Algebra 2, Part 1 Course Outline & Objectives

Course Description:

In Algebra 2 Part 1, students will master equations and inequalities, including writing equations and solving absolute equations and inequalities. Students will learn to identify and graph linear functions and inequalities, with a focus on domain and range, as well as slopes of lines, including parallel and perpendicular lines. Students will also solve systems of linear equations and inequalities and will become proficient in using matrices and determinants to solve systems. Students will learn to solve quadratic equations, learning the implication of the imaginary number, and will graph quadratics. Students will learn to perform operations with complex numbers.

Credits - One Semester (0.5 Carnegie unit / CA: 5 credits) | Prerequisites: Algebra 1; Geometry

Course Outline

Unit 1: Equations and Inequalities

- 1.1 Writing Equations
- 1.2 Solving One-Step Equations
- 1.3 Solving Multi-Step Equations
- 1.4 Solving Inequalities
- 1.5 Graphing on Number Lines
- 1.6 Solving Absolute Value Equations
- 1.7 Solving Absolute Value Inequalities

Common Core Standards

In Unit 1 students will learn:

How to write equations from basic mathematical statements. How to solve one-step and multi-step equations. To understand and analyze the differences between equations and inequalities, and how to gain a mastery in solving inequalities as well as graphing them on a number line. How to solve absolute value equations and inequalities, understanding that there will be more than one solution in both cases.

How to graph the absolute value inequalities. [A-SSE, A-CED, A-REI, F-IF]

Unit 2: Linear Functions & Inequalities

- 2.1 Relations, Functions, Domain & Range
- 2.2 Graphs of Linear Functions
- 2.3 The Slope of a Line
- 2.4 Parallel and Perpendicular Lines
- 2.5 y=mx+b
- 2.6 Writing Equations of Lines
- 2.7 Graphing Inequalities

In Unit 2 students will learn:

To understand and show a comprehension of what relations are and what makes a relation a function, with techniques for identifying functions both graphically as well as algebraically. How to identify the domain and range for several relations, as well as how to apply domain and range restrictions to real-life problems.

How to graph linear functions and describe slope behaviors, including how to identify two linear functions that are either parallel or perpendicular.

How to, given two points or other key characteristics of a line, be able to work backward and determine the equation of that line.

How to solve and graph linear inequalities, showing the understanding that there will be infinite solutions to a linear inequality.

[A-SSE, A-CED, A-REI, F-IF, F-BF]

Course Outline

Unit 3: Systems of Linear Equations and Inequalities

3.1 The Graphing Method – Two Variables

3.2 The Substitution Method -Two Variables

3.3 The Addition Method -Two Variables

3.4 Graphing Linear Equations - 3 Variables

3.5 Modeling and Solving Systems of Linear Equations

Unit 4: Matrices and Determinants

4.1 Matrix Operations

4.2 Multiplication of Matrices

- 4.3 Determinants
- 4.4 Cramer's Rule
- 4.5 Inverses of 2x2 Matrices
- 4.6 Solving Systems Using Matrices

Common Core Standards

In Unit 3 students will learn:

How to solve systems of both linear equations and inequalities using a range of potential methods, including the graphing method, the substitution method, and the addition method. To understand that each method is favorable under different sets of circumstances, and that all methods should ultimately lead to the exact same solution.

How to find systems of equations that yield "no solution," in the case of parallel lines and how to determine if systems are consistent, inconsistent, dependent, or independent. How to solve systems of equations with three variables and to understand that in order to solve systems, one must have as many equations as there are variables.

[A-SSE, A-CED, F-IF, F-BF]

In Unit 4 students will learn:

How to solve systems of equations using the graphing, addition, and substitution methods, and how to use matrices, as another way to readily solve systems of equations with two and three variables.

How to perform matrix operations, including addition, subtraction, and in the case of Cramer's rule, division of matrices.

To understand the limitations upon whether or not certain matrix operations can be performed, based upon the dimensions of the matrices.

How to find the determinants of both two variable and three variable matrices, and how to use the determinants to find solutions to sets of equations.

Cramer's rule will be gone into in depth, and students will learn to solve systems using this technique.

How to find inverses of matrices and how to use the inverses of matrices to solve systems.

[F-IF, F-BF]

Course Outline

Unit 5: Quadratic Equations

- 5.1 Quadratic Equations and functions: ax²+bx+c
- 5.2 Solutions to Quadratic Functions; Factoring
- 5.3 Completing the Square
- 5.4 The Quadratic Formula
- 5.5 Complex Roots: i
- 5.6 Graphing Basic Parabolas (Positive &

Negative)

5.7 Graphing Quadratics

Unit 6: Polynomials

- 6.1 Addition and Subtraction of Polynomials
- 6.2 Products of Polynomials
- 6.3 Factoring Special Polynomials
- 6.4 Division of Polynomials; Long Division
- 6.5 Division of Polynomials: Synthetic Division
- 6.6 Rational Roots of Polynomials
- 6.7 Real Roots of Polynomials
- 6.8 Fundamental Theorem of Algebra

Unit 7: Complex Numbers (i), Operations w/ Functions

- 7.1 Basic Operations with Complex Numbers
- 7.2 Multiplying and Dividing Complex Numbers
- 7.3 Algebraic Operations with Functions
- 7.4 Composition of Functions

Common Core Standards

In Unit 5 students will learn:

To recognize quadratic equations and to be able to understand and analyze the basic anatomy of a quadratic function, including x and y vertices, axis of symmetry, the vertex, and the direction and relative steepness of the curve of the quadratic.

To understand that the solution to quadratic equations represent the x intercepts and to be able to understand that there can be either one, two, or zero solutions for any given quadratic, which can be shown graphically as well as solved for algebraically. How to solve quadratic equations using the factoring method, completing the square, and the quadratic formula and will begin to identify which methods work better for which equations. To understand that all three methods should yield the same results. To understand the concept of complex roots "i" and that in the case of a negative square root, i is used to represent the imaginary solution.

How to perform basic operations that involve i. [N-CN, A-SSE, F-IF, F-BF]

In Unit 6 students will learn:

The basic vocabulary associated with and the key aspects of polynomials, including the degree of a polynomial and its coefficients.

How to perform basic operations with polynomials, like the addition, subtraction, multiplication, and division of them. With regards to dividing polynomials, how to factor (when possible) both the top and bottom expressions, and to cancel like factors.

The two methods of dividing polynomials; long division and synthetic division.

How to make wise decisions regarding which method would be most convenient and when.

How to solve polynomials by applying the Fundamental Theorem of Algebra, including listing possible rational roots, complex roots and irrational roots.

[N-CN, A-SSE, A-APR, A-REI, F-BF]

In Unit 7 students will learn:

Complex numbers and the notion of imaginary numbers and solutions. How to perform Basic operations with complex numbers and how to add, subtract, multiply, and divide complex numbers. In the case of dividing complex numbers, how to multiply the numerator and denominator of complex fractions by the "conjugate" of the complex number in the denominator. How to answer all complex number problems in the standard form, upon their simplification.

How to perform the composition of functions, in which one function is substituted in for the input variable of another. [N-CN, A-SSE, F-BF]