



MATH 4 - Concepts in Mathematics for Teachers I

Catalog Description

Transfer Status: CSU

Prerequisite: Intermediate Algebra or equivalent

Unit(s): 3.00

Lecture: 51.00 Contact hours/102.00 Out of class hours/153.00 Total hours/3.00 Unit(s)

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Course Description: This course focuses on the development of quantitative reasoning skills through in-depth, integrated explorations of topics in mathematics, including real number systems and subsystems. Emphasis is on comprehension and analysis of mathematical concepts and applications of logical reasoning. (C-ID MATH 120).

Objectives

Upon successful completion of this course, the student should be able to:

1. Illustrate numbers in the different numeration systems and perform calculations with place value systems.
2. Evaluate the equivalence of numeric algorithms and explain the advantages and disadvantages of equivalent algorithms in different circumstances;
3. Apply algorithms from number theory to determine divisibility in a variety of settings;
4. Analyze least common multiples and greatest common divisors and their role in standard algorithms;
5. Explain the concept of rational numbers, using both ratio and decimal representations; analyze the arithmetic algorithms for these two representations; and justify their equivalence;
6. Analyze the structure and properties of whole, rational, and real number systems; define the concept of rational and irrational numbers, including their decimal representation; and illustrate the use of a number line representation;
7. Develop and reinforce conceptual understanding of mathematical topics through the use of patterns, problem solving, communication, connections, modeling, reasoning, and representation; and
8. Develop activities implementing curriculum standards.

Course Content

Topic Titles / Suggested Time Topic	
	<u>Lecture</u>
<u>Topics</u>	<u>Lec Hrs</u>
Numeration systems: history, Hindu-Arabic numeration system, and place value systems	8.00
Integers: structure and basic properties, computational algorithms	7.00
Basic number theory: divisibility, prime and composite numbers, prime factorization, fundamental theorem of arithmetic, least common multiple and greatest common divisor	8.00
Real numbers: structure and basic properties, arithmetic operations, rational and irrational numbers, decimal representation, number line representation	7.00
Rational numbers: structure and properties, ratio and proportion	7.00
Patterns, problem solving, communication, connections, modeling, reasoning, and representation	7.00
National and state curriculum standards for elementary school math including Common Core State Standards	7.00
Total Hours: 51.00	

Methods of Instruction

- A. Collaborative Group Work
- B. Discussion
- C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
- D. Lecture

Methods of Evaluation

- A. Exams/Tests
- B. Quizzes
- C. Class Assignments and Class Response, Daily Homework Assignments, where the student will demonstrate problem-solving skills

Examples of Assignments

Reading Assignments

1. Read the section in the textbook on Introduction to Problem Solving and be able to list the famous four-step process for solving problems and at least ten different problem-solving strategies.
2. Read the section in the textbook on the whole numbers and numeration systems and be able to show the differences in the Egyptian, Roman, Babylonian, Mayan, Ionian, Chinese, and Hindu-Arabic numeration systems.

Writing Assignments

1. Describe in words at least two characteristics of a problem that would suggest using (a) the "Guess and Test" strategy, (b) the "Use a Variable" strategy, and (c) the "Solve a Simpler Problem" strategy.
2. Describe in words and explain the difference between a positional numeration system and a place-value numeration system.

Out-of-Class Assignments

1. Review the section on the Introduction of Problem Solving and solve the problems assigned by the instructor showing each step.
2. Review the section on the Whole Numbers and Numeration Systems and solve the problems assigned by the instructor showing each step.

Recommended Materials of Instruction

Billstein, R., Libeskind, S., Lott, J. (2020). A Problem Solving Approach to Mathematics for Elementary School Teachers. *Pearson, 13th*.

Other Learning Materials

Scientific calculator

Minimum Qualifications

Mathematics (Masters Required)

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