Math 1 : Mathematical Reasoning

California State University, Sacramento · Department of Mathematics & Statistics

This is a one-semester course, which satisfies the quantitative reasoning requirement for GE (area B4). It is recommended for students whose majors do not include a specific mathematics requirement. The objectives of the course are the following:

- Show the essence of mathematics - rather than teaching specific techniques in arithmetic, algebra or other areas.
- Help students see some of the quality, elegance, and beauty in mathematics, and overcome any fear of mathematics.
- Enhance precision in the evaluation and expression of ideas, and thereby develop a student's quantitative reasoning skills.

The primary purpose of the course is to give students an understanding of some of the vocabulary, methods and reasoning of mathematics. The focus is on the ideas of mathematics and on giving students an understanding of why results hold - and not on learning specific results, techniques, or skills. Students will be given periodic writing assignments that encourage them to think through concepts of the course.

Catalog Description

Recommended for students whose majors do not include a specific mathematics requirement. Objectives are to show some of the essence and quality of mathematics, and to enhance precision in the evaluation and expression of ideas, thereby developing a student's quantitative reasoning skills. Designed to give students an understanding of some of the vocabulary, methods, and reasoning of mathematics with a focus on ideas. **Graded**: Graded Student. **Units**: 3.0.

Prerequisites

Math 9 or three years of high school mathematics which includes two years of algebra and one year of geometry; and completion of ELM requirement.

Area B-4 Mathematical Concepts and Quantitative Reasoning Student Learning Outcomes

Students will be able to:

1. Solve problems by thinking logically, making conjectures, and constructing valid mathematical arguments.
2. Make valid inferences from numerical, graphical and symbolic information.
3. Apply mathematical reasoning to both abstract and applied problems, and to both scientific and non-scientific problems.

Text

To be determined in consultation with the instructor and the Math 1 Coordinator. Texts will be recommended for use in the course, and a text will be chosen for any sections that are not taught by full-time faculty. (The recommendations of texts are intended to indicate a reasonable level for the course.) A typical text for classes not taught by full-time faculty would be *Mathematical Ideas* by Miller, Heeren, Hornsby & Heeren.

Coverage

Coverage will be determined from the list of topics below, and the chosen text or classroom materials, in a manner consistent with course objectives. Handouts will be given outlining the material to be covered as the course progresses.

Writing Component

This is an area B4 GE course and has a writing component. To satisfy the writing requirement graded assignments involving writing and understanding of complex technical prose, interpretation of theoretical ideas, and the use of mathematical ideas will be part of the course.

Topics

Course content will be selected from the topics listed below. These topics can be applied to a wide variety of subject areas, and the selection of topics will be made by the full-time instructor in order to best satisfy the purposes of the course(in general, the instructor should consider three to four topics as being sufficient for the course).

I. Numeration Systems

- A. History of numbers and numerals
- B. Historical numeration systems (i.e., simple grouping, multiplicative, positional, etc.)
- C. Computations in bases other than 10

II. Logic

- A. Logical connectives and compound statements
- B. Truth tables
- C. Negation of statements (including De Morgan's Laws, negation of for all, there exists)
- D. Valid arguments
- E. Circuit theory

III. Sets

- A. Set relations and operations
- B. Venn diagrams
- C. Relationship between sets and logic
- D. Applications of sets
- E. Infinite sets

IV. Combinatorics

- A. Counting methods
- B. Permutations
- C. Combinations

V. Probability

- A. Sample spaces and composite events
- B. Properties of probability
- C. Conditional probability
- D. Independence