

# Applying to math Ph.D. programs

Slides to accompany

Undergraduate Mathematics Colloquium

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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

- Material to submit to Department
- Material to submit to College or University

## Typical components (more discussion to come)

- Form and application fee
- Three letters of recommendation
- Transcripts (\*including fall of senior year)
- GRE General Test
- GRE Subject Test
- Personal statement

## Dates, fees and instructions

Deadlines in December or January.

Typical application fees are \$50 to \$75.

Not every university provides clear instructions online, so you may want to call.

## Information specific to CMU

Application deadline is January 8, which is a week earlier than in the past.

Students submit applications online to the Department of Mathematical Sciences through our website.

There is no application fee.

GRE General Test scores are no longer collected because they are irrelevant.

Because of the pandemic, GRE Subject Test scores are optional. (Many other universities are also not collecting GRE scores this year.)

For more information, go to

<http://www.math.cmu.edu/graduate/admissions.html>

## Graduate Record Exams (GRE)

<http://www.gre.org/>

### GRE General Test (price \$205 in 2018)

Many dates; computer-based or paper-based

### GRE Math Subject Test (price \$150 in 2018)

September (deadline to register in August)

October (deadline to register in September)

There is also an April test date but by then admission decisions are already made.

Register early as test centers fill up quickly.

Monday tests for those who cannot take the test on Saturday due to religious reasons.

[Fee waivers based on financial need.](#)



## Letters of recommendations

These should be from mathematics professors from whom you took advanced mathematics courses in which you got A's.

Ask two months before the letters are due.

Programs handle letters in different ways:

- recommenders mail letters themselves
- students mail letters with applications
- recommenders upload letters on the web

Student fill out waiver of access forms.

Recommenders fill out evaluation forms.

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

Follow up: call the various program secretaries to make sure the letters have arrived and your application is complete.

## 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 late 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.

## Examples of other outside graduate funding

National Physical Science Consortium

<http://www.npsc.org/>

National Defense Science and  
Engineering Graduate Fellowship

<http://www.asee.org/ndseg/>

American Association of University Women

<http://www.aauw.org/>

## 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!

## Fundamental ways to improve your dossier

Get more A's in advanced mathematics courses

Study for the GRE Subject Exam

Favorably impress your mathematics professors

## Other ideas for improving your dossier

On your own or supervised by a professor, do all the problems in an advanced undergraduate or beginning graduate level textbook.

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. E.g., SURF and SEMS at CMU.

Other summer programs in US and abroad such as Budapest Semesters in Mathematics.



## Decision schedule

Most offers are made in February and March.

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. Faculty may contact you if there is chance this might happen. You may contact the program director or secretary if you are waiting to hear.

## Which offer to accept?

- Financial support (teaching assistantship, research assistantship, VIGRE, IGERT, RTG)
- Possible thesis advisors and research topics
- Environment for graduate study
- Course and seminar offerings
- Success of past students
- Samples of written qualifying exams

Most programs will offer to pay for a campus visit to meet faculty and students, and attend classes and seminars. This might help you to decide. **However, because of the pandemic, Zoom meetings will substitute for in-person visits.**

## Another pandemic specific idea

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

Look to see whether faculty who seem like they might be thesis advisors 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 as a last resort or as a fourth evaluation. Start by asking faculty who could judge your potential for research in mathematics.

Is it possible to defer admission for a year?

Rarely, and it depends on the reason why. I have only seen this when the student won a prestigious fellowship to spend a year abroad studying mathematics at a top university.

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.