

B.A. in Mathematics

Assessment Plan for AY 2006-2007

I. Mission Statement

The Bachelor of Arts degree in Mathematics is designed to provide students with the background needed for industrial and academic positions, for entry into mathematics graduate programs or professional programs (e.g. business school, law school) and, coupled with appropriate education courses, to prepare students to teach high school mathematics.

This fits in well with the mission of Indiana University Kokomo, which aims to enhance the educational and professional attainment of the residents of North Central Indiana by providing a wide range of bachelor's degrees.

II. Goals of the Mathematics Curriculum and Student Learning Outcomes

Program Goals

Students, upon completing the coursework required for a Bachelor of Arts degree in Mathematics, will be able to

1. Understand the nature of truth and the concept of proof in the discipline of mathematics.
2. Understand the application of mathematical techniques to other fields.
3. Formulate and solve problems mathematically.
4. Communicate mathematical ideas clearly and effectively.
5. Independently comprehend mathematical material appropriate for undergraduates.

Student Learning Outcomes

Goal 1. Understand the nature of truth and the concept of proof in the discipline of mathematics.

1. Students will be able to construct and write proofs for mathematical assertions, using a variety of methods.
2. Students will be able to disprove mathematical assertions, by constructing counterexamples.
3. Students will independently read mathematical arguments, and be able to judge their validity.

Goal 2. Understand the application of mathematical techniques to other fields.

1. Students will understand that many problems can be solved by constructing mathematical models.
2. Students will be able to translate concepts from other fields into mathematical relationships.
3. Students will be able to apply computational techniques of mathematics to a wide variety of applications.

Goal 3. Formulate and solve problems mathematically.

1. Students will be able to perform algorithmic and logical procedures.
2. Students will be able to use appropriate technology.
3. Students will be able to formulate a hypothesis and determine its validity.

Goal 4. Communicate mathematical ideas clearly and effectively.

1. Students will be able to explain the solutions to problems using correct mathematical vocabulary and mathematical notation.
2. Students will be able to solve problems in a group setting.

Goal 5. Independently comprehend mathematical material appropriate for undergraduates.

1. Students will be able to read mathematics to reinforce the material presented in class.
2. Students will be able to locate materials which will aid them in doing their mathematics assignments.
3. Students will be able to independently learn new concepts and utilize them.

III. Curriculum Map

The tables that follow indicate in which courses the outcomes are addressed, specifically listing the courses in which each outcome is introduced, expanded on, and reinforced. Every course is associated with at least one outcome and every outcome is associated with at least one course.

Goal 1. Understand the nature of truth and the concept of proof in the discipline of mathematics.

Outcome	Courses in which outcome is INTRODUCED	Courses in which outcome is EXPANDED	Courses in which outcome is REINFORCED
Construct and write proofs for mathematical assertions, using a variety of methods.	M303	M360 M366 T336 M403 M413 M415 M447 M448 M471	M404 M414 M472
Disprove mathematical assertions, by constructing counterexamples	M303	M360 M366 T336 M403 M413 M415 M447 M448 M471	M404 M414 M472
Independently read mathematical arguments, and be able to judge their validity	M303	M360 M366 T336 M403 M413 M415 M447 M448 M471	M404 M414 M472

Goal 2. Understand the application of mathematical techniques to other fields.

Outcome	Courses in which outcome is INTRODUCED	Courses in which outcome is EXPANDED	Courses in which outcome is REINFORCED
Understand that many problems can be solved by constructing mathematical models	M215 M216 M311	M313 M360 M415 M447 M471	M366 M448 M472
Translate concepts from other fields into mathematical relationships.	M215 M216 M311	M313 M360 M415 M447 M471	M366 M448 M472
Apply computational techniques of mathematics to a wide variety of applications.	M215 M216 M311	M313 M360 M415 M447 M471	M366 M448 M472

Goal 3. Formulate and solve problems mathematically.

Outcome	Courses in which outcome is INTRODUCED	Courses in which outcome is EXPANDED	Courses in which outcome is REINFORCED
Perform algorithmic and logical procedures.	M215	M216 M311 M303 M313 M360 M366 T336 M403 M413 M415 M447 M471	M404 M414 M448 M472
Use appropriate technology.	M215	M216 M311 M303 M313 M360 M447 M471	M366 M448 M472
Formulate a hypothesis and determine its validity.	M303 T336	M403 M413 M447	M404 M414 N448

Goal 4. Communicate mathematical ideas clearly and effectively.

Outcome	Courses in which outcome is INTRODUCED	Courses in which outcome is EXPANDED	Courses in which outcome is REINFORCED
Explain the solutions to problems using correct mathematical vocabulary and mathematical notation.	M215	M216 M311 M303 M313 M360 M366 T336 M403 M413 M415 M447 M471	M404 M414 M448 M472
Solve problems in a group setting.	M366 T336 M403 M447	M404 M448	

Goal 5. Independently comprehend mathematical material appropriate for undergraduates.

