Applying to Graduate Programs in Mathematics

Overview

- Deciding to apply to graduate programs in mathematics.
- Typical Applications Process & Selection Criteria
- The Ohio State Graduate Program in Mathematics

Is a Graduate Degree in Mathematics for me?

Undergraduate Preparation

- Number & level of math courses → Investment
- Grades → Understanding & Talent
- Appreciation of mathematical rigor and proofs.
- Solid Core Foundation – for example:
  - Ph.D.: Abstract/Linear Algebra & Real Analysis.
  - M.S.: (Multivariable) Calculus, Linear Algebra + ...
- Other courses: Differential Equations, Topology, Logic, Complex Analysis, Geometry, Probability, Combinatorics, Number theory.

Be Passionate About Mathematics

- Immerse yourself in mathematical problem
- Seek to gain insights and find solutions
- Ask for mathematical connections and reasons, etc
- View mathematics as subject of exploration and evolution.
- Want to be a Mathematician.

Is a graduate degree in Mathematics for me?
**Is a Ph.D. in Mathematics for me?**

**For Ph.D. need to be VERY Passionate about Mathematics**

... your passion will be tested ....

- Modest pay checks as Graduate Assistant (GTA/GRA).
- A lot of work/time between courses, thesis, and teaching.
- Many uncertainties (passing requirements, finding thesis topics and advisors, about research careers, etc)
- Endure all this for ~SIX YEARS.

**Outlook & Rewards**

- Chance to contribute a unique & original piece of knowledge to humanity.
- Established yourself as research mathematician within your research community.
- Pursue faculty positions in research and teaching.
- Leadership positions in private sector. Ph.D.'s sought for proved intellect, independence, and endurance.
- Ph.D. employments some of the most flexible, secure, and satisfying there are.

**Choosing a Program**

**PhD vs Masters.** (see above)

**Academic Criteria**

- Strength/Specializations.
- Breadth & Level of courses/subjects/programs.
- Ranking/publications of department/faculty.
- Job placements of recent graduates.

Do your career goals match up with the curriculum and reputation of institution. Consider areas:

Research – Teaching – Professional

**Academic Life:**

Seminars, Special Programs, Collaborations (cf web pages)
### Choosing a Program

**Support**, what is offered:
- Fellowship
- Assistantships (GRA/GTA) Stipend Salaries (wrt Cost of Liv.)
- Work/Teaching Loads.
- Tuition Coverage.
- Support for Summers, Travel, Off-Time GRAs, etc
- Competitive Fellowships.

**Metrics/Geography** of department:
- Demography of student body (size, diversity, domes/int'l)
- Campus facilities and life
- Housing, family support, etc
- Surrounding area

### Choosing a Degree & Program

**“Reach” vs. “Safety” Choices**
- Graduate school is about growing with challenges – only save choices may limit potentials and what mathematician you can grow into.
- Save choices should be places you are still comfortable going to.

**Not so good criteria**
- Expectations by others
- Recent boy-friend/girl-friend
- Football Team

### Application

**Consider Department Recruiter’s Point of View**
- Want admitted students to succeed in program!
  - Emphasize qualities that suggest you can master the requirements of the programs and stay with it.
- Healthy/fitting make-up of the student population.
- Committees need to look through 100's of application
  - Be organized, informative, and concise.
  - Be on time. Follow up. Be responsive.

**Standard Ingredients**

- Undergraduate Transcripts and other Records.
- GRE General & Subject Tests (Ph.D.)
- Letters of Recommendation
- Curriculum Vitae
- Letter of Intent
- Additional Distinctions
- Application Forms
- Application Fee
Application

Undergraduate Records

*Transcripts.*
- Must be official (order from your university)
- Get transcripts from all undergraduate places you visited.

*GPA*
- Indicate unusual grade scales, quarter/semester credits.
- Compute **Major-GPA** or (e.g.) **Junior-GPA** (include in CV)
- GPA will be evaluated w.r.t. level of courses taken and level of institutions visited.
- Median of our domestic Ph.D. admissions in 2015 was 3.84 university minimum is 3.0, fellowship minimum is 3.6.

