MATH-1100: MATHEMATICAL EXPLORATIONS

Cuyahoga Community College

Viewing: MATH-1100 : Mathematical Explorations

Board of Trustees:
March 2020

Academic Term:
Fall 2021

Subject Code
MATH - Mathematics

Course Number:
1100

Title:
Mathematical Explorations

Catalog Description:
Survey of mathematical topics to develop a broader appreciation of mathematics by exploring ways in which the artistic, aesthetic, and intellectual aspects of mathematics are as important as its utility. Students will have the opportunity to study basic concepts and skills of problem solving, set theory, logic and number theory with the purpose of introducing them to the nature of mathematics as it applies to both the practical and the abstract. This course is designed for students whose majors do not require courses in Statistics or STEM and will count towards the requirements for Associate's degrees requiring a 1000-level math.

Credit Hour(s):
3

Lecture Hour(s):
3

Requisites

Prerequisite and Corequisite
MATH-0910 Basic Arithmetic and Pre-Algebra or appropriate score on Math placement test to enroll in MATH-0955 Beginning Algebra and ENG-0995 Applied College Literacies, or appropriate score on English placement test to enroll in ENG-1010 College Composition I; or MATH-0955 Beginning Algebra; or MATH-0990 Math Literacy for College Students; or sufficient score on Math assessment test; or departmental approval: equivalent coursework.

Note: MATH-0950 Beginning Algebra I taken prior to Fall 2016 will also be accepted to meet the prerequisite requirement for this course. ENG-0990 Language Fundamentals II taken prior to Fall 2021 will also meet prerequisite requirements.

Outcomes

Course Outcome(s):
Solve problems utilizing various techniques.

Essential Learning Outcome Mapping:
Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):
1. Define, compare, and contrast inductive and deductive reasoning.
2. Define and work with different types of sequences such as arithmetic, geometric, Fibonacci, and successive differences.
3. Use inductive reasoning to identify the next term or statement of a sequence.
4. Discuss and apply various problem solving strategies.
5. Use estimations to approximate answers to applications.

Course Outcome(s):
Demonstrate knowledge in the basic concepts of set theory.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Define and use the basic terminology and notation of set theory including: set, element, empty set, complement, subset, proper subset, universal set, union, and intersection.
2. Write sets using the descriptive method, set-builder notation, and ellipses
3. Classify sets as finite or infinite.
4. Define and determine the cardinality of a set.
5. Use Venn diagrams to show the relationship between sets.
6. Perform set operations including union, intersection, difference between, and Cartesian product operations on two sets.
7. Apply De Morgan's Laws to two sets.
8. Apply Venn diagrams to graphical analysis of two sets.

Course Outcome(s):

Demonstrate a knowledge of the basic principles and terminology of symbolic logic.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Identify statements including compound statements, their components, and logical connectives.
2. Define and form the negation of a statement, including the use of De Morgan's Laws, and detect incorrect negations.
3. Represent statements using standard logical symbols (p, q, ~,v,^).
4. Identify and correctly use universal and existential quantifiers.
5. Read and construct basic truth tables to find the truth values of conjunctives, disjunctives, conditional and biconditional statements.
6. Define equivalent statements and determine whether or not two statements are equivalent.
7. Recognize conditional statements and identify the antecedent and consequent of such statements.
8. Define and analyze the negation, converse, inverse, and contrapositive of a conditional statement.
9. Write a conditional statement as a disjunction.

Course Outcome(s):

Convert between various bases.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Count, add and subtract in a variety of different bases.
2. Convert between base ten and other bases such as binary, octal, and hexadecimal.
3. Convert between bases other than base ten.

Course Outcome(s):

Categorize numbers using various topics in number theory.

Essential Learning Outcome Mapping:

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

Objective(s):

1. Define and classify numbers to be prime or composite.
2. Define and find special primes.
3. Determine if a number is perfect, abundant, or deficient.
4. Explore number relationships including friendly numbers and twin primes.

5. Find the greatest common factor and least common multiple using prime factorization, division by primes, and the Euclidean Algorithm.
6. Define and apply the Golden Ratio and Fibonacci sequence.
7. Deduct the numerical value of the Golden Ratio using continued fractions.
8. Relate the Fibonacci sequence with the Golden Ratio using ratios.
9. Identify the relationship between the Fibonacci Sequence and the Golden Ratio and give examples of their manifestation in art, biology, and architecture.
10. Build magic squares and discuss their historical significance.

Methods of Evaluation:

1. Homework
2. Quizzes
3. Projects
4. Periodic exams
5. In class collaborative work
6. Comprehensive final exam

Course Content Outline:

1. Problem Solving
   a. Inductive and Deductive Reasoning
   b. Number patterns
   c. Strategies for Problem Solving
   d. Calculation and Estimation
2. The Basic Concepts of Set Theory
   a. Symbols and Terminology
   b. Set Operations and Cartesian Products
   c. Cardinal Numbers
   d. Venn Diagrams and Subsets
3. Introduction to Logic
   a. Statements and Quantifiers
   b. Truth Tables and Equivalent Statements
   c. The Conditional and Related Statements
4. Base Conversions
   a. Conversion between Number Bases
   b. Counting, Adding, and Subtracting in Different Bases
5. Number Theory
   a. Prime and Composite Numbers
   b. Special Prime Numbers
   c. Perfect Numbers, Deficient and Abundant Numbers, Amicable “Friendly” Numbers, Twin Primes
   d. Greatest Common Factor and Least Common Multiple using Various Methods
   e. The Fibonacci Sequence and the Golden Ratio

Resources

Miller, Charles D., Vern E. Heeren and E John Hornsby, Jr. *Mathematical Ideas*. 14th. Reading, MA: Addison Wesley, 2019.

Smith, Carl J. *The Nature of Mathematics*. 13th ed. Belmont, CA: Cengage, 2016.

Aufmann, Richard N., Lockwood Joanne S., Nation, Richard D. and Clegg, Daniel K. *Mathematical Excursions*. 4th ed. Belmont, CA: Cengage, 2017.

Resources Other

1. MyMath Lab Software
2. Enhanced Web Assign

Instructional Services

OAN Number:
Ohio Transfer 36 TMMSL

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