most top 20 schools.
- “a counterweight to grade inflation”
- can help for competitiveness in getting fellowships, regardless of program rank

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The application “package”

Graduate programs look at:

- * coursework
- * grades
- * awards and honors
- * GRE General Exam and GRE Subject Test scores (must send official scores mailed by ETS, \$25 each)
- * research experience and publications
- * letters of recommendation
- * essays: Statement of Purpose and (in some cases) Personal Statements
- * Curriculum Vitae / Resumé
- * transcripts (make sure they're sent on time!)

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Getting good recommendations

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- * Take difficult coursework and do well in it, ideally with your recommender
- * Do independent reading/research and work hard in it, ideally with your recommender
- * Engage with your professors: ask questions in class (study, though, so you're not asking stupid questions!), go to office hours, be energetic and enthusiastic
- * Give your recommenders a CV (discuss things that don't naturally fit on a CV too!) and course list with grades to help them decide what to write about

Getting good recommendations (ctd.)

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- * Try to learn a bit about what your professors do and talk to them about it (take this seriously; your interest shouldn't be superficial); this can be a good way to find a mentor to get you started on research and help you learn more difficult material ahead, but don't be too disappointed if you're turned down - professors are busy!
- * Attend and present in graduate seminars (if appropriate).
- * Consider the placement of other people who got recommendations from the possible recommender.

Getting good recommendations (ctd.)

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- * Know where your recommenders' friends and coauthors are; you may have better chances there.
- * Make sure when you ask for your recommendations that they are strong and enthusiastically endorse you.
- * Pick professors you've taken difficult courses with or done research or independent reading with (professors for lower division classes not generally recommended).
- * Choose regular faculty rather than VAPs or lecturers, as they're better established and their opinion tends to have more clout.

The application essays: Statement of Purpose

- * Summarizes your goals, preparation, motivation, interests pertinent to math, why you want to go to the particular school. Usually 1-2 pages single-spaced, though some places have strict word limits (example: 500 word limit for Purdue).
- * Don't just tell them you love math; you need to demonstrate why. Be specific in addressing your interests; describe why you love the particular subfield you do.
- * Most important essay and one of the things you have the greatest control over: you should start writing this the summer before you apply and revise it over the course of several months.
- * Discuss possible thesis/dissertation advisors and why you want to work with them (research what they do and try to be as specific as you can when writing about them!)

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The application essays: Personal Statement

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- * Aren't always asked for, unlike the Statement of Purpose.
- * Much more personal and more like the essays for undergraduate admission. In a way addresses what kind of life experience you can bring to “liven up” the student body.
- * Write about experiences in your life that have shaped you and why they've shaped you. What have you learned from those experiences?
- * Be honest but be positive: make sure you're putting your best self forward.

General advice for application essays

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- * Address all aspects of the prompt and tweak your essays for each school; you shouldn't recycle whole essays.
- * Use professional word choice and avoid diction that comes off as overly dramatic.
- * Look at some sample/template essays, but don't be discouraged too much if you don't measure up to them.
- * Say as much as you can in as few words as you can - don't ramble! The people reviewing your application are reading hundreds of applications, so they like essays that are short and to the point but well-written and address all aspects of the prompt.

General advice for application essays

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- * Avoid long sentences, but it's good to employ variety in sentence structure and length.
- * Be wary of repeating words and phrases; thesauruses are your friends!
- * Have friends, family, and professors read and edit your drafts, but respect their time by trying your best to send them essays devoid of spelling and grammatical errors. If you know “the one who wields the red pen of death,” you should definitely talk to him or her.

The process of choosing schools and applying

- * Applications cost anywhere between \$5 (Ohio State) and \$95 (Ivy League schools like Cornell), and with additional costs like GRE Score Reports (\$25 each) and transcripts from each school you went to (\$10 each from UCR), it may cost over a grand to apply to grad school depending on how many schools you apply to.
- * Applications are due anywhere from early December (UC Berkeley and UCLA) to late January (University of Michigan) for funded Ph.D. programs. Masters students can apply to other programs later, but they are less likely to receive funding or may not receive optimal funding. Research these deadlines early and put them on your calendar so you don't miss them!

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The process of choosing schools and applying (ctd.)

