

MATHEMATICS, PHD

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum degree requirements (<https://guide.wisc.edu/graduate/#requirements>) and policies (<https://guide.wisc.edu/graduate/#policies>), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

Face to Face	Evening/ Weekend	Online	Hybrid	Accelerated
Yes	No	No	No	No

Mode of Instruction Definitions

Accelerated: Accelerated programs are offered at a fast pace that condenses the time to completion. Students typically take enough credits aimed at completing the program in a year or two.

Evening/Weekend: Courses meet on the UW–Madison campus only in evenings and/or on weekends to accommodate typical business schedules. Students have the advantages of face-to-face courses with the flexibility to keep work and other life commitments.

Face-to-Face: Courses typically meet during weekdays on the UW–Madison Campus.

Hybrid: These programs combine face-to-face and online learning formats. Contact the program for more specific information.

Online: These programs are offered 100% online. Some programs may require an on-campus orientation or residency experience, but the courses will be facilitated in an online format.

CURRICULAR REQUIREMENTS

Requirement Detail	
Minimum Credit Requirement	51 credits
Minimum Residence Credit Requirement	32 credits
Minimum Graduate Coursework Requirement	51 credits must be graduate-level coursework. Refer to the Graduate School: Minimum Graduate Coursework (50%) Requirement policy: https://policy.wisc.edu/library/UW-1244 (https://policy.wisc.edu/library/UW-1244/).
Overall Graduate GPA Requirement	3.00 GPA required. Refer to the Graduate School: Grade Point Average (GPA) Requirement policy: https://policy.wisc.edu/library/UW-1203 (https://policy.wisc.edu/library/UW-1203/).
Other Grade Requirements	No additional grade requirements.

Assessments and Examinations Students are required to pass at least two qualifying exams. At least one qualifying exam must be passed by the beginning of the fourth semester (the spring semester of the second year). Both qualifying exams must be passed by the beginning of their sixth semester (the spring semester of the third year).

Students must pass a preliminary exam (specialty exam) by the end of the eighth semester (end of fourth year).

Students must satisfy all the requirements for dissertator status by the end of the eighth semester (end of fourth year).

Language Requirements No language requirements.

Graduate School Breadth Requirements All doctoral students are required to complete at least a 12-credit doctoral minor or graduate/professional certificate. Refer to the Graduate School: Breadth Requirement in Doctoral Training policy: <https://policy.wisc.edu/library/UW-1200> (<https://policy.wisc.edu/library/UW-1200/>).

REQUIRED COURSES

Students must take a total of 51 graduate credits, or generally 18 courses. This includes courses in math and in breadth. In the PhD program, math courses numbered above 700 are for graduate credit. Math courses below 700 must be approved by the academic advisor.

Area of Specialization

There are five general and overlapping areas of specialization¹ within the department:

- Algebra, Algebraic Geometry, Combinatorics and Number theory
- Analysis, Differential Equations and Probability
- Applied and Computational Mathematics
- Logic
- Geometry, Topology, and Dynamics

Additional Area of Specialization: Mathematics Education¹

The course requirement is the same as for the other specialties except that the required 51 credits should include 18 credits in courses related to mathematics education, and at least one of the courses must be on research techniques in education. The 18 credits may come (wholly or in part) from courses included in breadth.

There are many different paths that one may take to 51 credits while pursuing a PhD in Mathematics at Wisconsin. Below are a few possible paths in different subject areas. These are just possibilities, and are not meant to prescribe any particular path.

Algebra, Algebraic Geometry, or Number Theory¹

Students may complete the following sequence of courses.

Code	Title	Credits
MATH 741	Abstract Algebra	3
MATH 742	Abstract Algebra	3
MATH 747	Lie Algebras	3
MATH 748	Algebraic Number Theory	3
MATH 750	Homological Algebra	3

MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 761	Differentiable Manifolds	3
MATH 763	Introduction to Algebraic Geometry	3
MATH 764	Introduction to Algebraic Geometry	3
MATH 843	Representation Theory	3
MATH 844	Arithmetic Geometry	3
MATH 845	Class Field Theory	3
MATH 848	Advanced Topics in Number Theory	3
MATH 851	Topics in Geometric Topology	3
MATH 900	Graduate Teaching Seminar	1
MATH 941	Seminar-Algebra	1-3
MATH 967	Seminar in Number Theory	1-3
MATH 990	Reading and Research	1-3
MATH 742	Abstract Algebra	3
MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 758	Introduction to Ergodic Theory and Dynamics	3
MATH 801	Topics in Applied Mathematics	3
MATH/STAT 833	Topics in the Theory of Probability	3
MATH/E C E/ STAT 888	Topics in Mathematical Data Science	1-3
MATH 900	Graduate Teaching Seminar	1
MATH 921	Seminar in Analysis	1-3
MATH 990	Reading and Research	1-3

Applied or Computational Mathematics¹

Students may complete the following sequence of courses.

