# Mathematics, BA

Bachelor of Arts students majoring in mathematics enroll in one of these programs: Program A is for students who plan to work in business or government or pursue graduate study in mathematics. Program B is for students who seek secondary school teaching licensure. Program C, in which students choose a specialization, may be especially appropriate for students who plan to seek a math-related job after earning the bachelor's degree rather than going on to graduate study. Defined areas of specialization include business (economics, finance, or risk management and insurance), data sciences (biostatistics, computer science, data science, or statistics and actuarial science), and physical sciences (biochemistry, biomathematics, chemistry, or physics). Program C is also available for students who wish to tailor the study of mathematics to other fields, including areas within engineering.

## Learning Outcomes

Math majors will be able to:

- give correct, logical mathematical proofs using mathematical terminology and hypotheses;
- reason logically and quantitatively using algebraic, analytic, and numerical methods;
- incorporate mathematical ideas and reasoning into well-written English; and
- model and analyze problems in pure mathematics and in other disciplines.

## Transfer From Engineering to Mathematics

Certain engineering students who have completed MATH:1550 Engineering Calculus I, MATH:1560 Engineering Calculus II, MATH:2550 Engineering Matrix Algebra, MATH:2560 Engineering Differential Equations, or MATH:3550 Engineering Vector Calculus may count these courses toward the major in mathematics. See the Department of Mathematics website.

## Requirements

The Bachelor of Arts with a major in mathematics requires a minimum of 120 s.h., including at least 38–47 s.h. of work for the major. Total credit for the major depends on a student's choice of Program A, B, or C. Students must maintain a grade-point average of at least 2.00 in all courses for the major and in all UI courses for the major. They must also complete the College of Liberal Arts and Sciences GE CLAS Core.

All students complete the post-calculus mathematics requirement, the upper-level mathematics requirement, and the requirements for Program A, B, or C. Students must complete a two-semester sequence of MATH:1850 Calculus I and MATH:1860 Calculus II. Students in certain specializations within Program C may be able to substitute another two-course calculus sequence; see information for specific specializations below. Advanced placement credit, CLEP credit, and credit granted through the Mathematics Incentive Program are accepted for all or part of the calculus requirement.

Students may count up to 56 s.h. of Department of Mathematics coursework (prefix MATH) toward credit required for the Bachelor of Arts degree. For policies concerning transfer credit, credit by examination, cumulative grade-point average, and general rules relating to regression and duplication, see For Undergraduate Students on the College of Liberal Arts and Sciences website.

For information about duplication, regression, and use of the second-grade-only option for mathematics courses, contact the Department of Mathematics or visit the Department of Mathematics website. The website also provides details about schedule planning and career options for mathematics students. For more information on admission, financial support, employment opportunities, the faculty, facilities, and other topics, visit the Department of Mathematics or the University of Iowa website.

The BA with a major in mathematics requires the following coursework.

| Requirements | Hours |
|---|---|
| Post-Calculus Mathematics Courses | |
| Upper-Level Mathematics Course | |
| Program Requirements | 38-47 |

## Post-Calculus Mathematics Courses

15 s.h. of post-calculus mathematics courses (prefix MATH) applied toward the major must be completed at the University of Iowa; students may not count transfer courses or credit by exam toward this requirement.

Post-calculus courses in the Department of Mathematics are numbered 2000 or above, excluding MATH:3996 andMATH:3997.

## Upper-Level Mathematics Course

Students must take at least one upper-level mathematics course for the BA degree. Upper-level mathematics courses include MATH:3900 and courses numbered 4000 or above, excluding MATH:4120.

No courses from other departments can be counted as upper-level mathematics courses unless they are cross-referenced with an upper-level mathematics course (prefix MATH).

## Program A

Program A is primarily for students who plan to work in business or government or to pursue graduate study in mathematics.

### Program A: Core Courses

Students complete the following core courses.

| Course # | Title | Hours |
|---|---|---|
| MATH:1850 & MATH:1860 | Calculus I and Calculus II | 8 |
| MATH:2700 | Introduction to Linear Algebra | 4 |
| MATH:2850 | Calculus III | 4 |
| MATH:3600 | Introduction to Ordinary Differential Equations | 3 |
| MATH:3720 | Introduction to Abstract Algebra | 4 |
| MATH:3770 | Foundations of Analysis | 4 |

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

## Program A: Electives

Students complete four electives (12–16 s.h.), including at least two courses with a MATH prefix. Of these two courses, at least one course must be an upper-level mathematics course.

