

B.A. and B.S. in Mathematics

Assessment Plan

2020 - 2024

Mission Statement

The BA and BS degrees in Mathematics are 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.

Goals of the Mathematics Curriculum

Students, upon completing the coursework required for a BA or BS 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.

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 be able to translate concepts from other fields into mathematical relationships.
2. Students will be able to interpret the results of their computations.
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.

Goal 4. Communicate mathematical ideas clearly and effectively.

1. Students will be able to express their mathematics clearly in both written and oral form.
2. Students use correct mathematical vocabulary and mathematical notation.
3. Students will be able to solve problems in a group setting.

Clearly these goals are congruent with the missions of the degree program, the School of Sciences, and IU Kokomo.

Curriculum Map

The table that follows indicates in which courses the outcomes are addressed. Every course is associated with at least one outcome and every outcome is associated with at least one course.

Goal/ Outcome	M215	M216	M311	M303	M313	M347	M463	M466	M403	M404	T336	M413	M414	M415	M447	M448	M471
1.1				X		X	X	X	X	X	X	X	X	X	X	X	X
1.2				X		X			X	X	X	X	X				
1.3				X		X			X	X	X	X					
2.1	X	X	X	X	X		X	X						X	X	X	X
2.2	X	X	X	X	X		X	X						X	X	X	X
2.3	X	X	X	X	X		X	X						X	X	X	X
3.1	X	X	X				X	X	X	X	X	X	X	X	X	X	X
3.2	X	X	X				X	X			X			X	X	X	X
4.1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4.3					X	X				X		X	X	X			X

Assessment Activities planned for AY 2020 - 2024

Benchmarks

For each course the assessment data will be reviewed and the percentage of students who have achieved acceptable levels of performance, 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 8 or more students an acceptable level of performance will be achieved if, using the performance criteria for the assessed outcome, 85% of students who earn a grade of C- or better in the course perform at level A or above. For courses with an enrollment of less than 8 students an acceptable level of performance will be achieved if, using the performance criteria for the assessed outcome, 75% of students who earn a grade of C- or better in the course perform at level A or above.

Activities

From AY 2020 to 2024 learning outcomes will be assessed on the following schedule. At the start of each academic year faculty will meet to review the assessment plan and decide which courses will be used for that year's assessment and which data will be collected throughout the year for that assessment.

AY 2020 - 2021	
Student Learning Outcomes	Goal 1: Understand the nature of truth and the concept of proof in the discipline of mathematics. Outcome 1: Proof construction Outcome 2: Counterexample construction
Measure Description	For both outcomes, students enrolled in M303, M403, and M404 will be evaluated. Selected questions from the final examination in each course will be used to determine a student's ability to construct proofs as well as counterexamples. The final exam will be used for this determination since it will reflect the student's best performance on these tasks.
Benchmark / Target	A student's construction of proofs will be deemed acceptable if at least two of the three proofs were written at the E or A level. A student's construction of counterexamples will be deemed acceptable if at least one of the two counterexamples were at the E or A level.

AY 2021 - 2022	
Student Learning Outcomes	Goal 4: Communicate mathematical ideas clearly and effectively. Outcome 1: Mathematical expression Outcome 2: Notation and vocabulary
Measure Description	For both outcomes, students enrolled in M215, M216, M413, and M414 will be evaluated. The final exam in each course will be used for this determination since the students will have had the most practice for these outcomes beforehand.
Benchmark / Target	A student's ability to express mathematics clearly will be deemed acceptable if at least 3 out of 4 problems scored at the E or A level. A student's use of notation will be deemed acceptable if at least 3 of the 4 problems were at the E or A level.

