

# SAMPLE PATHWAYS THROUGH THE MATHEMATICS MAJOR

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## I. COLLEGE DISTRIBUTIONAL REQUIREMENTS

All programs of study in mathematics *must* be designed with the advice of a Math Major Advisor, and also – for double majors or majors in conjunction with a minor or concentration in another field – with an advisor from the second program. In addition, all programs *must* satisfy the

**Bryn Mawr College Distribution Requirement**

*One* semester course in *each* of the following four “Approaches to Inquiry”

**Critical Interpretation (CI)** – critically interpreting works, such as texts, objects, artistic creations and performances, through a process of close reading.

**Cross-Cultural Analysis (CC)** – analyzing the variety of societal systems and patterns of behavior across space.

**Inquiry into the Past (IP)** – inquiring into the development and transformation of human experience over time.

**Scientific Investigation (SI)** – understanding the natural world by testing hypotheses against observational evidence.

## II. MATH MAJOR REQUIREMENTS

A minimum of 10 semester courses is required for the major, including the six core courses listed below and four electives at or above the 200 level. Core Requirements:

- (1) MATH B201 Multivariable Calc (H121 or H216)
- (2) MATH B203 Linear Algebra (H215)
- (3) MATH B301 Real Analysis I (H317)
- (4) MATH B303 Abstract Algebra I (H333)
- (5) MATH B302 Real Analysis II (H318) or MATH B304 Abstract Algebra II (H334)
- (6) MATH B398 or B399 Senior Conference

The course numbers HXXX refer to Haverford College equivalents. With the exception of Senior Conference, equivalent courses at Haverford or elsewhere may be substituted for Bryn Mawr courses with approval of the major advisor.

MATH B301 and MATH B302 have been designated as Writing Attentive (WA). As the analysis and algebra sequences, MATH 301/302 and MATH 303/304, both have a strong proof writing focus, students often find it useful to take a course such as MATH 206 (Transition to Higher Mathematics) before they enroll in these sequences. Mathematics majors are encouraged to complete their core requirements other than Senior Conference by the end of their junior year. Senior Conference must be taken during the senior year. Students considering the possibility of graduate study in mathematics or related fields are urged to go well beyond the minimum requirements of the major. In such cases, a suitable program of study should be designed with the advice of a major advisor.

II.1. **Math Electives.** Any mathematics course at or above the 200-level (including graduate courses) or any course cross-listed as a mathematics course at Bryn Mawr or Haverford can be used as an elective towards the major.

In addition, some Bryn Mawr and Haverford courses from departments other than mathematics that have a substantial mathematical content may also be counted as electives. Currently, courses that count as math electives include:

- (1) CHEM B221: Physical Chemistry I;
- (2) CHEM B321: Advanced Physical Chemistry.
- (3) CMSC B231: Discrete Mathematics;
- (4) CMSC B310: Computational Geometry;

- (5) CMSC B340: Analysis of Algorithms;
- (6) ECON B304/ECON H304: Econometrics;
- (7) PHYS B306: Mathematical Methods in the Physical Sciences;
- (8) PHYS B328: Galactic Dynamics and Mechanics.

A student may also, in consultation with a major advisor, petition the Department to accept additional courses as electives.

At most three courses can be doubled counted for a second major.

**II.2. Major Writing Requirement.** Students will take two writing attentive courses to satisfy the major writing requirement. Courses that are designated as writing attentive are MATH B301 and MATH B303.

## III. SAMPLE PROGRAMS

**Note:** In each sample program, distribution requirements and electives can be interchanged among the various semesters to accommodate the student's desires.

Students will take two writing attentive courses to satisfy the major writing requirement. Courses that are designated as writing attentive *W.A.* are MATH B301 and MATH B303.

## III.1. Math Major: General Plan.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Emily Balch Seminar Foreign Language Distribution Requirement	MATH 102: Calculus II Foreign Language Distribution Requirement Free Elective
Second year	MATH 201: Multivariable Calculus Distribution Requirement Free Elective Free Elective	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Distribution Requirement Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Free Elective Free Elective	MATH 302 or MATH 304 Math Elective (200 or 300 level) Free Elective Free Elective
Fourth year	Math 398: Senior Conference Math Elective (200 or 300 level) Free Elective Free Elective	Math Elective (200 or 300 level) Free Elective Free Elective Free Elective

**Note:** If considering graduate study, enroll in as many 300-level math electives as possible.

III.2. Math Major starting with Calculus II.