### Mathematics

Students may choose from mathematics courses numbered MATH:2150, MATH:3800, or courses above MATH:3800.

### Computer Science

Students may choose computer science courses numbered CS:1210 through CS:4740, excluding CS:3210, CS:3910, CS:3980, and CS:3990.

### Statistics and Actuarial Science

Students may choose statistics courses numbered STAT:2020, STAT:3100 through STAT:4740, STAT:5100 through STAT:5120, excluding STAT:3510, STAT:4143, and STAT:4200.

Among the courses previously listed, only one of the following three courses can be counted toward the elective requirement: STAT:2020, STAT:3100, or STAT:3120. None of these courses can be counted as credit earned toward graduation if taken after STAT:4100 owing to regression policies.

Students may choose actuarial science courses numbered ACTS:3080 and ACTS:4130 through ACTS:4380.

# Program B

Program B is intended for students seeking secondary school teaching licensure. Students who wish to earn teaching licensure in addition to earning a Bachelor of Arts with a major in mathematics must also complete the Teacher Education Program (TEP); see the section titled "Teacher Licensure."

## Program B: Core Courses

Students complete the following core courses.

| Course # | Title | Hours |
|---|---|---|
| MATH:1850 & MATH:1860 | Calculus I and Calculus II | 8 |
| MATH:2150 | Foundations of Geometry | 3 |
| MATH:2700 | Introduction to Linear Algebra | 4 |
| MATH:2850 | Calculus III | 4 |
| MATH:3720 | Introduction to Abstract Algebra | 4 |
| MATH:3770 | Foundations of Analysis | 4 |
| MATH:4050 | Introduction to Discrete Mathematics | 3 |
| or MATH:4060 | Discrete Mathematical Models | |
| CS:1210 | Computer Science I: Fundamentals | 4 |
| STAT:3120 | Probability and Statistics | 4 |

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

## Program B: Electives

Students in Program B must take at least one additional Department of Mathematics post-calculus course (3–4 s.h.). Post-calculus courses must avoid duplication and regression with core mathematics courses, particularly when engineering mathematics courses are considered. With the department's approval, capable students are encouraged to substitute more advanced courses in the same subject area for any of the electives. The Department of Mathematics website offers advice on course selection.

## Teacher Licensure

Students interested in teaching in elementary and/or secondary schools should seek admission to the Teacher Education Program (TEP) in the College of Education.

To qualify for licensure in secondary teaching, students in the TEP complete a degree in education as well as a related College of Liberal Arts and Sciences degree. See Apply on the College of Education website for details on requirements and deadlines for applying to the College of Education and about TEP choices of majors leading to licensure.

Students who wish to earn teacher licensure should choose Program B.

# Program C: Math With a Related Specialization

The Department of Mathematics encourages students of other majors to take more mathematics courses and attempt a BA or BS secondary major (or secondary degree, if their first major is outside CLAS) in mathematics. Program C, math with a related specialization, offers a curricular path to achieve this goal. Students complete core courses, mathematics electives, and subtrack requirements.

Program C enables students to declare a concentration in a mathematics-related area. Options include specialization in business (subtracks in economics, finance, and risk management and insurance), data sciences (subtracks in biostatistics, computer science, data science, and statistics and actuarial science), and physical sciences (subtracks in biochemistry, biomathematics, chemistry, and physics). Students may declare one of these defined areas of specialization and must complete all requirements for one subtrack. They may also propose other plans of study under Program C. An individualized plan of study must be approved by the Department of Mathematics prior to the start of the student's final year.