Outcome	Courses in which outcome is INTRODUCED	Courses in which outcome is EXPANDED	Courses in which outcome is REINFORCED
Read mathematics to reinforce the material presented in class.	T336 M403 M413 M447 M471	M404 M414 M448 M472	
Locate materials which will aid them in doing their mathematics assignments.	T336 M403 M413 M447 M471	M404 M414 M448 M472	
Learn new concepts and utilize them.	M303 T336 M403 M413 M447 M471	M404 M414 M448 M472	

IV. Assessment Activities for AY 2006 – 2007

A. Student Learning Outcomes To Be Assessed During AY 2006 – 2007

The specific student learning outcomes to be assessed in AY 2006 – 2007 are as follows.

Goal 3.1. Students will be able to perform algorithmic and logical procedures.

This will be assessed in M215 (Fall 2006), M311 (Fall 2006), M360 (Fall 2006), M216 (Spring 2007), M303 (Spring 2007), and M366 (Spring 2007).

Goal 3.2. Students will be able to use appropriate technology.

This will be assessed in M215 (Fall 2006), M311 (Fall 2006), M360 (Fall 2006), M216 (Spring 2007), M303 (Spring 2007), and M366 (Spring 2007).

Goal 3.3. Students will be able to formulate a hypothesis and determine its validity.

This will be assessed in M303 (Spring 2007) and T336 (Spring 2007).

Portfolio materials of student work in all the mathematics classes will be collected throughout the academic year. The portfolio materials for a course will include, as a minimum, each student's final examination. If the faculty member teaching a course is concerned that the final exam will not provide sufficient examples of student work for assessment purposes, additional work such as graded homework, midterm tests, and major projects, will also be included in the portfolio.

The faculty will meet early in the fall 2007 semester to analyze and interpret the assessment data that has been collected in AY 2006 – 2007. In addition to coursework for AY 2006 - 2007, the faculty will review any general mathematics examinations which have been taken by graduating mathematics majors. To assess student achievement, the portfolio materials will be permuted among the faculty, so that in addition to the instructor having graded the work, another faculty member will also have closely reviewed the work pertaining to the outcomes being assessed. Each faculty member will keep detailed notes of their assessment of students work and evaluate it in regard to the performance criteria. In addition if any students complete the general examination, their performance on the relevant questions on that exam will be independently assessed by all Ph. D. mathematics faculty members. After reviewing all the work the faculty will meet to compare notes and assign a level of performance for each student in each course, and on the general exam.

B. Performance Criteria

The table that follows indicates the performance criteria of the learning outcomes for each goal of the mathematics curriculum that will be assessed in AY 2006 – 2007.

Goal 3. Formulate and solve problems mathematically.

Outcome	Components	Performance Criteria
Perform algorithmic and logical procedures.	Computational problems	Level I: Makes many or serious errors performing algorithmic computations. Level II: May make some errors when performing some algorithmic computations. Level III: Makes few and very minor errors performing algorithmic computations.
	Proofs	Level I: Can complete only very simple proofs. Level II: Can perform some less simple proofs, but may have difficulty with some more complex proofs. Level III: Can consistently complete more complex proofs.
Use appropriate technology.	Paper and pencil	Level I: Frequently unable to solve problems using paper and pencil. Level II: Usually able to solve problems using paper and pencil. Level III: Consistently able to solve problems using paper and pencil.
	Calculator	Level I: Frequently unable to solve problems using a calculator. Level II: Usually able to solve problems using a calculator. Level III: Student is consistently able to solve problems using a calculator.
	Computer	Level I: Frequently unable to solve problems using a computer. Level II: Usually able to solve problems using a computer. Level III: Consistently able to solve problems using a computer.
Formulate a hypothesis and determine its validity.		Level I: Unable to formulate a mathematical hypothesis. Level II: Can formulate some simple mathematical hypotheses and determine their validity. Level III: Able to formulate more complex mathematical hypotheses and determine their validity.

C. Benchmark

For each course the assessment data will be reviewed and the percentage of students who have achieved level II or higher, as described in the performance criteria, will be determined. The benchmark for acceptable student performance will be as follows. For courses with an enrollment of 10 or more students an acceptable level of performance will be achieved if, using the performance criteria for the assessed outcome, 90% of students who earn a grade of C- or better in the course perform at level II or above. For courses with an enrollment of less than 10 students an acceptable level of performance will be achieved if, using the performance criteria for the assessed outcome, 80% of students who earn a grade of C- or better in the course perform at level II or above.

V. Ongoing Assessment

A. Status of the Larger Program Assessment Plan

The assessment plan for the B.A. in Mathematics is essentially complete. The plan was completed in fall 2004, and mathematics faculty took advantage of the opportunity to have the plan reviewed by Susan Hatfield when she visited IUK in November 2004. At that time she commented that, of the plans submitted for her consideration, our plan was the most complete and raised the fewest questions and comments. No changes or additions to the plan were suggested, and none have been made at this time.