

**JEFFERSON COLLEGE**

**COURSE SYLLABUS**

**MTH130**

**STRUCTURE OF THE REAL NUMBER SYSTEM**

3 Credit Hours

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## MTH130: Structure of the Real Number System

### I. CATALOG DESCRIPTION

- A. Course pre-requisites/co-requisites: COMPASS algebra score of at least 66, or COMPASS college algebra score of at least 31 within the past two years, ACT math score of 22 or higher within the past two years, or MTH128 with a grade of "C" or better or MTH110 with a grade of "C" or better and reading proficiency.
- B. 3 semester credit hours
- C. Structure of the Real Number System presents topics from algebra within the context of the whole numbers, the integers, the rational numbers, and the real numbers. Students will study topics from algebra which are appropriate for elementary education majors. This course will meet the mathematics requirement for the Associate of Arts degree for elementary education majors only (F, S, Su)
- D. Structure of Real Number System (MAY be added to MOTR per MDHE)  
Fulfills Mathematic Sciences for AAT – Elementary/Early Childhood degree general education requirement, NOT part of MOTR CORE 42.  
Elective course applies toward AA and AAT degree requirement.

### II. EXPECTED LEARNING OUTCOMES/ASSESSMENT MEASURES

Note: Each of the following learning outcomes will be measured on at least one in-class exam, but instructors are encouraged to assess them with additional measures including homework, quizzes, and/or projects.

Expected Learning Outcomes	Assessment Measures
Explain, through writing and speaking, fundamental concepts, structure, patterns, and processes related to number, operations, and algebra topics that are important in elementary school (K-8) mathematics	Class discussion/practice Homework Quizzes/tests
Apply a variety of problem solving strategies appropriate to the K-8 curriculum to a range of mathematical problems, from number operations, and algebra, and find different methods for solving a given problem and explain the steps/process of each method	Class discussion/practice Homework Quizzes/tests
Represent quantities and relationships between quantities in problem situations	Class discussion/practice Homework Quizzes/tests

using symbols, words, diagrams, and graphs	
Construct viable mathematical arguments and evaluate the reasoning of others	Class discussion/practice Homework Quizzes/Tests
Use set notation and operations, and construct and interpret Venn diagrams in order to use them to solve problems	Class discussion/practice Homework Quizzes/tests
Identify and apply properties of real numbers, and explore different contexts and representations for operations on real numbers	Class discussion/practice Homework Quizzes/tests
Apply divisibility properties of composite numbers to find factors, multiples, prime factorization, and relatively prime numbers, and use them to solve problems	Class discussion/practice Homework Quizzes/tests
Perform calculations with fractions, decimals, percents, ratios, and proportions using different representations and models	Class discussion/practice Homework Quizzes/tests

### III. OUTLINE OF TOPICS

#### A. Mathematical reasoning

1. Identify inductive and deductive reasoning
2. Find counterexamples for false statements
3. Draw Venn diagrams to represent relationships
4. Translate statements into if-then form
5. Determine whether an argument is valid or invalid
6. Write the converse, contrapositive, and inverse of an if-then statement
7. Describe, extend, and make generalizations about numeric patterns
8. Write the rule for arithmetic and geometric number sequences
9. Solve problems using a variety of strategies and explain reasoning
10. Use multiple methods to solve a given problem

#### B. Sets and functions

1. Read and apply set notation
2. Carry out set operations
3. Use Venn diagrams to describe relationships between various sets
4. Find information from Venn diagrams and use them to solve problems
5. Represent functions using words, tables, graphs, and formulas
6. See and communicate patterns

#### C. Whole numbers

1. Use multiple models to illustrate place value and the base-ten number system

2. Distinguish between counts and measures
3. Explore different contexts and representations for number operations
4. Use multiple strategies for whole-number computations
5. Identify and use properties of whole numbers
6. Recognize and correct error patterns
7. Use multiple strategies for mental computations and for estimating the results of whole-number computations
8. Explore different counting and numbering systems
9. Carry out number operations in bases other than base ten

D. Number theory

1. Find all the factors of a counting number
2. Use several strategies to find the prime factorization of a composite number
3. Determine if two counting numbers are relatively prime
5. Know and carry out the divisibility tests for 2, 3, 4, 5, 6, 8, 9, 10
6. Find the greatest common factor and the least common multiple of a set of numbers
7. Use factors, multiples, prime factorization, and relatively prime numbers to solve problems

