Student Outcome Assessment Standards

B.A. in Mathematics

Article I. Process standards

Section 1.01 Knowledge of mathematical problem solving

Students know, understand, and apply the processes of mathematical problem solving. Indicators include the following:

(a) Apply and adapt a variety of appropriate strategies to solve problems.

(b) Solve problems which arise in mathematics and those involving mathematics in other contexts.

(c) Build new mathematical knowledge through problem solving.

(d) Monitor and reflect on the process of mathematical problem solving.

Section 1.02 Knowledge of reasoning and proof

Students reason, construct, and evaluate mathematical arguments and develop an appreciation for mathematical rigor and inquiry. Indicators include the following:

(a) Recognize reasoning and proof as fundamental aspects of mathematics.

(b) Make and investigate mathematical conjectures.

(c) Develop and evaluate mathematical arguments and proofs.

(d) Select and use various types of reasoning and methods of proof.

Section 1.03 Knowledge of mathematical communication

Students communicate mathematical thinking orally and in writing to peers, faculty, and others. Indicators include the following:

(a) **Communicate mathematical thinking coherently and clearly to peers, faculty, and others.**

(b) **Use the language of mathematics to express ideas precisely.**

(c) **Organize mathematical thinking through communication.**

(d) **Analyze and evaluate the mathematical thinking and strategies of others.**

Section 1.04 Appreciation for utility

Students demonstrate a positive disposition toward independent learning in mathematics. Indicators include the following:

(a) **Deliver a seminar talk acceptable to the faculty.**

(b) **Complete an independent study project or honors thesis with a faculty member.**

Article II. Content standards

Section 2.01 Algebra and number theory

Students demonstrate knowledge of modern algebra. Indicators include the following:

(a) **Understand and recognize the properties of groups.**

(b) **Understand and recognize the properties of rings.**

(c) **Understand and recognize the properties of group and ring homomorphisms.**

(d) **Understand Diophantine equations.**

(e) **Understand equivalence relations.**

Section 2.02 Geometry

Students demonstrate knowledge of euclidean and non-euclidean geometries. Indicators include the following:

(a) **Understand various axiomatic systems of geometry.**

(b) **Perform euclidean constructions.**

(c) **Demonstrate critical thinking ability by writing proofs and arguments in geometry.**

Section 2.03 Analysis

Students demonstrate knowledge and understanding of limit, continuity, differentiation, integration, sequences, and series as well as techniques and applications of calculus and analysis. Indicators include the following:

(a) **Demonstrate mastery of limits and continuity.**

(b) **Demonstrate mastery of differentiation.**

(c) **Demonstrate mastery of integration.**

(d) **Demonstrate mastery of sequences and series.**

(e) **Demonstrate mastery of applications of calculus, such as finding extrema and calculating probabilities for discrete and absolutely continuous random variables.**

(f) **Demonstrate mastery of proofs and logic involving limits, continuity, differentiation, integration, sequences, and series at the advanced level.**

Section 2.04 Applied mathematics

Students demonstrate appreciation for and mastery of applications of mathematics as found in real-world problems; e.g., those discussed in differential equations, numerical analysis, probability, etc.

(a) **Demonstrate ability to identify correct mathematical approach to an application problem.**

(b) **Demonstrate ability to construct solution to a one-stage applied problem.**

(c) **Demonstrate ability to construct solution to a multi-stage applied problem.**