Courses
- Evaluated are *breadth* and *sophistication* of Math courses.
- Core courses reassure preparation -- further courses indicate investment in mathematics.
- Create *separate list* of Math courses after freshmen calculus – Include current senior fall courses & planned winter courses.
- Content of core courses (Cite textbook if a standard one. and give subject/content list if 'unconventionally' taught).
- Pattern of a systematic non-math interest in course selection: Contributing or distracting ??

Graduated Record Examination (GRE) Scores - ETS

*Standardized Test Conducted by* [ETS.org](http://www.ets.org)
- Usually offered October, November, April.
- One “General” and several “Subject” Tests.

**GRE GENERAL TEST**
- Often university requirement for fellowships.
- Not much about math – but English skills.
  - Quantitative part based on high school math.
  - Both parts *may* reflect written English skills.

**GRE SUBJECT TEST IN MATHEMATICS**
- Tests basic college level preparation.
  - Low scores may not immediately exclude but will raise red flag and prompt careful inspections.
  - High scores can raise green flag. Esp. for students from less known institutions or problems with GPA.
- Most strong/pure PhD programs will take this serious even if not stated as an application requirement.
- Subject Test is practicable – do not walk into subject test cold! (Get sample tests and courses).
- Repeat reasonable amount of times.
**Application**

**GRE Subject Test in Mathematics**
- Typically offered 3 times a year (Apr, Sep, Oct)
- ETS Center on campus
- 60-70 Multiple choice questions
- Materials available in Graduate Office MA 102

**Letter of Intent/Purpose**
- **Customize:** Why do you choose university X, which faculty and specialties from X are you interested in. **Proof Read!**
- **Highlight:** A few particular strengths in your vita.
- **Study/Research Plan & Specialization:**
  - Useful for M.S. and professional degrees.
  - For Ph.D. be realistic, honest, but use to show interests and excitement for particular subjects in mathematics and indicate curiosity about new subjects (examples).
- **Investment:** Give sense that mathematics is center of your life. Illustrate with “inspiring” activities (courses, REUs)
- **Avoid:** Self-analysis, whining and excuses (leave to letter writers), cute jokes, politics, religion, etc

**Curriculum Vitae**
- Clear and concise. Numerical info at top.
- (As above) include various GPA sub-scores, interest as key words, awards, references.
- Include any other mathematical activities:
  - REUs, similar programs, individual studies projects
  - Workshops, conferences
  - Competitions, awards, recognitions
  - Documents/papers/programs you authored, etc.
- Deemphasize distractions. (Other career paths, past-times)
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Letters of Recommendation

- Follow procedures for sending – waiver system.
- Follow up that letters have been received!
- Will be read carefully and take very seriously!
- Make sure letter writer knows your mathematical ability well.
- Frequently discuss mathematics, sign up for individual study courses, supply with C.V. etc.
- Letter writers can explain difficult circumstances.
- Be conscious of comparative settings (classes).
- REU letters particularly valuable! (close interactions, research setting, comparison outside of home college)
- Reputation of letter writer. Does letter writer have connections to university you apply to (chat, check CV).

Decisions

- Contact current graduate students, special faculty and chairs at program departments.
- Talk to your own professors – both grad and undergrad advisors. Have them call up.
- Go to Visitation Days or visit on your own and talk to everyone there.
- Deferrals … generally not recommended.

Mathematics @ The Ohio State University

Faculty & Research

- 62 + 22 regular faculty (Columbus + branch campuses)
- High level of funding (CAREER, Sloan, NSF 50%).
- Distinguished faculty (US rank ~28, public ~15).
- Breadth, overlapping and interdisciplinary research

Areas:

- Logic
- Representation Thy Non Comm. Geometry
- Combinatorics
- Topology (pure & applied)
- Probability
- Number Theory
- Algebraic Geometry
- Differential Geometry Geom. Analysis
- Numerical Computationa
- Ergodic Theory Dynamical Systems
- Analysis: Harmonic, Complex,Functional
- Differential Equations
- Applied Math Math Biology

Institutes & Collaborations

- Mathematics Research Institute (NSF)
- Mathematical Biosciences Institute (NSF)
- Joint Faculty App’s w/ Bioscience Dept’s.
- Joint Appointments Comp. Sci.
- (Topological Data Analysis)
- Engineering, Phyiscal Sciences collaborations
- Education: MOOC, Teacher prep
- Nationwide Insurance (Actuarial Science)
Mathematics @ The Ohio State University

Programs - PhD degree

Advisor & Candidacy:
- Dissertation Advisor by early third year.
- Candidacy Examination/Committee by end of third year.
- Examination = overview paper & project pre-proposal.