E. Integers

1. Model integer operations with number lines and signed counters
2. Use properties of integers to simplify calculations
3. Recognize and correct common error patterns
4. Develop models and algorithms to use on the integers

F. Rational numbers as fractions

1. Use diagrams and models to illustrate fractions as part of a whole, part of a group or set, locations on a number line, and as a quotient of whole numbers
2. Compare fractions using common denominators, decimals, cross multiplication, and benchmarks
3. Plot fractions on number lines and explain the location
4. Use the meaning of fractions, pictures, and number lines to explain why multiplying the numerator and denominator by the same counting number produces an equivalent fraction
5. Explain that giving fractions common denominators expresses the fractions in terms of like parts
6. Solve problems involving fractions with the aid of pictures, tables, and number lines as well as numerically. Interpret pictures appropriately and justify solutions.
7. Use models to illustrate addition, subtraction, multiplication, and division of fractions and explain why the processes used to perform the operations make sense.
8. Write and recognize story problems that involve fraction addition,

- subtraction, multiplication, and division.
9. Use multiple strategies for mental computations and for estimating the results of fraction number computations.
  10. Recognize and correct error patterns.

G. Decimals, percents, and real numbers

1. Represent decimals using base-ten block and number lines
2. Explain decimal operations in different ways
3. Use scientific notation
4. Use different models such as strip diagrams and ratio tables to explain what it means for two quantities to be in a certain ratio
5. Explain and use different methods for solving problems involving proportions
6. Identify unit rates and explain what they mean
7. Recognize and generate equivalent forms of commonly used fractions, decimals, and percents
8. Use several method to solve basic percent problems
9. Solve simple and compound interest problems
10. Solve problems involving percent increases or decrease
11. Use multiple strategies for mental computations and for estimating the results of decimal-number and percent computations
12. Write story problems for decimal or percent problems

IV. METHODS OF INSTRUCTION

- A. Lecture
- B. Discussion
- C. In-class activities

V. REQUIRED TEXTBOOK

Long, C. *Mathematical Reasoning for Elementary Teachers* (Current Edition). Boston: Pearson.

VI. REQUIRED MATERIALS

Calculator

VII. SUPPLEMENTAL REFERENCES

- A. Student Solutions Manual
- B. Current Articles

## VIII. METHODS OF EVALUATION

- A. Homework 10-20%
- B. Classwork 0-20%  
Additional worksheets and projects may be assigned at the discretion of the instructor to reinforce various concepts
- C. Quizzes 0-20%
- D. Tests 30-60%  
There will be a minimum of three unit tests, each covering 1-2 chapters of material
- E. Comprehensive final examination 15-25%  
All students will be required to take a comprehensive final exam, the score of which must be included in the final course grade
- F. Grading Scale  
90-100% = A  
80-89% = B  
70-79% = C  
60-69% = D  
Below 60% = F

## IX. ADA AA STATEMENT

Any student requiring special accommodations should inform the instructor and the Coordinator of Disability Support Services (Technology Center 101; phone 636-481-3169).

## X. ACADEMIC HONESTY STATEMENT

All students are responsible for complying with campus policies as stated in the Student Handbook (see College website, <http://www.jeffco.edu>).

## XI. ATTENDANCE STATEMENT

Regular and punctual attendance is expected of all students. Any one of these four options may result in the student being removed from the class and an administrative withdrawal being processed: (1) Student fails to begin class; (2) Student ceases participation for at least two consecutive weeks; (3) Student misses 15 percent or more of the coursework; and/or (4) Student misses 15 percent or more of the course as defined by the instructor. Students earn their financial aid by regularly attending and actively participating in their coursework. If a student does not actively participate, he/she may have to return financial aid funds. Consult the College Catalog or a Student Financial Services representative for

more details.

## XII. OUTSIDE OF CLASS ACADEMICALLY RELATED ACTIVITIES

The U.S. Department of Education mandates that students be made aware of expectations regarding coursework to be completed outside the classroom. Students are expected to spend substantial time outside of class meetings engaging in academically related activities such as reading, studying, and completing assignments. Specifically, time spent on academically related activities outside of class combined with time spent in class meetings is expected to be a minimum of 37.5 hours over the duration of the term for each credit hour.