

Common Course Outline
MATH 131
Concepts of Mathematics I: Numeration Systems and Operations
4 Semester Hours

Community College of Baltimore County

Description

Students will learn the concepts and principles of mathematics taught in elementary education. Topics include the origin of numbers, system of cardinal numbers, numeration systems, and principles underlying the fundamental operations. This is not a “methods in teaching” course.

Prerequisites: (MATH 083 or MATH 101 or LVM3) or sufficient placement score; and ACLT 052 or ACLT 053.

Overall Course Objectives

Upon successfully completing the course students will be able to:

1. apply different problem solving techniques, including the use of calculators and/or other appropriate technology, to solve a variety of mathematical problems (both standard and non-standard) (I, III, IV, V, VI, 1, 4, 6, 7)
2. utilize inductive and deductive reasoning to solve problems, as appropriate (I, III, IV, VI, 1, 3, 4, 6, 7);
3. use set language, notation, and operations to work with various sets, both numerical and non-numerical (I, II, III, V, 1, 2);
4. illustrate the different relationships between sets using Venn diagrams (I, II, 1, 2);
5. compare and contrast decimal and non-decimal numeration systems from various cultures and periods in history using appropriate characteristics (i.e. number base, place value, position, zero, symbol) (III, V, 1, 3, 5);
6. illustrate general characteristics of numeration systems and their operations using various base systems (I, IV, VI, 1, 2, 4);
7. relate general numeration system characteristics to whole numbers, integers, and rational numbers (I, III, 1, 2);
8. perform arithmetic operations with whole numbers, integers, and rational numbers using algorithms, manipulatives, calculators, etc. (I, III, 1, 2, 4);
9. demonstrate the need for the order of operations and apply its principles to arithmetic calculations (I, II, III, 1, 2, 4, 5)
10. illustrate the properties of closure, identity, inverse, commutativity, associativity and distributivity for arithmetic operations as they apply to whole numbers, integers, and rational numbers (I, II, III, 1, 2);

11. apply the number theory topics of primes, composites, tests of divisibility, least common multiple, greatest common factor (divisor), and the fundamental theorem of arithmetic appropriately (I, III, 1);
12. demonstrate the property of denseness and order relationships (e.g. less than, greater than, etc.) using whole numbers, integers, and rational numbers using manipulatives, graphs and other mediums to solve problems as appropriate (I, II, III, 1, 2, 3, 4, 6, 7);
13. apply rational number concepts to practical situations using ratios, proportions and percents (I, II, III, IV, 1, 2, 3, 6, 7);
14. analyze a variety of standard and non-standard basic operation algorithms using manipulatives, estimation, mental computation, and error pattern detection (II, III, VI, 1, 2, 4, 7);
15. relate the concepts discussed throughout the course to the students' physical surroundings (III, VI, 7);
16. utilize the Internet and other resources to research course-related topics (I, III, VI, 1, 3, 5, 6, 7).

Major Topics

1. Problem Solving
 - a. George Polya's process for solving problems
 - b. Problem solving techniques
 - c. Inductive and deductive reasoning
2. Sets and Their Applications
 - a. Descriptions and definitions
 - b. Set operations
 - c. Venn diagrams
3. Numbers and Numeration Systems
 - a. Numeration systems other than Hindu-Arabic
 - b. Hindu-Arabic numeration system
 - c. Base arithmetic
4. Whole Numbers (with and without calculators)
 - a. Operations
 - b. Exponents
 - c. Properties
 - d. Estimation and mental computational techniques
 - e. Error patterns
5. Integers (with and without calculators)
 - a. Operations
 - b. Properties
 - c. Estimation and mental computational techniques
 - d. Error patterns
6. Number Theory
 - a. Primes and composites
 - b. Divisibility
 - c. Least common multiples and greatest common factors
7. Rational Numbers (with and without calculators)
 - a. Fractions (concepts and operations)
 - b. Decimals (concepts and operations)
 - c. Estimation and mental computational techniques

- d. Error patterns
- e. Ratio, proportion, and percent

Course Requirements (General Education Goal #VII)

Students will be given opportunities to collaborate via groupwork and/or oral presentation of problem solutions.

There will be multiple opportunities for the instructor to assess student progress through classwork and/or homework.

Grading: Grading procedures will be determined by the individual faculty member but will include the following:

1. Three (3) written examinations or portfolio packets (80% applications based)
2. Cumulative final examination or comprehensive portfolio
3. Three (3) written projects
4. Individual and group classwork
5. Oral presentation of problem solutions

Other Course Information

Individual faculty members may include additional course objectives, major topics, and other course requirements to the minimum expectations stated in the Common Course Outline.

The Community College of Baltimore County is committed to providing a high-quality learning experience that results in growth in knowledge, attitudes, and skills necessary to function successfully as a transfer student, in a career and as a citizen. To accomplish this goal, we maintain high academic standards and expect students to accept responsibility for their individual growth by attending classes, completing all homework and other assignments, participating in class activities and preparing for tests.

We take seriously our responsibility to maintain high-quality programs and will periodically ask you to participate in assessment activities to determine whether our students are attaining the knowledge, attitudes and skills appropriate to various courses and programs. The assessment activities may take many different forms such as surveys, standardized or faculty-developed tests, discussion groups or portfolio evaluations. We ask that you take these activities seriously so that we can obtain valid data to use for the continuous improvement of CCBC's courses and programs.