## Business, Data Sciences, and Physical Sciences: Core Courses

Students complete the following core mathematics courses. Students pursuing the biostatistics subtrack of the data sciences specialization should refer to the following section titled "Biostatistics Subtrack" for additional information about an alternative set of core courses. Students in the biomathematics subtrack of the physical sciences specialization should refer to the section titled "Biomathematics Subtrack" rather than the following list.

| Course # | Title | Hours |
|---|---|---|
| One of these sequences: | | |
| MATH:1850 & MATH:1860 | Calculus I and Calculus II | 8 |
| MATH:1550 & MATH:1560 | Engineering Calculus I and Engineering Calculus II | 8 |
| All of these: | | |
| MATH:2700 | Introduction to Linear Algebra | 4 |
| MATH:2850 | Calculus III | 4 |

| | | |
|---|---|---|
| MATH:3720 | Introduction to Abstract Algebra (students in the biostatistics subtrack must take MATH:3770) | 4 |
| or MATH:3770 | Foundations of Analysis | |

If students complete both MATH:3720 and MATH:3770, one may count toward core courses and the other toward the elective requirement.

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

## Business, Data Sciences, and Physical Sciences: Mathematics Electives

Students must take three mathematics elective courses (9–12 s.h.), including at least one upper-level math course. Mathematics elective options include mathematics courses (prefix MATH) numbered MATH:3600–MATH:5810, excluding MATH:3996, MATH:3997, and MATH:4120.

When a subtrack requires post-calculus mathematics courses, those courses may also count as mathematics electives, with the exception of the physics subtrack of the physical sciences specialization. See the following section titled "Physics Subtrack" for more information.

## Business Specialization

### Economics Subtrack

The business specialization with an economics subtrack requires the following four courses.

| Course # | Title | Hours |
|---|---|---|
| All of these: | | |
| CS:1210 | Computer Science I: Fundamentals | 4 |
| ECON:3100 | Intermediate Microeconomics | 3 |
| ECON:3150 | Intermediate Macroeconomics | 3 |
| STAT:3120 | Probability and Statistics | 4 |

### Finance Subtrack

The business specialization with a finance subtrack requires the following four courses.

| Course # | Title | Hours |
|---|---|---|
| This course: | | |
| FIN:3000 | Introductory Financial Management | 3 |
| One of these: | | |
| FIN:3200 | Investment Management | 3 |
| FIN:3300 | Corporate Finance | 3 |
| Two of these: | | |
| ACCT:3020 | Financial Accounting and Reporting | 3 |
| FIN:3200 | Investment Management (if not taken for the previous requirement) | 3 |
| FIN:3300 | Corporate Finance (if not taken for the previous requirement) | 3 |
| FIN:3400 | Principles of Risk Management and Insurance | 3 |
| A 3-4 s.h. finance course (prefix FIN) that counts toward the BBA in finance | | 3-4 |

### Risk Management and Insurance Subtrack

The business specialization with a risk management and insurance subtrack requires the following four courses.

| Course # | Title | Hours |
|---|---|---|
| Both of these: | | |
| FIN:3000 | Introductory Financial Management | 3 |
| FIN:3400 | Principles of Risk Management and Insurance | 3 |
| Two of these: | | |
| FIN:4420 | Property and Liability Insurance | 3 |
| FIN:4430 | Life and Health Insurance | 3 |
| FIN:4440 | Employee Benefit Plans | 3 |
| FIN:4450 | Risk Modeling | 3 |

## Data Sciences Specialization

### Biostatistics Subtrack

#### Biostatistics: Alternative Core Courses

Students may complete five core courses as previously listed, or they may complete the six courses listed below.

| Course # | Title | Hours |
|---|---|---|
| All of these: | | |
| MATH:1550 | Engineering Calculus I | 4 |
| MATH:1560 | Engineering Calculus II | 4 |
| MATH:2550 | Engineering Matrix Algebra | 2 |
| MATH:2560 | Engineering Differential Equations | 3 |
| MATH:3550 | Engineering Vector Calculus | 3 |
| MATH:3770 | Foundations of Analysis | 4 |

#### Biostatistics: Additional Required Courses

The data sciences specialization with a biostatistics subtrack requires the following six courses.