	Fall Semester	Spring Semester
First year	MATH 102: Calculus II Emily Balch Seminar Foreign Language Distribution Requirement	MATH 203: Linear Algebra Foreign Language Distribution Requirement Free Elective
Second year	MATH 201: Multivariable Calculus Distribution Requirement Free Elective Free Elective	MATH 206: Transition to Higher Math (as math elective) Math Elective (200 or 300 level) Distribution Requirement Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Free Elective Free Elective	MATH 302 or MATH 304 Math Elective (200 or 300 level) Free Elective Free Elective
Fourth year	Math 398: Senior Conference Free Elective Free Elective Free Elective	Math Elective (200 or 300 level) Free Elective Free Elective Free Elective

Note: A student following this program should consider doing research and/or honors in the senior year. Discuss this possibility with a Major Advisor early in the junior year. If considering graduate study, enroll in as many 300-level math electives as possible and considering enrolling in our graduate courses.

## III.3. Math Major starting with Multivariable Calculus.

	Fall Semester	Spring Semester
First year	MATH 201: Multivariable Calculus Emily Balch Seminar Foreign Language Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Foreign Language Distribution Requirement
Second year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Distribution Requirement Free Elective	MATH 302 or MATH 304 Distribution Requirement Free Elective Free Elective
Third year	Math Elective (200 or 300 level) Free Elective Free Elective Free Elective	Math Elective (200 or 300 level) Free Elective Free Elective Free Elective
Fourth year	Math 398: Senior Conference Free Elective Free Elective Free Elective	Math Elective (200 or 300 level) Free Elective Free Elective Free Elective

**Note:** A student following this program should consider doing research and/or honors in the senior year. Discuss this possibility with a Major Advisor early in the junior year. **If considering graduate study, enroll in as many 300-level math electives as possible and considering enrolling in our graduate courses.**

## III.4. Taking a semester abroad, starting with Calculus I.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Emily Balch Seminar Foreign Language Distribution Requirement	MATH 102: Calculus II Distribution Requirement Foreign Language Free Elective
Second year	MATH 201: Multivariable Calculus Distribution Requirement Free Elective Free Elective	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Distribution Requirement Free Elective
Third year	MATH 303 <i>or</i> MATH 301 Math Elective (200 or 300 level) Free Elective Free Elective	SEMESTER AWAY (Free Electives)
Fourth year	MATH 301 <i>or</i> MATH 303 Math 398: Senior Conference Math Elective (200 or 300 level) Free Elective	MATH 302 <i>or</i> MATH 304 Math Elective (200 or 300 level) Free Elective Free Elective

Note: Meeting with a Math Major Advisor as early as possible can increase the options available. For complete information on study abroad, please consult <http://www.brynmawr.edu/studyabroad>.

## III.5. Taking a semester abroad, starting with Calculus II.

	Fall Semester	Spring Semester
First year	MATH 102: Calculus II Emily Balch Seminar Foreign Language Distribution Requirement	MATH 203: Linear Algebra Distribution Requirement Foreign Language Free Elective
Second year	MATH 201: Multivariable Calculus Distribution Requirement Free Elective Free Elective	MATH 206: Transition to Higher Math (as math elective) Math Elective (200 or 300 level) Distribution Requirement Free Elective
Third year	MATH 303 <i>or</i> MATH 301 Math Elective (200 or 300 level) Free Elective Free Elective	SEMESTER AWAY (Free Electives)
Fourth year	MATH 301 <i>or</i> MATH 303 Math 398: Senior Conference Free Elective Free Elective	MATH 302 <i>or</i> MATH 304 Math Elective (200 or 300 level) Free Elective Free Elective

Note: Meeting with a Math Major Advisor as early as possible can increase the options available. For complete information on study abroad, please consult <http://www.brynmawr.edu/studyabroad>.



III.6. Math Major in the AB/MA Program.

