

Syllabus
Math 01.201 - Structures of Mathematics I

CATALOG DESCRIPTION:

Math 01.201 Structures of Mathematics I 3 s.h.

Prerequisites: Basic Algebra II This course concerns the development of number systems and algebraic structures, including the natural numbers, the integers, rational numbers, real and complex numbers. Students will be required to reason mathematically, solve problems, and communicate mathematics effectively at different levels of formality, using a variety of representations of mathematical concepts and procedures.

OBJECTIVES:

This course is intended to provide students with the opportunity to develop their knowledge of the content and discourse of mathematics, including:

- mathematical concepts and procedures and the connections among them;
- multiple representations of mathematical concepts and procedures;
- ways to reason mathematically, solve problems, and communicate mathematics effectively at different levels of formality;
- the nature of mathematics, the contributions of different cultures toward the development of mathematics, and the role of mathematics in culture and society;
- the changes in the nature of mathematics and the way we teach, learn, and do mathematics resulting from the availability of technology;
- the place of "school mathematics" (what students have learned in elementary school and high school) within the discipline of mathematics;
- the relationship of mathematics to other subjects and its applications in society.

Students in the course will use physical materials and models to explore fundamental properties of number systems and to describe real-world relationships. They will also develop conjectures and intuitive proofs of number theoretic properties. This course is most appropriate for those students preparing to be elementary or special education teachers.

CONTENT:

Unit I. Operations and Algebraic Thinking (3 weeks)

- A. Quantitative reasoning (Ch. 1, 12.5)
- B. Number sequences, patterns, and functional relationships (Ch. 12.3, 12.4, 13.4)
- C. Numeration systems and place value (Ch. 2)
- D. Understanding whole number operations (Ch. 3.1, 3.2, 3.4, 3.5)
- E. Properties of operations (Appendix F)

Unit II. Numbers and Operations in Base Ten (2 weeks)

- A. Mental math (Ch. 5.1)
- B. Estimation (Ch. 5.2)
- C. Computational strategies (Ch. 3.3, 3.6)
- D. Standard algorithms for whole numbers and decimals (Ch. 4)
- E. Laws of exponents and scientific notation (Ch. 5.4)

Unit III. Fractions (4 weeks)

- A. Meanings for fractions (Ch. 6)
- B. Computing with fractions (Ch. 7)

Unit IV. Ratio and Proportions (2 weeks)

- A. Multiplicative reasoning (Ch. 8)
- B. Ratios, rates, proportions, and percents (Ch. 9)
- C. Slope, linear functions, and proportional relationships (Ch. 13.1-13.3)

Unit V. Number Systems (1 week)

- A. Integers (Ch. 10.1-10.5)
- B. Real numbers (Ch. 10.6)
- C. Complex numbers

Unit VI. Number Theory (1 week)

- A. Factors and multiples
- B. Greatest common factor and least common multiple

POSSIBLE TEXT:

Sowder, Sowder, and Nickerson, *Reconceptualizing Mathematics for Elementary School Teachers* (2nd edition)
W.H. Freeman and Company, New York, © 2014, ISBN-13: 9781464103353