

# MATHEMATICS, PHD

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## Graduate

The goal of our PhD program is to train graduate students to become research mathematicians. Each year, an average of five students complete their theses and 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 analysis and geometric analysis, algebraic geometry and number theory, differential geometry, algebraic topology, category theory, and mathematical physics. 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

All students admitted to the PhD program receive full tuition fellowships and teaching assistantships. Teaching assistant salaries for the 2022-2023 academic year are \$33,000, and exceptional applicants are also considered for supplementary fellowships. Students making satisfactory progress can expect to be supported for six years.

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.

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.

PhD students will gain teaching experience as a teaching assistant for undergraduate courses. Most of our students lead two TA sections per week, under the supervision of both the faculty member teaching the course and the director of undergraduate studies. Students wanting more classroom experience (or extra pay) can teach their own sections of summer courses. First-year students are given a reduced TA workload in the spring semester, in preparation for the qualifying exams.

In addition to their stipend, each student is awarded an annual travel allowance to enable them to attend conferences for which limited funding is available or visit researchers at other institutions.

## Financial Aid

Students admitted to the Ph.D. program receive teaching assistantships and full tuition fellowships. Exceptional applicants become candidates for one of the university's George E. Owen Fellowships.

## 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 Kelso Morrill: a love of mathematics, a love of teaching, and a concern for students.

## Excellence in Teaching Awards

Three awards are given each year to a junior faculty member and graduate student teaching assistants 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 GRE scores for both the general and the subject test
- Official TOEFL scores (if English is not your first language)

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.

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.

## Financial Support

Students admitted to the PhD program receive full tuition fellowships and teaching assistantships. Teaching assistant salaries for the 2022–2023 academic year are \$33,000. Students making satisfactory progress can expect to be supported for six years. Exceptional applicants are considered for supplementary fellowships of \$6,000 each year for three years.

Students from underrepresented groups may be eligible for other university-wide supplemental fellowships. Summer teaching is available for students seeking extra income.

## 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.

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.