

MAT 123 Syllabus

General Information

MAT 123: Number Systems and Number Theory for Educators (3hr, 3cr)

Course Description: This course studies number systems, their representations, their development, their properties, and their relationship to one another. An in-depth development of number system operations, computations within these systems as a foundation for algebra, and the historical development of these ideas is included.

Prerequisites: Departmental Permission

Note: Material covered in this class will help teachers/teacher candidates prepare for a leadership position as elementary mathematics specialist.

Instructor: Your instructor will provide contact information, office hours and meeting times for your section.

Course Format and Grading

Expectations: This course studies number systems, their representations, their historical development, their properties, and their relationship to one another. This course uses the problem-solving approach to teaching and learning mathematics concepts. Students are encouraged to ask questions. Class participation is essential. You are strongly encouraged to take good notes and do not miss class. Bring your concerns and challenges to the instructor's attention early on in the course so that they can address them effectively.

Homework: Homework will be assigned in class. Solutions to most problems from the previous session will be reviewed and discussed in class. In order to be successful in this course it is essential that you devote a lot of time to your homework.

Grades: Your grade will be made up of 70% exams and 30% assignments that include homework.

Text, Materials, and Accommodating Disabilities

References:

- Beckmann, S. (2018). Mathematics for elementary teachers (5th ed). Pearson.
- Billstein, R., Libeskind, S., & Lott, J. W. (2016). A problem-solving approach to Mathematics for elementary school teachers (12th ed). Pearson.
- Sonnabend, T. (2010). Mathematics for teachers: an interactive approach for grades k-8 (4th ed). Brooks/Cole Cengage Learning.

Materials: Physical and Virtual Manipulatives; Learning Tools

Calculator: Texas Instruments and Scientific Calculators

Accommodating Disabilities: Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more info, contact the Office of Student Disability Services, Shuster Hall, Room 238, 718-960- 8441.

Course Objectives and Content

Course Objectives: This course meets the overall objectives for a CUNY common core Quantitative Reasoning course; these objectives and how they are met in this course are detailed in the sample final exam with scoring rubric attached to this document.

*At the end of this course, students will be able to:

SLO 1. Interpret and draw appropriate inferences from quantitative representations, such as formulas, graphs, or tables.

SLO 2. Represent quantitative problems expressed in natural language in a suitable mathematical format.

SLO 3. Use algebraic, numerical, graphical, or statistical methods to draw accurate conclusions and solve mathematical problems.

SLO 4. Effectively communicate quantitative analysis or solutions to mathematical problems in written or oral form.

SLO 5. Evaluate solutions to problems for reasonableness using a variety of means, including informed estimation.

SLO 6. Apply mathematical methods to problems in other fields of study.

*Course Topics

There is flexibility in the order and time allotted to each of the topics below, but all topics must be covered by the instructor and understood by the student. Historical development and perspective will be embedded within the topics where appropriate.

1. Numeration Systems

- Ancient numeration systems
- Number-base systems and Place Values

2. Whole Number Operations

- Addition and Subtraction of Whole Numbers
- Multiplication and Division of Whole Numbers
- Properties of Whole Number Operations
- Algorithms for Whole Number Operations
- Mental Computations and Estimations

3. Number Theory

- Factors and Divisibility
- Prime and Composite Numbers
- Common Factors and Common Multiples
- Division and Euclidean Algorithm

4. Operations with Integers

- Addition and Subtraction of Integers
- Multiplication and Division of Integers

5. Rational Numbers and Proportional Reasoning

- The Set of Rational Numbers
- Addition and Subtraction of Rational Numbers
- Multiplication and Division of Rational Numbers
- Properties of, Estimations and Error Patterns with Rational Numbers
- Quantitative and Proportional Reasoning

6. Decimals, Percents, and Real Numbers

- Terminating and Repeating Decimals (Rationals)

- Non-terminating and Non-Repeating Decimals (Irrationals)
- Operations on Decimals
- Percents
- Real Numbers

**See Sample Final Exam and Scoring Rubric with SLOs and Topics alignment*

Professional Standards

(Specific content and objectives will include the following standards from **NCTM CAEP Mathematics Content for Elementary Mathematics Specialist (Addendum to the NCTM CAEP Standards 2012)**)

Upon completion of this course, students will have met the following professional standards:

C.1. Number and Operations -To be prepared to support the development of student mathematical proficiency, all elementary mathematics specialists should know the following topics related to number and operations with their content understanding and mathematical practices supported by appropriate technology and varied representational tools, including concrete models:

C.1.1 Counting and cardinality, comparing and ordering, understanding the structure of the base ten number system with particular attention to place value, order of magnitude, one-to-one correspondence, properties, and relationships in numbers and number systems – whole numbers, integers, rationals, irrationals, and reals

C.1.2 Arithmetic operations (addition, subtraction, multiplication, and division) including mental mathematics and standard and non-standard algorithms, interpretations, and representations of numbers – whole numbers, fractions, decimals, integers, rationals, irrationals, and reals

C.1.3 Fundamental ideas of number theory – divisors, factors and factorization, multiples, primes, composite numbers, greatest common factor, and least common multiple

C.1.4 Quantitative reasoning and relationships that include ratio, rate, proportion, and the use of units in problem situations

C.1.5 Historical development and perspectives of number, operations, number systems, and quantity including contributions of significant figures and diverse cultures