	Fall Semester	Spring Semester
First year	MATH 201: Multivariable Calculus Emily Balch Seminar Foreign Language Distribution Requirement	MATH 203: Linear Algebra Math Elective (200 or 300 level) Foreign Language Distribution Requirement
Second year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Distribution Requirement Free Elective	MATH 302: Real Analysis II MATH 304: Abstract Algebra II Distribution Requirement Free Elective
Third year	Graduate Math Course * Free Elective** Free Elective Free Elective	Graduate Math Course * Free Elective** Free Elective Free Elective
Fourth year	Graduate Math Course * Math 701 or 702 (Thesis) Math 398: Senior Conference Free Elective	Graduate Math Course * Math 701 or 702 (Thesis) Free Elective Free Elective

Note: This plan assumes 4 transfer credits (such as AP, IB) toward the BMC degree.

\*Two Graduate Math courses may be advanced 300-level Math courses with additional work. Up to two graduate courses may be taken for both AB and MA credit.

\*\*It is highly recommended that a Math elective be chosen.

## III.7. Math Major with a minor in Computer Science.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I CMSC 110: Intro. Computer Science Emily Balch Seminar Foreign Language	MATH 102: Calculus II Distribution Requirement Distribution Requirement Foreign Language
Second year	MATH 201: Multivariable Calculus CMSC/Math 231: Discrete Math (counts as math elective) Distribution Requirement Free Elective	MATH 203: Linear Algebra Math Elective (200 or 300 level) CMSC 206: Data Structures Distribution Requirement
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Free Elective Free Elective	MATH 302 or MATH 304 Math Elective (200 or 300 level) Computer Science Elective Free Elective
Fourth year	Math 398: Senior Conference Computer Science Elective Free Elective Free Elective	Math Elective (200 or 300 level) Computer Science Elective Free Elective Free Elective

Note: Computer Science electives must include any two of CMSC 240, 245, 246, 330, 340, 345.

III.8. Math Major with Teaching Certification.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Emily Balch Seminar Foreign Language Distribution Requirement	MATH 102: Calculus II Foreign Language Distribution Requirement(English course) Free Elective
Second year	MATH 201: Multivariable Calculus Ed 200: Critical Issues in Education Psych 203: Educational Psychology Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Distribution Requirement Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Ed 210 or 275 (at BMC or HVD) Free Elective	MATH 302 or MATH 304 Math Elective (200 or 300 level) Math Elective (200 or 300 level) Free Elective
Fourth year	Math 398: Senior Conference Math Elective (200 or 300 level) Ed 210 or 275 (at BMC or HVD) Ed 301: Curriculum/Pedagogy Sem.	Ed 302: Practice Teaching Seminar Ed 303: Practice Teaching (2 units of credit)

Suggested math electives: Probability: BMC 205 or HC 218; Discrete Math: BMC 231; Geometry: BMC 221 or HC 205b; Number Theory: BMC 290 or 390; History of Mathematics: BMC 295. Meeting with a math major advisor as early as possible can increase the available options.

## III.9. Math Major with Pre-medical studies.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Bio 110: Intro. Biology I Emily Balch Seminar Foreign Language	MATH 102: Calculus II Bio 111: Intro. Biology II Distribution Requirement (English) Foreign Language
Second year	MATH 201: Multivariable Calculus Chem 103: General Chemistry I Distribution Requirement Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Chem 104: General Chemistry II Distribution Requirement
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Chem 211: Organic Chemistry I Free Elective	MATH 302 <i>or</i> MATH 304 Math Elective (200 or 300 level) Chem 212: Organic Chemistry II Free Elective
Fourth year	Math 398: Senior Conference Math Elective (200 or 300 level) Phys 101: Intro. Physics I Free Elective	Math Elective (200 or 300 level) Phys 102: Intro. Physics II Free Elective Free Elective

**Note:** This plan allows the student to have a “glide year” after graduation, before entering medical school. It is entirely possible to design a program that permits the student to enter medical school immediately upon graduation from Bryn Mawr. See a Health Professions Advisor for details, and consult [www.brynmaur.edu/healthpro](http://www.brynmaur.edu/healthpro).