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- * Advice from John Baez: “Go to the best school you possibly can” - alma mater prestige correlates with better career prospects and better pay.
- * If you have research interests, look into which schools do lots of it and which schools are considered the “best” at it (ask professors, ask others online, check out US News and World Report rankings).
- * Be realistic: look through lots of applicant profiles on mathematicsGRE.com or “math grad cafe” (Google search) and look for applicant profiles that are similar to yours and what kinds of schools they were admitted to, waitlisted at, and rejected by. This is likely a good predictor of what you can expect out of your application.

The process of choosing schools and applying (ctd.)

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- * With this sober realism in mind, apply to a range of places. Around 6 places is generally recommended, but if you have the time and money and you have good reason to, it may be wise to apply to more. Choose 2 “reach schools” that are unlikely to admit you (but be sure you can write compelling reasons as to why you should be admitted and don’t choose “impossible” schools - applying to schools with implicit or explicit cutoffs you don’t meet is almost always a waste of money!), 2 mid-range schools that you stand a fair but not certain chance of being admitted to, and 1 or 2 safety schools you know you’ll be admitted to.
- * Take into account location, cost of living, and financial support, but you may need to sacrifice these considerations for your future career as a mathematician.

When you're admitted

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- * Always go to the all/most-expenses-paid visits you're invited to. Before that point, you don't really know the school. Consider visiting even if they don't pay for you, depending on the school. Keep an open mind since you may end up choosing a school you weren't all that excited about being admitted to in the first place.
- * Take note of when you're expected to reply by. Also, rejecting an offer is always official, and accepting an offer is unofficial until April 15th, at which point it becomes official and binding. You can accept an offer and then withdraw, but it's frowned upon and might hurt future applicants from your institution, as it may discredit your recommenders.

When you're admitted (ctd.)

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- * Talk with people who came from the departments you're considering if you can.
- * Research attrition rates, job placement rates, average time to graduation, and requirements (qualifying exams, courses), and get a feel for the culture of each department (this is easier to do if you're visiting).
- * Other applicants are probably waiting on the places you've been admitted to but aren't serious about, so if you have a clear "best option" thus far, do other applicants a favor and decline your unwanted offers and withdraw from the places you don't care about that you haven't heard back from at your soonest possible convenience.

NSFGRFP: What is it and why should I apply?

- * VERY prestigious award given to incoming graduate students who pursue research in their field.
- * Selection criteria are “Broader Impacts” and “Intellectual Merit.” Broader impacts tends to be a weaker point in most application essays, especially for math students.
- * Recipients have their graduate school paid for and additionally earn about \$30,000 annually for four years.
- * Excellent practice for writing grant proposals and application essays.
- * You get specific feedback and criticism for free at the end of it, even if you don't win.
- * Application is due mid November, and you hear back in late March or early April.

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- * 3 letters of recommendation
- * transcript
- * 3 application essays: Personal Statement, Previous Research Experience, and Research Proposal. Each have a 2-page limit and specific formatting guidelines.
- * Application website: nsfgrfp.org

The essays

- * 1-2 pages single-spaced, 1 inch margins, 12 point Times New Roman.
- * Essay 1: Personal Statement.
 - A mix of the typical personal statement and statement of purpose prompt for graduate admissions. You should focus on your credentials and how and why you're motivated to do graduate work. Keep in mind that they're judging you on intellectual merit and broader impacts, so you should discuss the outreach you've done.
- * Essay 2: Previous Research Experience
 - Write about what your previous research experience was, what you accomplished in that experience, and why it motivates you. Talk about why it has intellectual merit and what its broader impacts may be or may have been.

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* Essay 3: Research Proposal

- Write about the research you want to do and address why it's interesting to you and what broader impacts your project may have.

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Contact: reevegarrett@gmail.com. I have

- * the essays of a NSF Graduate Research Fellowship winner who did work in Number Theory and her feedback sheets,
- * my essays and feedback sheets for NSF,
- * my application essays for graduate school,

A classic with mostly excellent advice: Steven G. Krantz, *A Mathematician's Survival Guide: Graduate School and Early Career Development*, American Mathematical Society, Providence, Rhode Island, 2003.

Helpful links

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- * mathematicsgre.com (has years worth of detailed applicant profiles)
- * http://thegradcafe.com/survey/index.php?q=math* (brief applicant profiles and gives historic information as to when particular schools make decisions)
- * Prof. Terry Tao's career advice blog piece (TONS of links!): <http://terrytao.wordpress.com/career-advice/>
- * Prof. John Baez's career advice:
<http://math.ucr.edu/home/baez/advice.html>
- * <http://hbpms.blogspot.com/>
- * <http://www.xamuel.com/mathematicians-survival-guide/>