

University of Arkansas – Fort Smith
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General Syllabus

MATH 13373 Number Sense I

Credit Hours: 3

Lecture Hours: 3

Laboratory Hours: 0

Prerequisite: MATH 11003 College Algebra or required placement

score Effective Catalog: 2018~2019

I. Course Information

A. Catalog Description

Designed for prospective early childhood teachers. Students study the connections among elementary numerical ideas and the instantiation of pedagogical methods used by current practitioners. The mathematical content domains involve common core standards concepts associated with number theory, problem solving, probability, statistics, and computation involving whole numbers and integers.

B. Additional Description - None

II. Student Learning Outcomes

A. Subject Matter

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

1. Draw significant connections between knowledge of numerical mathematical domains and age appropriate pedagogical methodologies that lead to significant K-6 student knowledge.
2. Have an understanding of pre-numeration concepts such as patterns, informal counting, and the meaning of number.
3. Understand four basic operations (e.g., addition, subtraction, multiplication, division) with natural numbers, whole numbers, and integers and their properties (e.g., commutative, associative, distributive, order of operations) including solving problems using multiple strategies.
4. Understand basic number systems (e.g., natural numbers, whole numbers, integers) and basic concepts of number theory (e.g., factors, multiples, place value, prime/composite).

5. Compute with place-holder and non-place-holder numeration systems other than Hindu-Arabic and describe the historical significance of early numeration systems and their connection to the evolution of numeration.
6. Solve problems containing whole numbers and integers and understand age appropriate methods for engaging students in learning whole numbers and integers.
7. Recognize patterns and understand their relationship to algebraic thinking in the early grades.
8. Use problem-solving techniques with these topic areas and develop mathematical classroom ecologies that lead to development of K-6 student problem solving ability.
9. Represent and interpret representations of categorical data.

B. University Learning Outcomes

This course enhances student abilities in the following areas:

Analytical Skills

Critical Thinking Skills: Students will analyze strategies used to compute with whole numbers and integers. Students will compare and contrast representations and strategies used to see a coherent consistency in the language of mathematics used by elementary teachers and students.

Quantitative Reasoning: Students will assign and use numbers, read and analyze data, create models, draw inferences, and support conclusions based on sound mathematical reasoning. Students will solve problems with whole numbers and integers in various representations.

Communication Skills (written and oral)

Students will communicate proficiently. Students will have small group discussions and individual presentations of problem-solving strategies as well as written reflections of various techniques for calculations with whole numbers and integers.

Ethical Decision Making

Students will model ethical decision-making processes while working in groups and during assessments. Students will practice the expectations concerning plagiarism by completing their own work.

III. Major Course Topics

- A. K through 6 Mathematics Pedagogy
 1. Use of manipulatives for conceptual development
 2. Multiple computation techniques
 3. Standards of Mathematical Practice
 4. Establishing models of operations and how K-6 students approach mathematics (example: repeated addition for multiplication)
- B. Problem Solving Techniques
 1. Working simpler or different problems

2. Using tables, charts, patterns, and equations
 3. Guess and check
 4. Using a 4-step process to understand what is given, what is asked, how one might solve the problem, and check solutions for accuracy
- C. Ancient Numeration Systems
1. Roman Numerals
 2. Egyptian
- D. Alternate Number Bases
1. Expanded form using place values for various bases
 2. Computations with bases other than 10
 3. Conversions to base 10 using place value
- E. Computations on Whole Numbers
1. Using manipulatives and drawing representations to show exchanges
 2. Establishing models for operations such as “take away” model for subtraction and “repeated addition” model for multiplication
 3. Multiple strategies used for all operations such as expanded form, partial quotients, partial sums, partial products
- F. Divisibility with Prime and Composite Numbers
1. Using divisibility rules for 2, 4, 5, 6, 9, and 10 to create prime factorizations
 2. Solving application problems using divisibility rules
- G. Greatest Common Divisor and Least Common Multiple
1. Listing divisors or multiples
 2. Using prime factorizations
 3. Solving application problems using GCD or LCM
- H. Computations on Integers
1. Using number lines
 2. Using manipulatives
 3. Using models to establish rules
- I. Properties of Whole Numbers and Integers
1. Closure, commutative, associative, distributive, inverse, identity
- J. Patterns
1. Arithmetic, Geometric, Fibonacci
 2. Figurative, and consecutive differences
- K. Categorical Data
1. Appropriate survey questions and representations
 2. Bar graphs, pictographs, and line plots