

Virginia Western Community College

MTH 288

Discrete Mathematics

Prerequisites

Completion of MTH 263 or equivalent with a grade of C or better.

Course Description

Presents topics in sets, counting, graphs, logic, proofs, functions, relations, mathematical induction, Boolean Algebra, and recurrence relations.

Semester Credits: 3

Lecture Hours: 3

Required Materials

Textbook:

Discrete Mathematics with Applications by Epp. 4th edition. ISBN: 9780495391326

Other Required Materials:

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Course Objectives:

- Note: Methods of proofs and applications of proofs are emphasized throughout the course.
- Logic - Propositional Calculus
 - Use statements, variables, and logical connectives to translate between English and formal logic.
 - Use a truth table to prove the logical equivalence of statements.
 - Identify conditional statements and their variations.
 - Identify common argument forms.
 - Use truth tables to prove the validity of arguments.
- Logic - Predicate Calculus
 - Use predicates and quantifiers to translate between English and formal logic.
 - Use Euler diagrams to prove the validity of arguments with quantifiers.
- Logic - Proofs
 - Construct proofs of mathematical statements - including number theoretic statements - using counter-examples, direct arguments, division into cases, and indirect arguments.
 - Use mathematical induction to prove propositions over the positive integers.
- Set Theory
 - Exhibit proper use of set notation, abbreviations for common sets, Cartesian products, and ordered n-tuples.

- Combine sets using set operations.
 - List the elements of a power set.
 - Lists the elements of a cross product.
 - Draw Venn diagrams that represent set operations and set relations.
 - Apply concepts of sets or Venn Diagrams to prove the equality or inequality of infinite or finite sets.
 - Create bijective mappings to prove that two sets do or do not have the same cardinality.
- Functions and Relations
 - Identify a function's rule, domain, codomain, and range.
 - Draw and interpret arrow diagrams.
 - Prove that a function is well-defined, one-to-one, or onto.
 - Given a binary relation on a set, determine if two elements of the set are related.
 - Prove that a relation is an equivalence relation and determine its equivalence classes.
 - Determine if a relation is a partial ordering.
- Counting Theory
 - Use the multiplication rule, permutations, combinations, and the pigeonhole principle to count the number of elements in a set.
 - Apply the Binomial Theorem to counting problems.
- Graph Theory
 - Identify the features of a graph using definitions and proper graph terminology.
 - Prove statements using the Handshake Theorem.
 - Prove that a graph has an Euler circuit.
 - Identify a minimum spanning tree.
- Boolean Algebra
 - Define Boolean Algebra.
 - Apply its concepts to other areas of discrete math.
 - Apply partial orderings to Boolean algebra.
- Recurrence Relations
 - Give explicit and recursive descriptions of sequences.
 - Solve recurrence relations.

Textbook Topical Description

<u>Topic</u>	<u>Chapter</u>	<u>Sections</u>
Speaking Mathematically	1	1.1-1.3
The Logic of Compound Statements	2	2.1-2.3
The Logic of Quantified Statements	3	3.1-3.4
Elementary Number Theory and Methods of Proof	4	4.1-4.8
Sequences, Mathematical Induction, Recursion	5	5.1-5.4, 5.6-5.7
Set Theory	6	6.1-6.4
Functions	7	7.1-7.4
Relations	8	8.1-8.5
Counting and Probability	9	9.1-9.7
Graphs and Trees	10	10.1-10.7

Notes to Instructors

A comprehensive final exam will be given.

[ADA Statement \(PDF\)](#)

[Title IX Statement \(PDF\)](#)