| Course # | Title | Hours |
|---|---|---|
| This course: | | |
| CPH:1400 | Fundamentals of Public Health | 3 |
| Three of these, with at least one course numbered 4000 or above: | | |
| MATH:3600 | Introduction to Ordinary Differential Equations (if student has not taken MATH:2560 as a core course) | 3 |
| MATH:3800 | Introduction to Numerical Methods | 3 |
| MATH:4220 | Fourier Analysis and Applications | 3 |
| MATH:4700 | Partial Differential Equations and Applications | 3 |
| MATH:4820 | Optimization Techniques | 3 |
| One of these: | | |
| STAT:2010 | Statistical Methods and Computing | 3 |
| STAT:3200 | Applied Linear Regression | 3 |

| | | |
|---|---|---|
| STAT:3210 | Experimental Design and Analysis | 3 |
| STAT:4100 | Statistical Inference I | 3 |
| STAT:4101 | Statistical Inference II | 3 |
| One of these: | | |
| BIOS:4120 | Introduction to Biostatistics | 3 |
| BIOS:5120 | Regression Modeling and ANOVA in the Health Sciences | 3 |
| BIOS:5310 | Research Data Management | 3 |
| BIOS:5710 | Biostatistical Methods I | 4 |
| BIOS:5720 | Biostatistical Methods II | 4 |
| BIOS:5730 | Biostatistical Methods in Categorical Data | 3 |

## Computer Science Subtrack

The data sciences specialization with a computer science subtrack requires three electives in computer science (prefix CS) numbered CS:1210–CS:4740, excluding CS:2110, CS:3010, CS:3210, CS:3910, CS:3980, CS:3990, and CS:3999.

## Data Science Subtrack

The data sciences specialization with a data science subtrack requires the following three courses.

| Course # | Title | Hours |
|---|---|---|
| Three of these, with at least one course in computer science (prefix CS) and one course in statistics (prefix STAT): | | |
| CS:3330 | Algorithms | 3 |
| CS:4400 | Database Systems | 3 |
| CS:4470 | Health Data Analytics | 3 |
| CS:5430 | Machine Learning | 3 |
| CS:5630 | Cloud Computing Technology | 3 |
| STAT:3100 | Introduction to Mathematical Statistics I | 4 |
| STAT:3101 | Introduction to Mathematical Statistics II | 3 |
| STAT:3200 | Applied Linear Regression | 3 |
| STAT:3210 | Experimental Design and Analysis | 3 |
| STAT:4520 | Bayesian Statistics | 3 |
| STAT:4540 | Statistical Learning | 3 |
| STAT:4560 | Statistics for Risk Modeling I | 3 |
| STAT:4580 | Data Visualization and Data Technologies | 3 |
| STAT:5810 | Research Data Management | 3 |
| At most one of these in each course subject: | | |
| CS:1210 | Computer Science I: Fundamentals | 4 |
| CS:2210 | Discrete Structures | 4 |
| CS:2230 | Computer Science II: Data Structures | 4 |
| STAT:2010 | Statistical Methods and Computing | 3 |

## Statistics and Actuarial Science Subtrack

The data sciences specialization with a statistics and actuarial science subtrack requires the following three courses.

| Course # | Title | Hours |
|---|---|---|
| Three of these: | | |
| ACTS:3080 | Mathematics of Finance I | 3 |
| ACTS:4130 | Quantitative Methods for Actuaries | 3 |
| ACTS:4150 | Fundamentals of Short-Term Actuarial Mathematics | 3 |
| ACTS:4180 | Life Contingencies I | 3 |
| ACTS:4280 | Life Contingencies II | 3 |
| STAT:2010 | Statistical Methods and Computing | 3 |
| STAT:3101 | Introduction to Mathematical Statistics II | 3 |
| STAT:3200 | Applied Linear Regression | 3 |
| STAT:3210 | Experimental Design and Analysis | 3 |
| STAT:3620 | Quality Control | 3 |
| STAT:4100 | Statistical Inference I | 3 |
| STAT:4101 | Statistical Inference II | 3 |
| STAT:4520 | Bayesian Statistics | 3 |
| STAT:4740 | Large Data Analysis | 3 |
| STAT:5100 | Statistical Inference I | 3 |
| STAT:5101 | Statistical Inference II | 3 |
| STAT:5120 | Mathematical Methods for Statistics | 3 |
| May count one of these if taken before STAT:4100: | | |
| STAT:2020 | Probability and Statistics for the Engineering and Physical Sciences | 3 |
| STAT:3100 | Introduction to Mathematical Statistics I | 4 |
| STAT:3120 | Probability and Statistics | 4 |

# Physical Sciences Specialization

## Biochemistry Subtrack

The physical sciences specialization with a biochemistry subtrack requires the following five courses.