AY 2022 - 2023	
Student Learning Outcomes	Goal 2: Understand the application of mathematical techniques to other fields. Outcome 1: Translate concepts Outcome 2: Interpret computation Outcome 3: Apply computational techniques
Measure Description	For outcome 1, students in M215, M303, and M463 will be evaluated. For outcome 2, students enrolled in M215, M216, and M303 will be evaluated. For outcome 3, students in M311 and M463 will be evaluated. The final exam in each course will be used for this determination since it will cover applications to other fields as well as all techniques developed in each course.
Benchmark / Target	A student's ability to translate concepts from another field was deemed acceptable if 2 out of 3 problems were correctly translated at the E or A level. A student's ability to interpret their computations was deemed acceptable if at least 3 of the 4 problems scored at the E or A level. A student's ability to interpret their computations was deemed acceptable if at least 3 of the 4 problems scored at the E or A level.

AY 2023 - 2024	
Student Learning Outcomes	Goal 3: Formulate and solve problems mathematically. Outcome 1: Follow procedures Outcome 2: Use technology
Measure Description	For outcome 1, students in M215 and M216 will be evaluated. Following logical procedures is a foundational skill that should be developed early. For outcome 2, students in M313, and M466 will be evaluated. Each class will be assigned 4 projects using the Maple software package which will form a portfolio for evaluation.
Benchmark / Target	A student's ability to perform algorithmic and logical procedures will be deemed acceptable if 3 out of 4 projects were scored at the E or A level. A student's use of technology will be deemed acceptable if at least 3 of the 4 Maple projects scored at the E or A level.

AY 2024 - 2025	
Student Learning Outcomes	Goal 1: Understand the nature of truth and the concept of proof in the discipline of mathematics. Outcome 3: Judge argument validity Goal 4: Communicate mathematical ideas clearly and effectively. Outcome 3: Working in groups
Measure Description	For 1.3, students in M303, M403, and T336 will be evaluated to compare how students have progressed in their ability to judge argument validity. For 4.3, students in M404 and M414 will be evaluated since students in these courses are nearing the end of their program and should have developed the ability to work in groups by this time. For 1.3, the final exam will be used for evaluation while for 4.3, 2 groups projects will be assigned.
Benchmark / Target	A student's ability to judge the validity of a mathematical argument will be deemed acceptable if their average score on the 4 problems is at the E or A level. A student's ability to work in a group setting will be deemed acceptable if at the average score on two group projects are both at the E or A level.

Criteria Descriptions

Goal / Outcome	Details
1.1	Student responses are determined to be exemplary (E) if a correct proof was given along with explanation, acceptable (A) if a correct proof was given without correct explanation, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
1.2	Student responses are determined to be exemplary (E) if a correct counterexample was given along with explanation, acceptable (A) if a correct counterexample was given without correct explanation, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
1.3	Student responses are determined to be exemplary (E) if their score on a project was 90%, acceptable (A) if their score on a project was 80%, needs revision (R) if their score was 70%, or not assessable (N).
2.1	Student responses are determined to be exemplary (E) if the concept was correctly translated from the outside field, acceptable (A) if the concept was mostly translated correctly, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
2.2	Student responses are determined to be exemplary (E) if the computations were correctly interpreted, acceptable (A) if the computations were interpreted mostly correctly, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
2.3	Student responses are determined to be exemplary (E) if the technique was completed correctly, acceptable (A) if the technique was mostly completed correctly, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
3.1	Student responses are determined to be exemplary (E) if the procedure was completed correctly, acceptable (A) if the procedure was mostly completed correctly, revision needed (R) if an attempt was made but there were errors, or not assessable (N).
3.2	Student scores are exemplary (E) if their score on a Maple assignment was at least 90%, acceptable (A) if their score on the assignments was at least 80%, revision needed (R) if their score was at least 70%, or not assessable (N).
4.1	Student responses were determined to be exemplary (E) if the selected problem had no errors, acceptable (A) if the problem was mostly correct with a few minor errors, revision needed (R) if an attempt was made but there were significant errors, or not assessable (N).
4.2	Student responses are determined to be exemplary (E) if all notation was used correctly, acceptable (A) if most notation was used correctly with a few errors, revision needed (R) if an attempt was made but there were significant errors, or not assessable (N).
4.3	Student projects are rated exemplary (E) if their score on the group project was at least 90%, acceptable (A) if their score was 80%, needs revision (R) if their score was 70%, or not assessable (N).

Table 1: Performance Criteria Details