
Mathematical Models with Applications 1A

Course Description

Mathematical Models with Applications 1A is a one-semester course designed to help students to build on their knowledge of algebra through mathematical experiences. Mathematical models from algebra, geometry, probability, and statistics are used to solve problems from a variety of advanced applications in both mathematical and nonmathematical situations. Students use multiple representations, technology, applications and modeling, and numerical fluency in problem-solving contexts. Throughout the course, they will discover examples of mathematics in daily life.

Learning is enhanced by the interactive components within each topic. Students can observe and listen as step-by-step examples of key algebraic concepts are presented on a virtual blackboard; interactive geometry software provides students hands-on practice with these concepts. Additionally, self-check activities are built into each topic; quizzes are provided at the end of each lesson; and comprehensive tests are given at the end of each unit.

Throughout the course, discussion groups about mathematics and algebra application assignments help students to relate their learning to real-life experiences, and require them to communicate their thoughts and findings.

Overview

Unit 1 – Algebra Review

- Lesson 1: Expressions and Exponents
- Lesson 2: Properties and Sentences

Unit 2 – Algebra for Modeling

- Lesson 1: Introduction to Functions and Equations
- Lesson 2: Solving Equations Analytically
- Lesson 3: Functions and Relations

Unit 3 – Linear Equations

- Lesson 1: Graphs of Linear Equations 1
- Lesson 2: Graphs of Linear Equations 2
- Lesson 3: Forms of Linear Equations

Unit 4 – Ratio, Proportion, and Variation

- Lesson 1: Ratio and Proportion
- Lesson 2: Direct Variation
- Lesson 3: Inverse Variation
- Lesson 4: Hooke's and Boyle's Laws

Unit 5 – Data Analysis and Statistics

- Lesson 1: Central Tendency and Stem-and-Leaf Plots
- Lesson 2: Scatter Plots and Line of Best Fit

Unit 6 – Systems of Equations

- Lesson 1: Solutions by Graphing
- Lesson 2: Solving Systems of Equations 1
- Lesson 3: Solving Systems of Equations 2
- Lesson 4: Linear Systems
- Lesson 5: Linear Inequalities

Objectives

Students completing this course will be able to develop the following skills:

- Read, write, and understand algebraic expressions.
- Evaluate algebraic expressions by substituting values for variables in the expression.
- Use the order of operations to simplify numerical expressions that involve grouping symbols, multiplication, division, addition, and subtraction.
- Use the order of operations to evaluate algebraic expressions for given values of the variable(s).
- Graph linear equations and horizontal and vertical lines by finding ordered pairs.
- Use graphing to solve systems of linear equations in which one equation is a constant function.
- Solve equations by combining like terms and using addition, subtraction, multiplication, and division.
- Understand and use function notation.
- Rewrite linear equations with two variables in slope intercept form.
- Find the slope and y-intercept of an equation by rewriting the equation in slope intercept form.
- Graph linear equations using the slope and y-intercept of the graph.
- Write the equation of a line that passes through a given point and is perpendicular or parallel to another line.
- Solve application problems that deal with inverse variation.
- Solve problems involving percentages by using proportions.
- Calculate the mean, median, mode, and range of a set of data.
- Create and analyze stem-and-leaf plots of data.
- Solve systems of linear equations.
- Communicate mathematically by expressing ideas, analyzing situations, explaining procedures for correct computation, and describing results numerically and graphically.
- Use the Internet to gain useful information.
- Use discussion groups and email to communicate with teacher and classmates and develop a sense of class membership.

Activities and Assessments

- **7 Online Discussion Group Assignments** – Within each unit, students participate in a group discussion of a topic relevant to the material covered. The teacher evaluates the students' contributions to the discussion and provides grading and feedback.
- **9 Algebra Application Assignments** – Within each unit, students demonstrate their understanding of algebraic concepts by completing from one to three computer-graded algebra application assignments.
- **19 Quizzes, 6 Evaluations, and 1 Final Exam** – Along with numerous self-check practice sets throughout the course, there is a quiz at the end of each of the 19 lessons in the course. There is also an evaluation at the end of each of the six units. At the conclusion of the course, students are given one opportunity to complete a comprehensive final exam. All of these assessments are computer-graded and provide students with instant feedback on their work.