Comprehensive Algebra I

COURSE DESCRIPTION: Students develop algebraic fluency by learning the skills needed to solve equations and perform manipulations with numbers, variables, equations, and inequalities. They also learn concepts central to the abstraction and generalization that algebra makes possible. Topics include simplifying expressions involving variables, fractions, exponents, and radicals; working with integers, rational numbers, and irrational numbers; graphing and solving equations and inequalities; using factoring, formulas, and other techniques to solve quadratic and other polynomial equations; formulating valid mathematical arguments using various types of reasoning; and translating word problems into mathematical equations and then using the equations to solve the original problems. This course has a more rigorous pace and more challenging assignments and assessments. It covers additional topics including translating functions, higher degree roots, and more complex factoring techniques.

PREREQUISITES: K12 MS Pre-Algebra, MTH112: Pre-Algebra, or equivalent

COURSE LENGTH: One Semester

REQUIRED TEXT: Algebra I: A Reference Guide and Problem Sets

MATERIALS LIST: No required materials for this course.

COURSE OUTLINE:

Semester 1

Unit 1: Algebra Basics

- Semester Introduction
- Expressions
- Variables
- Translating Words into Variable Expressions
- Equations
- Translating Words into Equations
- Replacement Sets
- Problem Solving
- Unit Review
- Unit Test

Unit 2: Properties of Real Numbers

- Number Lines
- Sets
- Comparing Expressions
- Number Properties
- Distributive Property
- Algebraic Proof
- Opposites and Absolute Value
- Unit Review
- Unit Test

Unit 3: Operations with Real Numbers

- Addition
- Subtraction
- Multiplication
- Reciprocals and Division
- Applications: Number Problems
- Unit Review
- Unit Test

Unit 4: Solving Equations

- Addition and Subtraction Equations
- Multiplication and Division Equations
- Multiple Transformations
- Variables on Both Sides of an Equation
- Transforming Formulas
- Estimating Solutions
- Cost Problems
- Unit Review
- Unit Test

Unit 5: Solving Inequalities

- Inequalities
- Solving Inequalities

- Combined Inequalities
- Absolute Value Equations and Inequalities
- Applications: Inequalities
- Unit Review
- Unit Test

Unit 6: Applying Fractions
- Ratios
- Proportions
- Percents
- Applications: Percents
- Applications: Mixture Problems
- Unit Review
- Unit Test

Unit 7: Linear Equations and Inequalities
- Equations in Two Variables
- Graphs
- Lines and Intercepts
- Slope
- Slope-Intercept Form
- Point-Slope Form
- Parallel and Perpendicular Lines
- Equations from Graphs
- Applications: Linear Models
- Graphing Linear Inequalities
- Inequalities from Graphs
- Unit Review
- Unit Test

Unit 8: Systems of Equations
- Systems of Equations
- Substitution Method
- Linear Combination

- Linear Combination with Multiplication
- Applications: Systems of Linear Equations
- Systems of Linear Inequalities
- Unit Review
- Unit Test

Unit 9: Semester Review and Test

- Semester Review
- Semester Test

Semester 2

Unit 1: Relations and Functions

- Semester Introduction
- Functions
- Function Equations, Part 1
- Function Equations, Part 2
- Absolute Value Functions
- Direct Linear Variation, Part 1
- Direct Linear Variation, Part 2
- Quadratic Variation
- Inverse Variation
- Translating Functions
- Unit Review
- Unit Test

Unit 2: Rationals, Irrationals, and Radicals

- Rational Numbers
- Terminating and Repeating Numbers
- Square Roots
- Irrational Numbers
- Estimating Square Roots, Part 1
- Estimating Square Roots, Part 2
- Radicals with Variables, Part 1
- Radicals with Variables, Part 2
- Using Square Roots to Solve Equations

- The Pythagorean Theorem
- Higher Roots
- Unit Review
- Unit Test

Unit 3: Working with Polynomials

- Overview of Polynomials
- Adding and Subtracting Polynomials
- Multiplying Monomials
- Multiplying Polynomials by Monomials
- Multiplying Polynomials
- The FOIL Method
- Unit Review
- Unit Test

Unit 4: Factoring Polynomials

- Factoring Integers
- Properties of Exponents
- Dividing Monomials
- Dividing Polynomials by Monomials
- Common Factors of Polynomials
- Factoring Perfect Squares
- Factoring Differences of Squares
- Factoring Quadratic Trinomials, Part 1
- Factoring Quadratic Trinomials, Part 2
- Factoring Completely
- Finding Roots of Polynomials
- Unit Review
- Unit Test

Unit 5: Quadratic Equations

- Solving Perfect Square Equations
- Completing the Square
- The Quadratic Formula

- The Discriminant
- Solving Quadratic Equations
- Equations and Graphs: Roots and Intercepts
- Applications: Area Problems
- Applications: Projectile Motion
- Discuss: Making Connections: Discuss Basketball
- Unit Review
- Unit Test

Unit 6: Rational Expressions
- Simplifying Rational Expressions
- Multiplying Rational Expressions
- Dividing Rational Expressions
- Adding and Subtracting Rational Expressions, Part 1
- Adding and Subtracting Rational Expressions, Part 2
- Unit Review
- Unit Test

Unit 7: Logic and Reasoning
- Hypothesis and Conclusion
- Reasoning and Arguments
- Forms of Conditional Statements
- Inductive and Deductive Reasoning
- Analyzing and Writing Proofs
- Counterexample
- Unit Review
- Unit Test

Unit 8: Semester Review and Test
- Semester Review
- Semester Test