Montgomery County Community College
MAT 103
Foundations of Mathematics
3-3-0

COURSE DESCRIPTION:
This course is to give the students an understanding of the foundations of math. Topics include sets, logic, number bases and the structure of the number system from naturals to the reals. This course does not satisfy the MAT 100 prerequisite requirement for MAT 125, MAT 131, MAT 140, or MAT 161.

REQUISITE(S):
Previous Course Requirements
- MAT 080 - Fundamentals of Mathematics, or MAT 011 - Beginning Algebra, or MAT 011B - Beginning Algebra with Review of Arithmetic with a minimum grade of C.

Concurrent Course Requirements
None

LEARNING OUTCOMES Upon successful completion of this course, the student will be able to	LEARNING ACTIVITIES	EVALUATION METHODS
1. Describe the difference between inductive reasoning and deductive reasoning use both types.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
2. Use the process of estimation to arrive at an approximate solution to a question.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
3. Discuss Polya's problem solving procedure and use it when solving problems.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes	Exams Quizzes Homework Projects

	Projects	
4. Identify a SET and write a set in either DESCRIPTION FORM, ROSTER FORM or SET-BUILDER NOTATION.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
5. Explain and use the following set concepts: ELEMENTS, FINITE & INFINITE SETS, WELL-DEFINED SETS, EQUAL SETS, EQUIVALENT SETS, NULL SET, UNIVERSAL SET, and CARDINAL NUMBER of a set.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
6. Use the set symbolism/notation appropriately.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
7. Identify a SUBSET and distinguish between PROPER and IMPROPER subsets.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
8. Perform the set operations of UNION, INTERSECTION, COMPLEMENT, and DIFFERENCE.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
9. Draw Venn diagrams to illustrate relationships among sets and to analyze set statements.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
10. Explain and use DeMorgan's Laws.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
11. Use set concepts and/or Venn diagrams to determine the number of elements in sets or parts of sets.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
12. Explain and use the following concepts in Mathematical Logic: SIMPLE STATEMENT, COMPOUND STATEMENT, QUANTIFIER, NEGATION, CONJUNCTION, DISJUNCTION, CONDITIONAL and VARIATIONS OF THE CONDITIONAL.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
13. Construct TRUTH TABLES and use them to identify SELF-CONTRADICTIONS, TAUTOLOGIES, IMPLICATIONS, and EQUIVALENT STATEMENTS.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
14. Analyze Symbolic Arguments using Truth Tables or standard argument forms or Euler diagrams.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
15. Explain the concept of Numerator Systems and write and interpret numbers using Egyptian, Roman, and Babylonian Numerals.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
16. Demonstrate how to write numbers in bases other than base10, and perform elementary calculations in those bases.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
17. Explain the concept of ALGORITHM and be able to multiply using the algorithms of DUPLATION AND MEDIATION and the GALLEY METHOD.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
18. Explain the meaning of the terms FACTORS, DIVISORS, MULTIPLES, DIVISIBILITY TESTS, PRIME and COMPOSITE NUMBERS and be able to use them in finding PRIME FACTORIZATIONS, THE GREATEST COMMON DIVISOR (FACTOR), and THE LEAST COMMON MULTIPLE.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
19. Perform (without a calculator) whole number operations, Integer operations, Rational Number operations, and Decimal operations.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
20. Perform calculations using ORDER OF OPERATIONS.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects
21. Explain/illustrate the number properties: CLOSURE, COMMUTATIVE, ASSOCIATIVE, DISTRIBUTIVE, IDENTITY ELEMENTS, INVERSE ELEMENTS, and DENSITY.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

LEARNING OUTCOMES	LEARNING ACTIVITIES	EVALUATION METHODS
22. Describe the structure of the Real Number System.	Lectures Small Group Discussions and/or Projects The Use of TI 84 Graphics Calculator Homework Quizzes Projects	Exams Quizzes Homework Projects

At the conclusion of each semester/session, assessment of the learning outcomes will be completed by course faculty using the listed evaluation method(s). Aggregated results will be submitted to the Associate Vice President of Academic Affairs. The benchmark for each learning outcome is that *70% of students will meet or exceed outcome criteria*.

SEQUENCE OF TOPICS:

1. Inductive Reasoning, Estimation, Problem Solving
2. Sets, Set Applications
3. Statements and Connectives, Truth Tables, Equivalent Statements, Symbolic Arguments, Euler Diagrams
4. Ancient Numeration Systems, Place Value and Positional Notation, Other Bases, Algorithms, Computation in Other Bases
5. Number Theory, Integers, Rational and Irrational Numbers, Real Number System

LEARNING MATERIALS:

Angel and Porter. (2017). *A Survey of Mathematics with Applications.* Pearson.

Other learning materials may be required and made available directly to the student and/or via the College's Libraries and/or course management system.

COURSE APPROVAL:

Prepared by: Joseph A. Freiwald, Professor of Mathematics Date: 5/1998
Revised by: Joseph A. Freiwald, Professor of Mathematics Date: 2/2004
Revised by: Joseph A. Freiwald, Professor of Mathematics Date: 5/2004
Revised by: Joseph A. Freiwald, Professor of Mathematics Date: 9/2004
Revised by: Mark McFadden Date: 2/1/2013
VPAA/Provost or designee Compliance Verification:
Victoria L. Bastecki-Perez, Ed.D. Date: 5/23/2013

Revised by: Marion Graziano/Debbie Dalrymple Date: 8/1/2017
VPAA/Provost or designee Compliance Verification:
Victoria L. Bastecki-Perez, Ed.D. Date: 8/24/2017

Revised by: Math Pathways Team Date: 2/29/2024
VPAA or designee Compliance Verification: Date: 2/29/2024

This course is consistent with Montgomery County Community College's mission. It was developed, approved and will be delivered in full compliance with the policies and procedures established by the College.