

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

MATHEMATICS 125 – STRUCTURE AND CONCEPTS OF ELEMENTARY MATHEMATICS I

3 hours lecture, 1 hour laboratory, 3 units

Catalog Description

In blending the mathematical topics of sets, whole numbers, numeration, number theory, integers, rational and irrational numbers, measurement, relations, functions and logic, the course will investigate the interrelationships of these topics using a problem-solving approach and appropriate use of technology.

Prerequisite

“C” grade or higher or “Pass” in MATH 110 or appropriate placement

Entrance Skills

Without the following skills, competencies and/or knowledge, students entering this course will be highly unlikely to succeed:

- 1) Computing and simplifying expressions involving rational numbers, decimals and exponents.
- 2) Problem solving using proportions, application problems and word problems.
- 3) Geometry: understand the basic geometric formulas and the basic properties of geometric figures.
- 4) Graphing: graph relations, interpret graphical data.

Course Content

- 1) Mathematical patterns
- 2) Problem solving and its history
- 3) Logic and sets
- 4) Numeration systems and their history
- 5) Natural numbers, whole numbers and integers and the concepts of their operations
- 6) Rational, irrational and real numbers and the concepts of their operations
- 7) Properties of real numbers
- 8) Basic number theory: divisibility, prime factorization, fundamental theorem of arithmetic, least common multiple and greatest common divisor
- 9) Ratio, percent and scientific notation
- 10) Measurement and how it is related to the concept of operations on real numbers
- 11) How and when to use estimation and mental arithmetic skills appropriately
- 12) Examples of children’s mathematical thinking
- 13) How topics taught in class pertain to teaching elementary school mathematics
- 14) Historical contributions of number and math theories and concepts from diverse cultures
- 15) The value of learning and teaching using different techniques
- 16) National and state curriculum standards for elementary school math including Common Core State Standards

Course Objectives

Students will be able to:

- 1) Identify and use various problem-solving strategies including strategies based on Polya’s Four Steps.
- 2) Solve logic problems at an elementary level.
- 3) Perform basic operations on sets, e.g., intersection, unions, differences, etc.

- 4) Compare and contrast common numeration systems and explain their mathematical applications.
- 5) Identify the properties and major subgroups of the real numbers.
- 6) Perform mathematical computations using estimations skills, algorithmic procedures and mental strategies.
- 7) Compare and contrast the metric system with other standard systems of measurement.
- 8) Analyze and contrast the basic operations and properties of the real number system.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Homework assignments which demonstrate the student's ability to perform operations on sets, solve problems using various strategies based on Polya's four steps, and analyze the basic operations and properties of the real number system.
- 2) Quizzes and exams (including a comprehensive in-class final exam) which measure the student's ability to solve logic problems, perform operations on sets, perform mental estimation and proportional reasoning to solve arithmetic problems.
- 3) Papers which measure the student's ability to solve problems by applying Polya's problem-solving strategies.
- 4) Presentation and/or group projects which demonstrate the student's ability to recognize various numeration systems, analyze the basic operations of the real number system, and apply Polya's problem-solving theories in a mathematical situation.
- 5) Independent and/or collaborative exploration activities which demonstrate the student's knowledge of the basic concepts of measurement.

Special Materials Required of Student

Scientific calculator

Minimum Instructional Facilities

- 1) Smart classroom with whiteboards covering three walls, graphing utility and viewscreen, overhead projector
- 2) Manipulative math materials

Method of Instruction

- 1) Lecture and discussion
- 2) Group activities
- 3) Instructor-guided discovery
- 4) Collaborative exercises
- 5) Field trip may be included

Out-of-Class Assignments

- 1) Problem sets
- 2) Watching videos
- 3) Reading/writing assignments

Texts and References

- 1) Required (representative example): Sowder, Sowder & Nickerson. *Reconceptualizing Mathematics for Elementary School Teachers*. 3rd edition. W.H. Freeman, 2017.
- 2) Supplemental: None

Exit Skills

Students having successfully complete this course exit with the following skills, competencies and/or knowledge:

- 1) Understand and Apply:
 - a. Problem-solving strategies based on Polya's Four Steps
 - b. Various numeration systems and their properties
 - c. Number sense
 - d. Basic set vocabulary
- 2) Identifying and Analyzing:
 - a. Sequences using patterns
 - b. Properties of the major subgroups of the real number system
- 3) Number Theory Concepts:
 - a. Prime and composite numbers
 - b. Prime factorization
 - c. Least common multiple
 - d. Greatest common factor
- 4) Using Various Computational Algorithms:
 - a. Estimation
 - b. Mental arithmetic
 - c. Calculators
 - d. Measurement
- 5) Hands-on Experience with Manipulative

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Analyze the concept, structure, algorithms and properties of the whole, rational, and real number system
- 2) Develop and reinforce conceptual understanding of mathematical topics through the use of patterns, problem solving, communication, connections, modeling, reasoning, and representation