| Course # | Title | Hours |
|---|---|---|
| Both of these: | | |
| MATH:3600 | Introduction to Ordinary Differential Equations | 3 |
| BMB:4240 | Biophysics and Advanced Biochemistry | 3 |
| Three electives from these: | | |
| BMB:3120 | Biochemistry and Molecular Biology I | 3 |
| BMB:3130 | Biochemistry and Molecular Biology II | 3 |
| BMB:4310 | Computational Biochemistry | 3 |
| May include one of these: | | |
| CHEM:4430 | Principles of Physical Chemistry | 3 |
| CHEM:4431 | Chemical Thermodynamics | 3 |
| CHEM:4432 | Quantum Mechanics and Chemical Kinetics | 3 |
| Up to 3 s.h. from this course: | | |

| | | |
|---|---|---|
| BMB:4999 | Advanced Undergraduate Biochemistry Research (requires departmental approval in advance) | arr. |

## Biomathematics Subtrack

### Biomathematics: Core Courses

Students in the biomathematics subtrack should complete one of the two sets of core courses below for a total of at least 23 s.h.

| Course # | Title | Hours |
|---|---|---|
| **Option 1** | | |
| One of these sequences: | | |
| MATH:1850 & MATH:1860 | Calculus I and Calculus II | 8 |
| MATH:1550 & MATH:1560 | Engineering Calculus I and Engineering Calculus II | 8 |
| All of these: | | |
| MATH:2700 | Introduction to Linear Algebra | 4 |
| MATH:2850 | Calculus III | 4 |
| MATH:3600 | Introduction to Ordinary Differential Equations | 3 |
| MATH:3770 | Foundations of Analysis | 4 |

| Course # | Title | Hours |
|---|---|---|
| **Option 2** | | |
| All of these: | | |
| MATH:1550 | Engineering Calculus I | 4 |
| MATH:1560 | Engineering Calculus II | 4 |
| MATH:2550 | Engineering Matrix Algebra | 2 |
| MATH:2560 | Engineering Differential Equations | 3 |
| MATH:3550 | Engineering Vector Calculus | 3 |
| MATH:3770 | Foundations of Analysis | 4 |
| An additional post-calculus mathematics course (prefix MATH) as previously defined in this section of the catalog, excluding MATH:2550, MATH:2560, MATH:2700, MATH:2850, MATH:3550, MATH:3600, MATH:3770, MATH:3800, MATH:4060, and MATH:4750 | | 3-4 |

### Biomathematics: Additional Required Courses

The physical sciences specialization with a biomathematics subtrack requires the following five courses.

| Course # | Title | Hours |
|---|---|---|
| All of these: | | |
| MATH:3800 | Introduction to Numerical Methods | 3 |
| MATH:4750 | Introduction to Mathematical Biology | 3 |
| STAT:3120 | Probability and Statistics | 4 |
| Two electives from these, with at least one course numbered 3000 or above: | | |
| BIOL:2512 | Fundamental Genetics | 4 |
| BIOL:2673 | Ecology | 3 |
| BIOL:3233 | Introduction to Developmental Biology | 3 |
| BIOL:3253 | Neurobiology I | 4 |
| BIOL:3254 | Neurobiology II | 4 |
| BIOL:3314 | Genomics | 3 |
| BIOL:3343 | Animal Physiology | 3 |
| BIOL:3713 | Molecular Genetics | 4 |
| BMB:3120 | Biochemistry and Molecular Biology I | 3 |
| BMB:3130 | Biochemistry and Molecular Biology II | 3 |
| BMB:4240 | Biophysics and Advanced Biochemistry | 3 |
| BME:2500 | Biomaterials and Biomechanics | 4 |
| CHEM:2210 | Organic Chemistry I | 3 |
| At most one of these: | | |
| BIOL:3172 | Evolution | 4 |
| BIOL:3373 | Human Population Genetics and Variation | 3 |
| At most one of these: | | |
| BIOL:2753 | Introduction to Neurobiology | 3 |
| PSY:2701 | Introduction to Behavioral Neuroscience | 4 |
| At most one of these: | | |
| BIOL:4213 | Bioinformatics | 4 |
| BIOL:4386 | Introduction to Scientific Computing for Biologists | 3 |
| BMB:3310 | Practical Data Science and Bioinformatics | 3 |
| BMB:4310 | Computational Biochemistry | 3 |

