

MA 162 Finite Mathematics

MA 162 Course Competencies

- A. Knowledge of human cultures and the physical and natural worlds through study in the sciences and mathematics, social sciences, humanities, histories, languages, and the arts.
- B. Intellectual and practical skills, including
 - inquiry and analysis
 - critical and creative thinking
 - written and oral communication
 - quantitative literacy
 - information literacy
 - teamwork and problem solving
- C. Personal and social responsibility, including
 - civic knowledge and engagement (local and global)
 - intercultural knowledge and competence
 - ethical reasoning and action
 - foundations and skills for lifelong learning
- D. Integrative and applied learning, including synthesis and advanced accomplishment across general and specialized skills.

Student Learning Outcomes for Quantitative Reasoning

In MA 162, students will learn to:

1. Interpret information presented in mathematical and/or statistical forms by (Gen Ed Comp B):
 - Stating the geometric interpretation of the solution to a linear programming problem.
 - Determining whether two events are independent or not
 - Determining whether two events are mutually exclusive or not
2. Illustrate and communicate mathematical and/or statistical information symbolically, visually, and/or numerically by (Gen Ed Comp A, B, C):
 - Using proper matrix notation to organize arrays of numbers and represent equations
 - Writing and understanding permutations and combinations in their standard notation
 - Writing and understanding probabilities in standard notation
 - Writing and understanding set notation for unions, intersections, and complements
 - Representing sets within Venn Diagrams and understanding such representations

3. Determine when computations are needed and execute the appropriate computations by (Gen Ed Comp A, B):
 - Performing matrix operations
 - Finding the inverse of a matrix
 - Finding the simple, compound, or conditional probability
 - Determining unions, intersections, and complements of sets and events
 - Determining the number of ways a task can be performed using counting principles

4. Apply an appropriate model to the problem to be solved by (Gen Ed Comp A, B, C):
 - Solving a system of linear equations by substitution, elimination, using matrix row operations, and using matrix equations.
 - Solving a linear programming problem graphically and by the simplex method.
 - Determining whether a problem involves permutations, combinations, or basic counting methods
 - Determining whether they have a simple, compound, or conditional probability problem

5. Make inferences, evaluate assumptions, and assess limitations in estimation modeling and/or statistical analysis by (Gen Ed Comp A, D):
 - Setting up and solving an application involving systems of equations.
 - Setting up and solving an application involving linear programming.
 - Solving multi-step problems that contain simple, compound and conditional probabilities.

MA 162 Course Outline

I. Linear Systems

- A. Solve linear systems of two or more variables by graphing, substitution, elimination or Gauss-Jordan methods.
- B. Recognize consistent, inconsistent, and dependent systems
- C. Write solutions in parametric form
- D. Set up and solve applied problems

II. Matrix Operations

- A. Recognize and be able to write coefficient matrices and augmented matrices
- B. Be able to define and identify square matrices, equal matrices, and matrices dimensions.
- C. Add and subtract matrices
- D. Perform scalar multiplication
- E. Perform matrix multiplication
- F. Find inverses
- G. Use inverses to solve systems

III. Linear Inequalities

- A. Graph inequalities
- B. Graph systems of inequalities
- C. Identify corner points and feasible regions
- D. Solve optimization problems by substituting corner points into objective functions.
- E. Identify standard maximization and minimization problems.
- F. Solve standard maximization simplex problems
- G. Solve duality problems using simplex
- H. Convert non-standard optimization problems to standard maximum problems:
 - i. Problems with \geq constraints
 - ii. Problems with $=$ constraints
 - iii. Problems with negative numbers on the right-hand side of constraints
 - iv. Problems with a minimized objective function.
- I. Identify simplex problems without a single solution
 - i. Multiple solutions
 - ii. Unbounded solutions
 - iii. No solutions
- J. Solve applied optimization problems using simplex and/or graphing methods.

IV. Sets

- A. Use, define and identify setbuilder notation, empty or null set, universal set, equal sets, subsets, proper subsets, elements, union, intersection, complements, disjoint sets
- B. Use and solve applied problems with Venn Diagrams.
- C. Identify the number of elements in sets

V. Combinatorics

- A. Define and use the Multiplication Rule on applied counting problems.
- B. Define and use the Addition Rule on applied counting problems.
- C. Solve applied permutation problems.
- D. Solve applied combination problems

VI. Probability

- A. Identify and define experiment, outcome, trial, sample space, event, empirical probability, random outcomes
- B. Find probabilities of equally likely events in applied problems
- C. Find probabilities of compound events in applied problems
 - i. union
 - ii. intersection
 - iii. complement
- D. Define and identify mutually exclusive events and independent events.
- E. Solve applied conditional probability problems.
- F. Solve applied probability problems using Baye's Rule

OPTIONAL

VII. Markov Chains

- A. Identify and define state matrices, transition matrices, markov chains, and steady-state matrices
- B. Solve applied problems involving Markov Chains
- C. Find steady-state matrices
- D. Identify regular matrices

VIII. Solve applied problems using Bernouilli's Formula