Dissertation & Defense:
- Independent research guided by advisor.
- Writing thesis (publications dependent on field)
- Defense by end of sixth year.

Master of Science Options:
- Automatic with Candidacy (=ABD)
- Also earlier with sufficient course work and extra exam.

Qualifying Requirements:
- Real Analysis and Abstract Algebra.
- Pass Course Sequences with good grades (A or A-)
  OR Pass Exams beginning first or second year.
- Complete by third semester.

Course Requirements:
- One additional course sequence beyond the above.
- Or alternative sequences if testing out of analysis/algebra.
- By end of second year.

Miscellaneous Requirements:
- Foreign Language (French/German/Russian)
- Invitations Lectures
Mathematics @ The Ohio State University

Masters of Math Sciences (3 Tracks – terminal 2 Years)

► Math Biology
  ▪ Collaboration with MBI faculty, Bio-Dept's, Medical Ctr.
  ▪ Model & Diff Eq emphasis, Bio Crash Course – Thesis
  ▪ Bio-medical Ind., CDC/HHS, Academia, Teaching.

► Mathematics Educators
  ▪ Advanced Careers in Math Education – Thesis
  ▪ Collaboration with Dept of Education, Linguistic, CS

► Computations Sciences
  ▪ Collaboration w Engineering - Thesis

Masters of Actuarial and Quantitative Risk Management (2016)

Applications

► General Deadline: December 15th
► Application Fee: $5 (five) “commitment fee”
► Follow online instructions at http://www.math.osu.edu/graduate/apply
► For inquiries contact Thomas Kerler kerler.2@osu.edu

Mathematics @ The Ohio State University

Academic Year & Teaching

► OSU is now on Semesters
  ▪ Regular Support: AU, SP  Optional: SU

► HeadStart for Incoming Students (5 weeks before start)
  ▪ Qualifier preparation courses
  ▪ Teaching at Ohio State

Teaching Load

► Two recitations (usually same)
  ▪ Twice a week
  ▪ Special Settings: Own classes, CMS, online Homework, project based cooperative learning, MatLab based courses, ...

Job Prospects

► Recent Ph.D. graduates found competitive research post-doctoral positions.

► Many find college-level faculty teaching positions. Colleges anywhere in the country from CA to NY.

► Others leave for government jobs (e.g., NSA) or private sector (e.g., insurance industry)

► Professional MS degree in private sector but also specialized Ph.D.-programs.
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Mathematics @ The Ohio State University

Support

- GTA monthly stipend: $2,000 - $2,300 for 9 months
- University Fellowships: Stipend at GTA level over 12 months (but no teaching duties)
- Departmental Fellowships (SGA, Rhodus). Annual competition.
- Headstart awards: ~$1,000 (for 5 week training courses)
- All instructional tuition fees are waived.
- Summer stipends: Mix of GTAs, depart. GRAs, grant GRAs awarded competitively to 80%-95% who request it.
- Health Insurance Subsidy. (Pay only 15% of premium ~ $30/mo)

Miscellaneous & Facilities

- Access to OSU library (>4 Mio volumes) and OhioLink library system of OH.
- Supercomputer Center
- OSU Research Office
- Journal of Number Theory
- Journal of Approximation Theory

Job Prospects

- Recent Ph.D. graduates found competitive research post-doctoral positions. Princeton U, IAS, Yale, Rutgers, U Chicago, Cal-Tech, Duke, Vanderbilt, U. Minnesota, UIUC, UIC, Purdue...
- Many find college-level faculty teaching positions. Colleges anywhere in the country from CA to NY.
- Others leave for government jobs (e.g., NSA) or private sector (e.g., insurance industry)
- Professional MS degree in private sector but also specialized Ph.D.-programs.

The University

- ~55,000 Students with ~13,000 pursuing graduate and professional degrees.
- 17 Colleges with 220 departments offering many thousands of courses
- 1800+ of student organizations & sports clubs.
- Many resources. (Housing, Financial Aid, Technical Services, Child Care, etc)
- Top Ranked Recreational Facility.
- Nationally Ranked Athletics