## III.10. Double major in Mathematics and Physics.

	Fall Semester	Spring Semester
First year	MATH 102: Calculus II Phys 121: Modeling the Physical World: Foundations & Frontiers Emily Balch Seminar Foreign Language	MATH 203: Linear Algebra Phys 122: Classical Mechanics Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus Phys 201: Electromagnetism Distribution Requirement Free Elective	MATH 206: Transition to Higher Math (as math elective) Phys 214: Intro. Quantum Mechanics Distribution Requirement Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Phys 306: Mathematical Methods (counts as math elective) Free Elective	MATH 302 <i>or</i> MATH 304 Math Elective (200 or 300 level) Phys 305 or 331 Free Elective
Fourth year	Math 398: Senior Conference Physics Elective (300 level) Physics 398: Senior Seminar I Free Elective	Math Elective (200 or 300 level) Physics Elective (300 level) Free Elective Free Elective

**Note:** You must meet with major advisors in both departments. Some suggested courses to fulfill remaining Math Electives are Math 311 (Partial Differential Equations), Math 312 (Topology) and Math 322 (Functions of Complex Variables), because these courses relate best to the field of Physics.

## III.11. Double major in Mathematics and Computer Science.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I CMSC 110: Intro. Computer Science Emily Balch Seminar Foreign Language	MATH 102: Calculus II CMSC 206: Data Structures Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus CMSC 231: Discrete Math (counts as math elective) CMSC 245 Princ. Progr. Languages Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Computer Science Elective Distribution Requirement
Third year	MATH 301 <i>or</i> MATH 303 CMSC 240: Princ. Comp. Org. Computer Science Elective Distribution Requirement	MATH 302 <i>or</i> MATH 304 CMSC 330: Algorithms Computer Science Elective Free Elective
Fourth year	MATH 303 <i>or</i> MATH 301 Math 398: Senior Conference CMSC 340 <i>or</i> CMSC 345 (counts as math elective) Computer Science Elective	Math Elective (200 or 300 level) Computer Science Elective CMSC 399: Senior Conference Free Elective

**Note:** You must meet with major advisors in both departments.

The following Computer Science courses double count for the major in Mathematics and the major in Computer Science:

- (1) CMSC B231: Discrete Mathematics,
- (2) CMSC B310: Computational Geometry, and
- (3) CMSC B340: Analysis of Algorithms.

## III.12. Double major in Mathematics and Economics.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I ECON B105: Intro to Economics Emily Balch Seminar Foreign Language	MATH 102: Calculus II Econ Elective (200 level) Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus ECON B200: Microeconomics ECON B253: Intro to Econometrics Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) ECON B202: Macroeconomics Distribution Requirement
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Econ Elective* (200 or 300 level) Distribution Requirement	MATH 302: Real Analysis II ECON B304: Econometrics (counts as both math and econ elective) Econ Elective (300 level, <i>W.I.</i> ) Free Elective
Fourth year	Math 398: Senior Conference Math Elective (200 or 300 level) Econ Elective* (200 or 300 level) Free Elective	Math Elective (200 or 300 level) Econ Research Seminar (390-399) Free Elective Free Elective

\* Econ elective with ECON B200 or B202 as a pre-requisite

Note: You must meet with major advisors in both departments.

## III.13. Double major in Mathematics and Chemistry.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Chem 103: General Chemistry I Emily Balch Seminar Foreign Language	MATH 102: Calculus II Chem 104: General Chemistry II Foreign Language Distribution Requirement Distribution Requirement
Second year	MATH 201: Multivariable Calculus Chem 211: Organic Chemistry I Physics 121 or 101 Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Chem 212: Organic Chemistry II Physics 122 or 102
Third year	Math 301 or Math 303 Chem 221: Physical Chemistry I (counts as math elective) Chem 242: Biological Chemistry Chem 251: Research Methodology I	MATH 302 or MATH 304 Chem 222: Physical Chemistry II Chem 231: Inorganic Chemistry Chem 252: Research Methodology II
Fourth year	Math 301 or Math 303 Math Elective (200 or 300 level) Chemistry Elective (300 level) Free Elective	Chemistry Elective (300 level) Math 399: Senior Conference Math Elective (200 or 300 level) Free Elective

Suggested Math Electives: Math 210, Math 251 or Math 351, Math 312.



