MATHEMATICS, PHD

Graduate

The goal of our PhD program is to train graduate students to become research mathematicians. Our students go on to exciting careers (https://mathematics.jhu.edu/graduate/placement/) in mathematics both inside and outside of academia.

Faculty research interests (https://mathematics.jhu.edu/people/) in the Johns Hopkins University Department of Mathematics are concentrated in several areas of pure mathematics, including algebraic geometry, algebraic topology, category theory, geometric analysis, harmonic analysis, mathematical physics, number theory, and partial differential equations. The department also has an active group in data science, in collaboration with the Applied Math Department (https://engineering.jhu.edu/ams/).

The Department values diversity among its members, is committed to building a diverse intellectual community, and strongly encourages applications from all interested parties.

A brief overview of our graduate program is below. For more detailed information, please see the links at the right.

Program Overview

PhD candidates take two or three courses per semester over the first several years of the program. These are a mix of required and intermediate-level graduate courses, independent studies, and special topics classes offered by our faculty. Candidates must take, attend, participate in, and pass the course 110.771 (GTA Teaching Seminar). The seminar is an important part of the preparation for classroom teaching, and thus an essential part of mathematics graduate education. The seminar is generally required in a student's first year at JHU. A student supported by an external fellowship may delay taking the seminar until the spring before they are required to TA (but may not postpone the seminar entirely).

By the beginning of their second year, students are asked to demonstrate competency in algebra and in analysis by passing written qualifying exams in these two broad areas. Students are then expected to choose an advisor, who will supervise their dissertation and also administer an oral qualifying exam to be taken in the second or third year. More specifics about all these requirements are described on the requirements page (https://mathematics.jhu.edu/graduate/requirements/).

All graduate students are invited to attend weekly research seminars in a variety of topic areas (https://mathematics.jhu.edu/events/)as well as regular department teas and a weekly wine and cheese gathering attended by many junior and senior members of the department. A graduate student lunch seminar series provides an opportunity for our students to practice their presentation skills to a general audience.

Teaching experience is regarded as an important part of the graduate program, and graduate students are required to teach during their program.

Each student is awarded a travel allowance to enable them to attend conferences for which limited funding is available, or to visit researchers at other institutions.

William Kelso Morrill Award

The William Kelso Morrill Award for excellence in the teaching of mathematics is awarded every spring to the graduate student who best exemplifies the traits of William Kelso Morrill: a love of mathematics, a love of teaching, and a concern for students.

Joel Dean Excellence in Teaching Awards

These awards are given each year to graduate student teaching assistants, undergraduate teaching assistants, and non-tenure-track faculty who have demonstrated exceptional ability and commitment to undergraduate education.

Admission Requirements

Admission to the PhD program is based on primarily on academic records, letters of recommendation, and a personal statement. *The Department of Mathematics values diversity among its members, is committed to building a diverse intellectual community, and strongly encourages applications from all interested parties.*

Via the online application (http://grad.jhu.edu/apply/), applicants should submit:

- A Statement of Purpose
- An optional Personal Statement
- Transcripts from all institutions attended
- Three letters of recommendation
- Official TOEFL scores (if English is not your first language)
- *Optionally*, a self-reported score for the GRE Mathematics subject test.

The required Statement of Purpose discusses your academic interests, objectives, and preparation. The optional Personal Statement describes your personal background, and helps us create a more holistic understanding of you as an applicant. If you wish you may also discuss your personal background in the Statement of Purpose (e.g. if you have already written a single essay addressing both topics), instead of submitting separate statements.

Submission of GRE Math subject scores is optional. The department views GRE Math subject scores as useful information. For applications which do not include these scores, more weight will be placed on the other elements of the application. Applicants who choose to self-report a GRE Math Subject score need not send an official score report at time of application; we will request verification only if you are accepted to the program.

Application fee waivers are available based on financial need and/or participation in certain programs (http://grad.jhu.edu/apply/application-process/#1464027869971-8cbbde29-b882).

Many frequently asked questions about the graduate admission process are answered here (https://mathematics.jhu.edu/graduate/admissions/prospective-graduate-student-faq/).

No application materials should be mailed to the department. All application materials are processed by the Graduate Admissions Office (http://grad.jhu.edu/apply/).

Undergraduate Background

The following is an example of what the math department would consider a good background for a student coming out of a four-year undergraduate

program at a college or university in the U.S. (assuming a semester system):

- Calculus in one variable (two semesters, or AP credits)
- Multivariable Calculus (one semester)
- Linear Algebra (one semester)
- Complex analysis (one semester)
- Real analysis (two semesters)
- Abstract algebra (two semesters)
- Point-set topology (one semester)

Many admitted students have taken upper-level undergraduate mathematics courses or graduate courses. Nevertheless, the department does admit very promising students whose preparation falls a little short of the above model. In such cases, we strongly recommend that the student start to close the gap over the summer, before arriving for the start of the fall semester.

Additional Information for International Students

Student Visa Information: The Office of International Services at Homewood (http://ois.jhu.edu/) will assist admitted international students in obtaining a student visa.

English Proficiency: Johns Hopkins University requires students to have adequate English proficiency for their course of study. Students must be able to read, speak, and write English fluently upon their arrival at the university. Applicants whose native language is not English must submit proof of their proficiency in English before they can be offered admission and before a visa certificate can be issued. Proficiency can be demonstrated by submitting results from either the Test of English as a Foreign Language (TOEFL) (http://www.toefl.org/) or the IELTS (https://www.ielts.org/en-us/). Johns Hopkins prefers a minimum score of 100 on the TOEFL or a Band Score of 7 on the IELTS. Results should be sent to Johns Hopkins directly by TOEFL or IELTS. Applicants taking the IELTS must additionally upload a copy of their score through the application system. However, do **not** send the student copy or a photocopy of the TOEFL.

Program Requirements

Course Requirements

Mathematics PhD candidates must show satisfactory work in Algebra (110.601-602), Real Variables (110.605), Complex Variables (110.607), and one additional non-seminar mathematics graduate course in their first year. The first-year algebra and analysis requirement can be satisfied by passing the corresponding written qualifying exam in September of the first year; these students must complete at least two courses each semester. In addition, PhD candidates must take Algebraic Topology (110.615) and Riemannian Geometry (110.645) by their second year. Students having sufficient background can substitute an advanced topology course for 110.615, or an advanced geometry course for 110.645 with the permission of the instructor.

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the spring before they are required to TA (but may not postpone the seminar entirely).

Candidates must show satisfactory work in at least two mathematics graduate courses each semester of their second year, and if they have not passed their oral qualifying exam, in the first semester of their third year.

Qualifying Exams

Candidates must pass written qualifying exams by the beginning of their second year in Analysis (Real & Complex) and in Algebra. Exams are scheduled for September and May of each academic year, and the dates are announced well in advance.

Oral Exam

Candidates must pass an oral qualifying examination in the student's chosen area of research by April 10 of the third year. The topics of the exam are chosen in consultation with the faculty member who has agreed (provisionally) to be the student's thesis advisor, who will also be involved in administering the exam.

PhD Dissertation

Candidates must produce a written dissertation based upon independent and original research. After completion of the thesis research, the student will defend the dissertation by means of the Graduate Board Oral exam (http://krieger.jhu.edu/math/graduate/requirements/graduate-board-oral-exam/). The exam must be held at least three weeks before the **Graduate Board** deadline the candidate wishes to meet.

Our PhD program does not have a foreign language requirement.