Millersville University
Math 104
Fundamentals of Mathematics I, 3 credits

Course Description:

Mathematics content which elementary and special education teachers of mathematics at any level need to know and understand before beginning to teach. Math 104 is designed to equip all such majors with sufficient knowledge and facility in mathematics for teaching mathematics effectively at the elementary level. The course includes an examination of problem solving, number systems, algorithmic structure, and the properties of integers, rational, and real numbers. Attention will be given to how the content addresses the PA Department of Education Mathematics Standards, the NCTM Principles and Standards for School Mathematics, and the Common Core State Standards for Mathematics. This course is required for all elementary education, special education, and middle level education majors.

Prerequisite:

At least an 80% passing score on the Mathematics Department Basic Skills Test prior to course enrollment.

Course Objectives: Students will be able to

- Demonstrate knowledge of the concepts, procedures and skills necessary to teach the structure of number systems and arithmetic operations.
- Communicate and model important mathematical ideas related to number systems and arithmetic operations using a variety of strategies.
- Demonstrate appropriate and correct application of mathematics terminology and symbolism for number systems and arithmetic operations.
- Demonstrate the appropriate use of physical and technological tools for representing and connecting mathematical ideas within number systems and arithmetic operations.
- Demonstrate the ability to transfer knowledge and thinking strategies to new situations.

Assessment Tools:

Instructors will make use of a variety of assessment tools in making sure that the students meet the objectives of the course. These may include: in-class activities, graded assignments, projects, presentations or quizzes, as well as exams and a final.

Required Materials:

- Textbook: Beckmann, S. (2014). *Mathematics for elementary teachers with activities*. Boston, MA: Pearson. ISBN: 9781269862189
- Millersville University Manipulative Kit (provided)
- Calculator: Make sure it has the +, -, x, and ÷ buttons (e.g., TI-34II or comparable).

List of Topics:

Operations (+, -, x, ÷) and algebraic thinking

- Counting numbers
- Decimals
- Fractions
- Represent and solve problems using operations

Number and operations

- Develop understanding of place value
- Counting numbers
- Develop understanding of decimals
- Develop understanding of fractions as numbers
- Develop understanding of fraction equivalence
- Develop understanding of comparing fractions
- Develop understanding of unit fractions
- Develop understanding of negative numbers
- Develop understanding of rounding numbers
- Develop understanding of prime and composite numbers
- Develop understanding of factors and multiples
- Develop understanding of properties of arithmetic
- Develop understanding of mental math strategies
- Develop understanding of single-digit multiplication facts

Counting/Cardinality

Rational and Irrational Numbers

- Distinguish between the different sets of numbers

Divisibility Concepts

- Even and odd

Alignment of Topics to Required Textbook:

Topic	***Section (Beckmann)***
The Counting Numbers	1.1
Decimals and Negative Numbers	1.2
Comparing Numbers in Base Ten	1.3
Rounding Numbers	1.4
Defining and Reasoning About Fractions	2.2
Equivalent Fractions	2.3
Comparing Fractions	2.4
Interpretations of Addition and Subtraction	3.1
The Commutative and Associative Properties of Addition, Mental Math, and Single-Digit Facts	3.2
Why the Standard Algorithms for Adding and Subtracting Numbers in the Base-Ten System Work	3.3
Adding and Subtracting Fractions	3.4
Interpretations of Multiplication	4.1
Why Multiplying by 10 Is Special in Base Ten	4.2
The Commutative and Associative Properties of Multiplication	4.3
The Distributive Property	4.4
Properties of Arithmetic, mental Math, and Single-Digit Multiplication Facts	4.5
Why Algorithms for Multiplying Whole Numbers Work	4.6
Multiplying Fractions	5.1
Interpretations of Division	6.1
Division and Fractions and Division with Remainder	6.2
Why Division Algorithms Work	6.3
Fraction Division from the “How Many Groups?” Perspective	6.4
Fraction Division from the “How Many in One Group?” Perspective	6.5
Rational and Irrational Numbers	8.6