## Chemistry Subtrack

The physical sciences specialization with a chemistry subtrack requires the following five courses.

| Course # | Title | Hours |
|---|---|---|
| Both of these: | | |
| MATH:3600 | Introduction to Ordinary Differential Equations | 3 |
| CHEM:3250 | Inorganic Chemistry | 3 |
| Three electives from these: | | |
| CHEM:3110 | Equilibria and Electrochemistry | 3 |
| CHEM:3120 | Spectroscopy and Separations | 3 |
| CHEM:4430 | Principles of Physical Chemistry | 3 |
| CHEM:4431 | Chemical Thermodynamics | 3 |
| CHEM:4432 | Quantum Mechanics and Chemical Kinetics | 3 |
| CHEM:4480 | Introduction to Molecular Modeling | 3 |
| CHEM:5114 | Chemical Systems Modeling | 3 |
| May include one of these: | | |
| CHEM:3430 | Analytical Measurements | 3 |
| CHEM:3440 | Physical Measurements | 3 |
| CHEM:4450 | Synthesis and Measurement | 3 |

## Physics Subtrack

The physical sciences specialization with a physics subtrack requires the following four courses. If students complete both MATH:3720 and MATH:3770, one may count toward core courses and the other toward this subtrack.

| Course # | Title | Hours |
|---|---|---|
| Three of these, with at least two courses in physics (prefix PHYS): | | |
| MATH:3600 | Introduction to Ordinary Differential Equations | 3 |
| MATH:3800 | Introduction to Numerical Methods | 3 |
| MATH:4200 | Complex Variables | 3 |
| PHYS:3710 | Intermediate Mechanics | 3 |
| PHYS:3730 | Statistical Physics | 3 |
| PHYS:3811 | Electricity and Magnetism I | 3 |
| PHYS:3812 | Electricity and Magnetism II | 3 |
| PHYS:3741 | Introduction to Quantum Mechanics I | 3 |
| PHYS:3742 | Introduction to Quantum Mechanics II | 3 |
| One of these, which will not count toward the mathematics electives: | | |
| MATH:3720 | Introduction to Abstract Algebra | 4 |
| or MATH:3770 | Foundations of Analysis | |
| MATH:3900 | Introduction to Mathematics Research | 3 |
| Mathematics course (prefix MATH) numbered MATH:4000-MATH:5899, excluding MATH:4120 | | 3-4 |
| Physics course (prefix PHYS) taken for at least 3 s.h. and numbered PHYS:3000-PHYS:4998, excluding PHYS:3756, PHYS:3850, PHYS:4750, and PHYS:4990 | | |

## Other Program C Specializations: Core Courses

Students may complete Program C with another specialization not listed here; they should work with an academic advisor in mathematics to create their plan of study. Students pursuing this option complete the following core mathematics courses.

| Course # | Title | Hours |
|---|---|---|
| One of these sequences: | | |
| MATH:1850 & MATH:1860 | Calculus I and Calculus II | 8 |
| MATH:1550 & MATH:1560 | Engineering Calculus I and Engineering Calculus II | 8 |
| One of these groups: | | |
| MATH:2700 & MATH:2850 | Introduction to Linear Algebra and Calculus III | 8 |
| MATH:2550 & MATH:2560 & MATH:3550 | Engineering Matrix Algebra and Engineering Differential Equations and Engineering Vector Calculus | 8 |
| One of these: | | |
| MATH:3720 | Introduction to Abstract Algebra | 4 |
| MATH:3770 | Foundations of Analysis | 4 |

If students complete both MATH:3720 and MATH:3770, one may count toward core courses and the other toward the elective requirement described below.

More advanced courses may be substituted for the core courses with Department of Mathematics approval.

## Other Program C Specializations: Electives

Students choose six electives beyond the core courses, including three mathematics elective courses (9-12 s.h.), at least one of which must be an upper-level math course numbered MATH:3900 or numbered 4000 or above. Mathematics elective options include mathematics courses (prefix MATH) numbered MATH:3600–MATH:5810, excluding MATH:3996, MATH:3997, and MATH:4120. Only one of MATH:2560 or MATH:3600 may be counted toward the major requirements.

