

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

MATHEMATICS 126 – STRUCTURE AND CONCEPTS OF ELEMENTARY MATHEMATICS II

3 hours lecture, 1 hour laboratory, 3 units

Catalog Description

In blending the mathematical topics of statistics, probability, measurement, coordinate geometry, plane geometry, solid geometry, logic, relations and functions, 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 125 or equivalent

Entrance Skills

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

- 1) Understand and Apply:
 - a. Problem-solving strategies based on Polya's Four Steps
 - b. Number sense
- 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) Use Various Computational Algorithms:
 - a. Estimation
 - b. Mental arithmetic
 - c. Calculators

Course Content

- 1) Mathematical patterns
- 2) Problem solving and its history
- 3) Geometric shapes in two and three dimensions
- 4) Similarity and congruence of triangles
- 5) Measurement involving geometric figures
- 6) Study of the different measurement systems
- 7) Coordinate geometry and how it relates to algebraic equations and functions
- 8) Transformational geometry involving geometric figures and number theory
- 9) Concepts of probability and statistics
- 10) Looking at examples of children's mathematical thinking
- 11) Discussions on how topics taught in class pertain to teaching elementary school mathematics
- 12) Historical contributions of spatial and math theories and concepts from diverse cultures
- 13) Discussions on the value of learning and teaching using different techniques

Course Objectives

Students will be able to:

- 1) Identify and use various problem-solving strategies based on Polya's Four Steps.
- 2) Construct and analyze geometric shapes in both two and three dimensions.
- 3) Write justifications (proofs) for basic congruence and similarity theorems as related to triangles.
- 4) Calculate the coordinates of geometric figures and develop and use algebraic equations.
- 5) State and apply congruence and similarity properties.
- 6) Describe and illustrate families of polygons and polyhedral.
- 7) Use formulas and Pythagorean Theorem to find perimeter, area and volume.
- 8) Perform transformations using coordinate geometry.
- 9) Develop strategies to calculate the number of possible outcomes for various events.
- 10) Determine probabilities by acting out, simulating and representing various events.
- 11) Collect, organize, and display data for statistical analysis.
- 12) Analyze central tendency and dispersion of data.
- 13) Investigate rules and graphs for functions.
- 14) Solve problems involving basic algebraic concepts.

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 in which students accurately identify parts and properties of geometric shapes, implement techniques from class to compute the area, volume of geometric figures, test conjectures about triangles, perform transformations in two dimensions, demonstrate the concepts of probability and descriptive statistics, and solve basic algebraic problems.
- 2) Quizzes and exams (including a comprehensive in-class final exam) which measure students' ability to analyze geometric shapes, write justifications(proofs) for basic congruence and similarity theorems as related to triangles, compute the measurements of geometric figures, calculate the coordinates and use the algebraic equations related to geometric figures, and demonstrate the elementary concepts of probability and descriptive statistics.
- 3) Papers which measure students' ability to solve problems by using various strategies based on Polya's Four Steps.
- 4) Presentation and/or group projects which demonstrate students' ability to apply the elementary concepts of probability and descriptive statistics.
- 5) Independent and/or collaborative exploration activities which demonstrate students' ability to analyze basic geometric shapes, develop relationships of transformational geometry, and identify concepts of functions.

Special Materials Required of Student

Scientific calculator, protractor, compass, ruler (English and metric)

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 covering course material

Texts and References

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

Exit Skills

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

- 1) Analyzing:
 - a. Properties of rationales and the reals
 - b. Three dimensional geometric figures
- 2) Computing:
 - a. Improved number sense
 - b. Measurements of geometrical figures
 - c. Elementary concepts of counting and probability
- 3) Problem Solving:
 - a. Patterns to find function rules
 - b. Strategies based on Polya's Four Steps
- 4) Deriving the Formulas of Geometric Figures including:
 - a. Areas
 - b. Perimeters
 - c. Volumes
 - d. Surface areas
- 5) Create Transformations of a Line by:
 - a. Reflections
 - b. Rotations
 - c. Translations

Student Learning Outcomes

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

- 1) Analyze the concept, structure, algorithms, and critical thinking involved in solving problems related to geometry, measurement, and probability.
 - 2) Develop and reinforce conceptual understanding of mathematical topics through the use of patterns, problem solving, communication, connections, modeling, reasoning, and representation.
- *For the complete list of **learning objectives**, please see the **Course Objectives** section