Analysis and/or Differential Equations¹

Students may complete the following sequence of courses.

Code	Title	Credits
MATH 719	Partial Differential Equations	3
MATH 720	Partial Differential Equations	3
MATH 721	A First Course in Real Analysis	3
MATH 722	Complex Analysis	3
MATH 725	A Second Course in Real Analysis	3
MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 758	Introduction to Ergodic Theory and Dynamics	3
MATH 761	Differentiable Manifolds	3
MATH 821	Advanced Topics in Real Analysis	3
MATH 823	Advanced Topics in Complex Analysis	3
MATH 825	Selected Topics in Functional Analysis	3
MATH 827	Fourier Analysis	3
MATH 828	Advanced Topics in Harmonic Analysis	3
MATH 900	Graduate Teaching Seminar	1
MATH 921	Seminar in Analysis	1-3
MATH 990	Reading and Research	1-3

Probability¹

Students may complete the following sequence of courses.

Code	Title	Credits
MATH 718	Randomized Linear Algebra and Applications	3
MATH/COMP SCI/ I S Y E/STAT 726	Nonlinear Optimization I	3
MATH/COMP SCI/ I S Y E 730	Nonlinear Optimization II	3
MATH/STAT 733	Theory of Probability I	3
MATH/STAT 734	Theory of Probability II	3
MATH 735	Stochastic Analysis	3
MATH 741	Abstract Algebra	3

Code	Title	Credits
MATH 703	Methods of Applied Mathematics 1	3
MATH 704	Methods of Applied Mathematics-2	3
MATH 705	Mathematical Fluid Dynamics	3
MATH/STAT 709	Mathematical Statistics I	4
MATH/ COMP SCI 714	Methods of Computational Mathematics I	3
MATH/ COMP SCI 715	Methods of Computational Mathematics II	3
MATH 717	Stochastic Computational Methods	3
MATH 718	Randomized Linear Algebra and Applications	3
MATH 719	Partial Differential Equations	3
MATH 721	A First Course in Real Analysis	3
MATH 722	Complex Analysis	3
MATH 725	A Second Course in Real Analysis	3
MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 900	Graduate Teaching Seminar	1
MATH 921	Seminar in Analysis	1-3
MATH 990	Reading and Research	1-3

Logic¹

Students may complete the following sequence of courses.

Code	Title	Credits
MATH 721	A First Course in Real Analysis	3
MATH 725	A Second Course in Real Analysis	3
MATH 740	Enumerative Combinatorics/ Symmetric Functions	3
MATH 741	Abstract Algebra	3
MATH 742	Abstract Algebra	3
MATH 747	Lie Algebras	3
MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 763	Introduction to Algebraic Geometry	3
MATH 770	Foundations of Mathematics	3
MATH 771	Set Theory	3
MATH 773	Computability Theory	3

MATH 776	Model Theory	3
MATH 873	Advanced Topics in Foundations	3
MATH 900	Graduate Teaching Seminar	1
MATH 975	Seminar-The Foundations of Mathematics	1-3
MATH 990	Reading and Research	1-3

Geometry, Topology, and Dynamics¹

Students may complete the following sequence of courses.

Code	Title	Credits
MATH 721	A First Course in Real Analysis	3
MATH 722	Complex Analysis	3
MATH 725	A Second Course in Real Analysis	3
MATH 741	Abstract Algebra	3
MATH 742	Abstract Algebra	3
MATH 751	Introductory Topology I	3
MATH 752	Introductory Topology II	3
MATH 758	Introduction to Ergodic Theory and Dynamics	3
MATH 761	Differentiable Manifolds	3
MATH 765	Differential Geometry	3
MATH 843	Representation Theory	3
MATH 851	Topics in Geometric Topology	3
MATH 853	Topics in Algebraic Topology	3
MATH 873	Advanced Topics in Foundations	3
MATH 900	Graduate Teaching Seminar	1
MATH 951	Seminar in Topology	1-3
MATH 990	Reading and Research	1-3

Footnotes

¹ These pathways are internal to the program and represent different curricular paths a student can follow to earn this degree. Pathway names do not appear in the Graduate School admissions application, and they will not appear on the transcript.