

# MATH-1370: MATHEMATICS FOR ELEMENTARY AND MIDDLE SCHOOL TEACHERS I

---

## Cuyahoga Community College

**Viewing: MATH-1370 : Mathematics for Elementary and Middle School Teachers I**

**Board of Trustees:**

September 2023

**Academic Term:**

Fall 2024

**Subject Code**

MATH - Mathematics

**Course Number:**

1370

**Title:**

Mathematics for Elementary and Middle School Teachers I

**Catalog Description:**

First of two semester sequence designed for elementary and middle school education majors. Emphasis on understanding ideas and concepts. Includes sets and numeration, whole numbers, number theory, fractions, decimals, integers, rational and real numbers, and problem-solving strategies. Highlights applications to classroom, projects, and use of current technology, including scientific/graphing calculators and computers.

**Credit Hour(s):**

4

**Lecture Hour(s):**

4

## Requisites

**Prerequisite and Corequisite**

MATH-0965 Intermediate Algebra, or qualified Math placement, or departmental approval: equivalent coursework.

Note: MATH-1200 or 1280 taken prior to Fall 2016, or MATH-1270 taken prior to Summer 2017 will also be accepted to meet prerequisite requirements for this course.

## Outcomes

**Course Outcome(s):**

Use models to understand place-value and the base-ten number system.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Determine whether sets are finite or infinite.
  2. Determine the cardinality of sets.
  3. Distinguish between cardinal and ordinal numbers and demonstrate their relationship to counting.
  4. Perform pairwise comparison of sets and appropriately label units.
  5. Order and compare whole numbers using different representations.
  6. Express numbers in expanded form and demonstrate how expanded form models grouping by powers of ten.
-

**Course Outcome(s):**

Represent and solve problems involving addition, subtraction, multiplication, and division of whole numbers and apply properties of operations.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Use and illustrate the relevance of the properties of addition, subtraction, multiplication, and division to the calculation of sums, differences, products, and quotients of whole numbers.
2. Illustrate addition, subtraction, multiplication, and division using a variety of models.
3. Demonstrate the relationship between addition and subtraction, multiplication and division.
4. Demonstrate the relationship between addition and multiplication, subtraction and division, and multiplication and exponentiation.
5. Use the order of operations to simplify expressions.
6. Recognize and reason about the appropriate use of addition, subtraction, multiplication, and division in solving application problems.

---

**Course Outcome(s):**

Compute with numbers using mental math, estimation, calculators, and paper and pencil algorithms.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Estimate calculations of whole numbers.
2. Estimate by rounding.
3. Use the order of operations with a calculator to simplify expressions.
4. Explain how different algorithms can be used to solve problems in base ten (e.g. standard algorithm and lattice method).
5. Explain the relationship between algorithms and mental estimation techniques.
6. Use the properties of operations to perform mental calculations.

---

**Course Outcome(s):**

Understand representations of fractions and use algorithms to compute with fractions.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Find the simplest form of fractions.
2. Identify equivalent fractions and explain what it means for two fractions to be equivalent.
3. Order fractions and explain the reasoning.
4. Find fractions between two fractions.
5. Express mixed numbers as improper fractions and vice versa.
6. Estimate calculations with fractions.
7. Model fractions as part of a whole.
8. Demonstrate the connection between fractions and division.
9. Use and illustrate the relevance of the properties of addition, subtraction, multiplication, and division to the calculation of sums, differences, products, quotients of fractions, and to the simplification of fractions.

---

**Course Outcome(s):**

Use algorithms to compute with decimals and use ratios and rates to represent relationships.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Express numbers in decimal form.
2. Order decimals using place value and explain the reasoning.
3. Estimate calculations of decimals.
4. Use the properties of operations to perform mental calculations with decimals.
5. Round decimals.
6. Use and illustrate the relevance of the properties of addition, subtraction, multiplication, and division to the calculation of sums, differences, products, and quotients of decimals.
7. Convert between standard and scientific notation emphasizing base ten place value.
8. Describe the process to convert among decimals, percentages and fractions.
9. Change forms among decimals, percentages, and fractions.
10. Define ratios and rates.
11. Explain the relationship between fractions, ratios, and unit rates.
12. Write equivalent ratios.
13. Demonstrate the use of fractions, ratios, and rates in applications.

**Course Outcome(s):**

Use algorithms to compute with integers.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Extend the variety of models from whole numbers to integers (e.g. chip model and number line).
2. Use and illustrate the relevance of the properties of addition, subtraction, multiplication, and division to the calculation of sums, differences, products, and quotients of integers.
3. Order integers using a variety of models.

**Course Outcome(s):**

Use factors, multiples, prime numbers, and prime factorization to solve problems.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Express numbers as a product of primes.
2. Determine if a number is divisible by another number.
3. Find the prime factorization of a number.
4. Determine if a number is a prime or composite.
5. Find the number of factors a number contains.
6. Find the greatest common factor.
7. Find the least common multiple.
8. Describe the differences between the GCF and LCM and distinguish between the appropriate applications of each.