All electives must be offered for 3–4 s.h. The area of specialization should be in a subject that is math-related and should demonstrate a progression of learning in that discipline. At least some of the proposed electives must be upper-level for that course subject. Students must propose their plan of study before they begin their final year. Individualized plans of study must be approved by the Department of Mathematics.

# Combined Programs

# BA/MAT (Mathematics Education Subprogram)

The College of Liberal Arts and Sciences and the College of Education offer students the opportunity to earn their Bachelor of Arts/Master of Arts in Teaching degree with a mathematics education subprogram in as little as five years. Students can begin work toward the MAT while completing their bachelor's degree. The combined program allows students to count a limited amount of credit toward both the BA and MAT degree requirements.

Separate application to each program is required. For more information, see Mathematics Education in the Master of Arts in Teaching, MAT (College of Education) section in the catalog.

# Honors

# Honors in the Major

Students majoring in mathematics have the opportunity to graduate with honors in the major. Students must maintain a cumulative University of Iowa grade-point average (GPA) of at least 3.33, as required by the College of Liberal Arts and Sciences; additionally, students must maintain a cumulative GPA of at least 3.40 in the major, a GPA set by the Department of Mathematics.

To graduate with honors in the major, students must also complete one of the following options.

## Option 1

Students complete five upper-level mathematics courses as defined in "Upper-Level Mathematics Courses" under "Requirements." Mathematics courses (prefix MATH) numbered 6000 or above must be approved by the mathematics honors advisor in advance.

Sometimes an honors research project may only produce a research report but not a formal thesis. A research report will be counted as one upper-level math course toward option 1 by enrolling in MATH:3996 Individual Study and Honors in Mathematics for 3 s.h. A research report must be approved by the honors research project supervisor.

### Option 2

Students complete three upper-level mathematics courses and write an honors thesis. A student who chooses this option must contact the Department of Mathematics honors advisor and find a faculty member who is willing to supervise their honors thesis project. The Department of Mathematics honors advisor will then appoint a thesis committee of at least two faculty members. The student will need to obtain preapproval at the beginning of their thesis project, obtain midterm approval from the thesis committee, and pass a defense.

The Department of Mathematics encourages students to use their sole-authored or coauthored research papers as honors theses if the papers have been published, accepted, or submitted to a research journal. Satisfactory peer reviews or referee's reports may be accepted in lieu of preapproval and midterm approval.

It is recommended that students who earn honors in mathematics pursue the BS degree.

## University of Iowa Honors Program

In addition to honors in the major, students have opportunities for honors study and activities through membership in the University of Iowa Honors Program. Visit Honors at Iowa to learn about the university's honors program. Honors in mathematics is awarded by the Department of Mathematics and is separate from the University of Iowa Honors Program.

Membership in the UI Honors Program is not required to earn honors in the mathematics major. However, honors in mathematics can be applied toward UI Honors Program requirements.

# Career Advancement

The Pomerantz Career Center offers multiple resources to help students find internships and jobs.

# Academic Plans

## Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the university's Four-Year Graduation Plan. Courses in the major are those required to complete the major; they may be offered by departments other than the major department.

Many mathematics courses must be taken in sequence, so students must begin major requirements as early as possible, and individual plans of study must be constructed carefully. The major typically requires 11 or 12 courses. Students must choose Program A, B, or C by the end of the third semester and must remain in their chosen program until they graduate in order to stay on track for the four-year graduation plan.

**Before the third semester begins:** coursework in the major through second-semester calculus.

**Before the fifth semester begins:** two or three more courses in the major.

**Before the seventh semester begins:** three or four more courses in the major and at least 90 s.h. earned toward the degree.

**Before the eighth semester begins:** two or three more courses in the major.

**During the eighth semester:** enrollment in all remaining coursework in the major, all remaining GE CLAS Core courses, and a sufficient number of semester hours to graduate.

## Sample Plans of Study

Sample plans represent one way to complete a program of study. Actual course selection and sequence will vary and should be discussed with an academic advisor. For additional sample plans, see MyUI.

### Mathematics, BA

- Program A
- Program B

### Program A

This sample plan is currently being reviewed and will be added at a later date.

### Program B

This sample plan is currently being reviewed and will be added at a later date.