III.14. Double major in Mathematics and Geology.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Geo 101: How the Earth Works Emily Balch Seminar Foreign Language	MATH 102: Calculus II Geo 102 or Geo 103 Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus Geo 202: Mineralogy and Crystal Chemistry Chem 103, Physics 101, or Physics 121 Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Chem 104, Physics 102, or Physics 122 Distribution Requirement
Third year	MATH 301 <i>or</i> MATH 303 Geo 203: Invertebrate Paleobiology Free Elective Free Elective	MATH 302 <i>or</i> MATH 304 Geo 204: Structural Geology Geo 205: Sedimentary Materials & Environments Free Elective
Fourth year	MATH 303 <i>or</i> MATH 301 Math 398: Senior Conference Math Elective (200 or 300 level) Geology Elective (300 level)	Math Elective (200 or 300 level) Math Elective (200 or 300 level) Geo 399: Senior Capstone Seminar Free Elective

Note: CMSC 110 (Introduction to Computer Science) is strongly recommended.

## III.15. Double major in Mathematics and Sociology.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Soc 102: Society, Culture, & Individ. Emily Balch Seminar Foreign Language	MATH 102: Calculus II Foreign Language Distribution Requirement Distribution Requirement
Second year	MATH 201: Multivariable Calculus Sociology Elective* Soc 265: Res. Design and Stat. Anal. Distribution Requirement	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Distribution Requirement Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Soc 302: Social Theory Sociology Elective*	MATH 302 <i>or</i> MATH 304 Math Elective (200 or 300 level) Sociology 303: Junior Conference (Discipline-Based Intensive Writing) Sociology Elective*
Fourth year	Math 398: Senior Conference Soc 398: Senior Conference Math Elective (200 or 300 level) Sociology Elective*	Math Elective (200 or 300 level) Sociology Elective* Free Elective Free Elective

\* Of the 5 sociology electives, at least 1 must be at the 300-level, and 1 may be at the 100-level.  
Note: Two of the math electives may count as *allied work* for the Sociology Major. To design your program, you must meet with a math major advisor, and with Faculty in the Sociology Department.

## III.16. Double major in Mathematics and English.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I Emily Balch Seminar Foreign Language Distribution Requirement	MATH 102: Calculus II English Elective (200 level)* Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus English Elective (200 level)* Distribution Requirement Free Elective	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Eng 250: Methods of Literary Study Free Elective
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i>  English Elective (200 level)* English Elective (300 level)*	MATH 302 or MATH 304 Math Elective (200 or 300 level) English Elective (200 level)* English Elective (300 level)*
Fourth year	Math 398: Senior Conference Eng 398: Senior Seminar Math Elective (200 or 300 level) English Elective*	Math Elective (200 or 300 level) Eng 399: Senior Essay English Elective* Free Elective

\* Of the 8 English Electives, at least 3 must be at the 300-level (not counting English 398 or 399). You need to take two 200 level classes before taking English 250. English 250 should be completed either in the spring semester of sophomore year or the fall semester of junior year. **Note: You must meet regularly with advisors in both departments and gain approval to double major.**

## III.17. Math major with a minor in Environmental Studies.

	Fall Semester	Spring Semester
First year	MATH 101: Calculus I EnvS 101: Intro. Env. Studies Emily Balch Seminar Foreign Language	MATH 102: Calculus II Environmental Studies Elective* Foreign Language Distribution Requirement
Second year	MATH 201: Multivariable Calculus Environmental Studies Elective* Distribution Requirement Free Elective	MATH 203: Linear Algebra MATH 206: Transition to Higher Math (as math elective) Environmental Studies Elective* Distribution Requirement
Third year	MATH 301: Real Analysis I; <i>W.A.</i> MATH 303: Abstract Algebra I; <i>W.A.</i> Environmental Studies Elective* Free Elective	MATH 302 or MATH 304 Math Elective (200 or 300 level) Free Elective Free Elective
Fourth year	Math 398: Senior Conference Math Elective (200 or 300 level) Free Elective Free Elective	Math Elective (200 or 300 level) EnvS 397: Senior Seminar Free Elective Free Elective

\* The Environmental Studies minor requires four electives beyond the introductory EnvS 101 and the capstone EnvS 397, any of which can be used to satisfy distribution requirements. Two of these must be chosen from the approved list in the natural sciences, math and engineering (many of which satisfy SI), and two from the approved list in the humanities and social sciences (many of which satisfy CI, CC or IP); see [www.brynmawr.edu/es/courses.html](http://www.brynmawr.edu/es/courses.html).

**Note:** Math 210 Differential Equations is *strongly* suggested as a Math Elective.

All programs of study **MUST** be designed with the advice of advisors in both departments.