**Course Outcome(s):**

Apply operations on rational and real numbers, solve equations, and analyze functions.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Use and illustrate the relevance of the properties of addition, subtraction, multiplication, and division to the calculation of sums, differences, products, and quotients of rational numbers.
2. Order rational numbers.
3. Determine if decimals represent rational or irrational numbers.
4. Demonstrate the difference between equality in an algebraic equation and equality in an arithmetic problem.
5. Identify the various parts of algebraic expressions.
6. Translate between algebraic expressions and verbal expressions.
7. Solve equations using algorithms.
8. Identify repeated patterns in sequences and distinguish between arithmetic and geometric sequences.

**Course Outcome(s):**

Apply a variety of strategies to solve problems that arise in mathematics and other fields.

**Essential Learning Outcome Mapping:**

Quantitative Reasoning: Analyze problems, including real-world scenarios, through the application of mathematical and numerical concepts and skills, including the interpretation of data, tables, charts, or graphs.

**Objective(s):**

1. Use and apply the strategies of guess and test, draw a picture, use a variable, look for a pattern, and make a list.
2. Use and apply the strategies of solve a simpler problem, draw a diagram, use direct reasoning, indirect reasoning and repeated reasoning.
3. Use and apply the strategies of use properties of numbers, solve an equivalent problem, work backwards, use cases, and solve an equation.
4. Use relevant physical models (e.g., manipulatives) to justify problem solving strategies.

**Methods of Evaluation:**

1. Exams
2. Quizzes
3. Assignments
4. Projects
5. Portfolios
6. Cooperative group work
7. Presentations
8. Journals
9. Calculator/computer application problems
10. Comprehensive final exam

**Course Content Outline:**

1. Sets and numeration
  - a. Sets
  - b. Finite and infinite sets
  - c. Cardinality of sets and ordinal numbers
2. Whole numbers
  - a. Numbers and numerals
  - b. Ordering whole numbers
  - c. Addition, subtraction, multiplication, division, and their properties
  - d. Exponents
  - e. Order of operations
  - f. Estimation

- g. Using a calculator
  - h. Algorithms for addition, subtraction, multiplication, and division
3. Fractions
- a. Concept of fraction
  - b. Ordering fractions
  - c. Addition, subtraction, multiplication, division, and their properties
  - d. Estimation
4. Decimals, ratio, and percent
- a. Decimals
  - b. Ordering decimals
  - c. Estimation
  - d. Algorithms for operating with decimals
  - e. Scientific notation
  - f. Classifying repeating decimals
  - g. Ratios and rates
  - h. Converting percentages
  - i. Estimation using fraction equivalents
5. Integers
- a. Integers and the integer number line
  - b. Addition, subtraction, multiplication, division, and their properties
  - c. Negative exponents and scientific notation
  - d. Ordering integers
6. Number theory
- a. Primes and composites
  - b. Tests for divisibility
  - c. Counting factors
  - d. Greatest common factor
    - i. Prime factorization method
  - e. Least common multiple
    - i. Prime factorization method
    - ii. Build-up method
7. Rational numbers and real numbers
- a. Rational numbers
  - b. Addition, subtraction, multiplication, division, and their properties
  - c. Ordering rational numbers
  - d. Real numbers
  - e. Rational exponents
  - f. Introduction to algebra
  - g. Relations
  - h. Sequences
8. Problem solving strategies
- a. Guess and test
  - b. Draw a picture
  - c. Use a variable
  - d. Look for a pattern
  - e. Make a list
  - f. Solve a simpler problem
  - g. Draw a diagram
  - h. Use direct reasoning
  - i. Use indirect reasoning
  - j. Use repeated reasoning
  - k. Use properties of numbers
  - l. Solve an equivalent problem
  - m. Work backwards
  - n. Use cases
  - o. Solve an equation

## Resources

Beckmann, Sybilla. *Mathematics for Elementary and Middle School Teachers with Activities*. 6th. Pearson, 2021.

---

Bassarear, Tom. *Mathematics for Elementary School Teachers*. 7th ed. Cengage Learning, 2020.

---

Billstein, Rick, Shlomo Libeskind, and Johnny W. Lott. *A Problem Solving Approach to Mathematics for Elementary School Teachers*. 13th ed. Pearson Education, Inc., 2020.

---

Bennett, Albert B., Ted Nelson, and Laurie J. Burton. *Mathematics for Elementary School Teachers: A Conceptual Approach*. 10th ed. McGraw Hill, 2015.

---

Musser, Gary L., William F. Burger, and Blake E. Peterson. *Mathematics for Elementary School Teachers: A Contemporary Approach*. 10th ed. John Wiley & Sons, Inc., 2014.

---

O'Daffer, Phares, Randall Charles, Thomas Cooney, John Dossey, and Jane Schielack. *Mathematics for Elementary School Teachers*. 4th ed. Pearson Education, Inc., 2008.

---

"Ohio Journal of School Mathematics"

---

"Principles and Standards for School Mathematics"

---

"Teaching Children Mathematics; Mathematics Teaching in the Middle School; Mathematics Teacher; and Journal for Research in Mathematics Education"

---

## Resources Other

*National Library of Virtual Manipulatives*. [nlvm.usu.edu](http://nlvm.usu.edu). Utah State University.

## Instructional Services

### OAN Number:

Ohio Transfer 36 TMM021

Top of page

Key: 2840