Applying to math Ph.D. programs

Slides to accompany
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What are the stages of graduate study?

Beginning and intermediate graduate courses

Reading courses that lead to selection of thesis topic and thesis advisor

Advanced courses and seminars

Qualifying exams

Research

Students can count on financial support for 5 or 6 years so long as they make good progress. For most students, time is tight! Taking courses and exams requires different skills from doing research. Ultimately, research is what counts, so it is essential to reach this stage as quickly as possible.

Thesis defense

Where to apply?

Read dozens of math department webpages. Look first for information about:

- research groups within each department
- individual faculty research interests

Key questions to ask yourself

1) In which part of mathematics do I wish to do research?

You do not need a definitive answer but you should have some ideas to narrow down the choice of graduate program.

2) Which faculty member there would make a good thesis advisor for me?

There should be at least one or there is no sense in applying!

More about individual mathematicians

- List of published papers with descriptions of each at MathSciNet:

  `http://www.ams.org/mathscinet/`

- Thesis advisor and former students at The Mathematics Genealogy Project:

  `http://genealogy.math.ndsu.nodak.edu/`

Programs handle applications in different ways

Most documents go to the Department but some might go to the College or University. When you click to apply, you might be taken to a third party portal that manages uploads on behalf of the institution.

Typical components (more discussion to come)

Form and application fee

Three letters of recommendation

Transcripts

GRE General Test – Many schools do not require anymore

GRE Subject Test – Some require, some make optional

Personal statement

Dates, fees and instructions

Deadlines mainly in December

Typical application fees are $50 to $75.

You can call the program office to ask questions about the procedure if it is unclear.

Information specific to CMU

Application deadline to begin in Fall, 2024, was December 20, 2023

Students submit applications online starting at the Department of Mathematical Sciences webpage, which links to MathPrograms.Org

There is no application fee.

GRE General Test scores are not collected.

GRE Subject Test scores are optional.

For more information, go to

`https://www.cmu.edu/math/grad/phd/admissions.html`

Graduate Record Exams (GRE)

`http://www.gre.org/`

GRE Math Subject Test ($150)

Many programs made the GRE Subject Test optional but a solid score still looks good.

Many students take it in fall before they apply for Ph.D. programs. See the website for dates.

Letters of recommendations

These should be from mathematics professors from whom you took advanced mathematics courses in which you got A's or professors who supervised your mathematical projects. These letters are used to assess your potential for success in mathematical research. Pick whom you ask accordingly. It matters a lot!

Ask two months before the letters are due. If you do not get a firm commitment within a reasonable time, then ask an additional person. If you end up with four letters, that is okay.

Letters of recommendations continued

Students enter names and other information about their recommenders into the application portal. Students fill out waiver of access forms. When the student agrees, the portal automatically contacts the recommenders by email with instructions on how to upload their letters. Recommenders may also be asked to fill out evaluation forms.

Good idea: type a checklist with instructions to give your recommenders one month before the first due date.

Occasionally, recommenders miss the prompt from the application portal. Most portals have a way for applicants to see whether letters have been uploaded and to send additional prompts if necessary.

Transcripts

Carefully follow each program's instructions about transcripts.

It is generally to your advantage to include grades from fall semester but sometimes this is impossible given the transcript deadline.

My suggestion is 1) satisfy the transcript deadline and 2) if necessary, tell them your fall math grades when they become available. Typically, this can be done informally, without sending an updated transcript. (But ask.)

Before writing your personal statement

Read the departments' program descriptions to see how they describe themselves. But use this information intelligently; do not just lift phrases!

Keep in mind that Ph.D. program faculty are primarily looking for evidence of your potential to become a research mathematician. This is true of your application as a whole.

Digressions on related interests such as teaching, science and philosophy can be included in your personal statement but should not be the main focus. Keep it relevant!

Should you plan to include other documents such as a thesis or mathematical paper you have written, results from math competitions, transcripts from specialized math programs, etc., plan to explain these in your statement.

Possible content of your personal statement

The most sophisticated mathematics you have done, regardless of whether it is in the specific area in which you wish to continue.

The area of mathematics in which you wish to do research. The degree of specificity can be tailored to the department.

Your background, especially relevant details not otherwise reflected in your application. E.g., research projects, mathematics competitions, the summer you spent solving all the problems in a serious textbook.

Faculty who seem like possible thesis advisors. But be very careful because faculty may have changed field or become inactive in research; don't put your foot in your mouth!

Helpful document to add to your application even if they do not ask for it

Concise table on your mathematics education up to and including the fall semester of your senior year:

– course number

– course title

– instructor

– if there was a textbook, name it and list the chapters covered

– if there was no textbook, list the primary topics covered

– grade received

Separately, list the math courses in which you will be enrolled during spring semester of your senior year.

National Science Foundation (NSF) Graduate Fellowships

`https://www.fastlane.nsf.gov/grfp/`

This is a prestigious three-year fellowship with a slightly obscure application process.

The deadline is in October, which forces you to get organized early.

Three recommendation letters and materials not unlike a graduate school application are required.

Winners are highly recruited.

Important comment

An offer of admission to a Ph.D. program in mathematics should come with an offer of a teaching assistantship or some other form of direct financial support (not loans) sufficient for education costs and basic living expenses. Otherwise, do not consider the offer!

A few ideas for improving your dossier

On your own or supervised by a professor, read an advanced undergraduate or beginning graduate level textbook and solve all the exercises.

Get an A in a graduate level course.

Do a senior year honors thesis project.

Research Experience for Undergraduates (REU) programs sponsored by the NSF.

(Not all such programs are NSF sponsored.)

SURF and SEMS at CMU

Other summer programs in US and abroad

Decision schedule

The first offers are made in January and the last offers are made in April.

All universities give students until April 15 to accept or decline.

If you receive an offer you know you will not accept, turn it down promptly because there are other students waiting.

Some students get offers on April 15-16 when a few slots open up.

Think about the possibility of a last-minute offer from a program you prefer before making your final decision.

You may contact the program director or the relevant staff person if you are waiting to hear.

Which offer to accept?

– Financial support (teaching assistantship, research assistantship)

– Possible thesis advisors and research topics

– Environment for graduate study

– Course and seminar offerings

– Success of past students

– Samples of written qualifying exams

If a program makes you an offer of admission, it is nearly certain that they will offer to pay for you to visit their campus and meet some of their faculty and current PhD students. Visits might be individual or during an open house. Visits are not required but might help you decide or reassure you about your choice.

Modern times

Math seminars and colloquia are being held by Zoom all over the world.

Look to see whether faculty who seem like they might be good thesis advisors are speaking. Or maybe their PhD students are speaking.

In most cases, you are allowed to attend but ask the organizer first.

Frequently asked questions

I worked as a TA. Should I ask the course instructor for a letter of recommendation?

Only if the course instructor was also your professor for an advanced math course or your faculty supervisor for a math project.

Should I ask my academic advisor for a letter?

Only if your academic advisor was also your professor for an advanced math course, or your faculty supervisor for a math project, or can attest to something that is not already clear from your transcript and other letters.

Is it possible to defer admission for a year?

Rarely, and it depends on the reason why. I know of only two examples at CMU.

What is the cutoff for GRE Math Subject Exam scores?

We do not have a cutoff and we do not keep statistics. Of course, low scores hurt and high scores help, and we understand what scores mean. However, we look at the whole package for evidence that a student is a good bet to succeed in doctoral research and beyond.

What about Masters degrees?

The short answer is that most people do not get a Masters degree on the way to a Ph.D. in Mathematics.

There is a longer answer why some do.