Syllabus for Advanced Algebra

This class is designed to further develop algebraic skills and prepare students for more advanced mathematics. This class focuses on a basic understanding of functions, what they do and basic function equations. The understanding of linear, quadratic, hyperbolic and exponential functions is explored. Alternative methods for solutions are learned using matrices and their applications. This class deals with how to manipulate and solve basic equations using more advanced algebraic techniques and how to rationalize reasonable solutions considering any possible restraints. Several applications use actual data so students can learn to derive equations from collected information.

Topic: Functions

Concepts: The Language of Algebra

Relations and Functions

Function Notations

Graphs of Functions

Using Graphs and Tables of Functions

Solving Equations

Rewriting formulae

Explicit Formulae for Sequences

Topic: Variations and Graphs

Concepts: Direct Variation

Inverse Variation

The Fundamental Theorem of Variation

The Graph of y = kx

The Graph of y = kx2

The Graphs of y = k/x and y = k/x2

Fitting a Model to Data I

Fitting a Model to Data II

Combined and Joint Variation

Topic: Linear Functions

Concepts: Constant Change and the graph of y = mx + b

Linear Combinations and Ax + By = C

The Graph of Ax + By = C

Finding an Equations of a Line

Fitting a Line to Data

Recursive Formulae for Sequences

Graphs of Sequences

Formulae for Linear (Arithmetic) Sequences

Step Functions

Topic: Matrices

Concepts: Storing Data in Matrices

Matrix Addition

Matrix Multiplication

Matrices for Size Changes

Matrices for Scale Changes

Matrices for Reflections

Transformations and Matrices

Matrices for Rotations

Rotations and Perpendicular Lines

Translations and Parallel Lines

Topic: Systems

Concepts: Inequalities and Compound Sentences

Solving Systems Using Tables or Graphs

Solving Systems Using Substitution

Solving Systems Using Linear Combinations

Inverses of Matrices

Solving Systems Using Matrices

Graphing Inequalities in the Coordinate Plane

Systems of Linear Inequalities

Linear Programming

Topic: Quadratic Functions

Concepts: Quadratic Expressions, Rectangles and Squares

Absolute Value, Square Roots, and Quadratic Equations

The Graph-Translation Theorem

Graphing y = ax2 + bx + c

Completing the Square

Fitting a Quadratic Model to Data

The Quadratic Formula

Pure Imaginary Numbers

Complex Numbers

Analyzing Solutions to Quadratic Equations

Topic: Powers

Concepts: Power Functions

Properties of Powers

Negative Integer Exponents

Compound Interest

Geometric Sequences

nth roots

Positive Rational Exponents

Negative Rational Exponents

Topic: Inverses and Radicals

Concepts: Composition of Functions

Inverses of Relations

Properties of Inverse Functions

Radical Notation for nth Roots

Products with Radicals

Quotients with Radicals

Powers and Roots of Negative Numbers

Solving Equations with Radicals

Topic: Exponential and Logarithmic Functions

Concepts: Exponential Growth

Exponential Decay

Continuous Compounding

Fitting Exponential Models to Data

Common Logarithms

Logarithmic Scales

Logarithms to Bases Other Than 10

Natural Logarithms

Properties of Logarithms

Using Logarithms to Solve Exponential Equations

Topic: Polynomials

Concepts: Introduction to Polynomials

Multiplying Polynomials

Quick-and-Easy Factoring

The Factor Theorem

The Rational-Root Theorem

Solving all Polynomial Equations

Finite Differences

Modeling Data with Polynomials