

# MATHEMATICS

## College Algebra I

### **Curriculum**

**Vineland Public Schools  
Vineland, NJ**

**2007-2008**

**Vineland Board of Education**

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# **Vineland Public Schools Mission Statement**

We believe that all Vineland Public School students can learn. We recognize that learning is the result of a strong partnership of parents, teachers, and the community, as students are challenged to become active participants in the quest for excellence. Our goal is to ensure a safe, creative, stimulating and caring environment, which promotes self-esteem, sound character, responsibility and respect for diversity. This will enable students to become knowledgeable, skillful, life-long learners who are contributing citizens in our changing society. WE expect the best from our students and will give no less of ourselves.

# COLLEGE ALGEBRA I

## Description:

Algebra is the language through which most of mathematics is communicated and therefore is a fundamental lifetime skill. This activity and experiment-based algebra uses technology, along with application, to foster a deeper understanding of algebraic ideas. The explorations emphasize symbol sense, algebraic manipulations, and conceptual understandings. The investigative process encourages the use of multiple representations – numerical, graphical, symbolic, and verbal to deepen understanding for all students and to serve a variety of learning styles. Since problem solving is inherent to doing mathematics, it is integrated throughout this course rather than just a cluster unto itself. Students will learn how to logically organize their thoughts thus enabling them to solve real-world mathematical problems.

## Course Goals:

These goals are to promote:

1. Exposure to variety of learning environments that are conducive to our multi-cultural society.
2. An increase in student self-esteem and confidence in his/her mathematical ability.
3. The value of mathematics and make students aware of its use in various careers.
4. Learning of Algebra through problem solving, inquiry and discovery. (NJCC 4.5A1)
5. Communication of mathematical thinking to peers and teachers both orally and in writing. (NJCC4.5B.1)
6. The use of reasoning to support their mathematical conclusions and problem solutions. (NJCC4.5D2)
7. Understanding how mathematical ideas interconnect and build on one another to produce a coherent whole. (NJCC4.5C6)
8. The use symbolic and graphical representations to communicate their mathematical thinking. (NJCC4.5E1)
9. The use of graphing calculators as a problem- solving tool. (NJCC4.5F3)

10. Multiple inferences of algebraic expressions and equations involving variables.
11. Understanding of the use of four mathematical operations of real numbers in conjunction with their applications to algebraic expressions and equations.
12. The use of transformational strategies to solve equations.
13. Understanding of the need for and the use of polynomials in algebra.
14. Understanding of the process of solving linear equations and linear inequalities and representing their solutions graphically on paper and graphing calculator.
15. Understanding of the process of solving quadratic equations by various methods.
16. Understand the process of solving systems of linear equations with two variables by various method including the graphing calculator.
17. A variety of problem solving techniques and strategies to solve problems.  
(NJCC4.5A3)
18. Recognition, description and generalization of patterns.
19. The collection, representation and interpretation of data in ways that enable them to make meaningful decisions.
20. Understanding of geometric figures and how algebra and geometry are related.
21. Understand relations and functions and describe their general behavior.
22. Use functions to model real-world phenomena and solve problems.

## **NJ MATH STANDARDS**

STANDARD 4.1 (NUMBER AND NUMERICAL OPERATIONS) ALL STUDENTS WILL DEVELOP NUMBER SENSE AND WILL PERFORM STANDARD NUMERICAL OPERATIONS AND ESTIMATIONS ON ALL TYPES OF NUMBERS IN A VARIETY OF WAYS.

### **4.1 Number and Numerical Operations**

- A. Number Sense
- B. Numerical Operations
- C. Estimation

STANDARD 4.2 (GEOMETRY AND MEASUREMENT) ALL STUDENTS WILL DEVELOP SPATIAL SENSE AND THE ABILITY TO USE GEOMETRIC PROPERTIES, RELATIONSHIPS, AND MEASUREMENT TO MODEL, DESCRIBE AND ANALYZE PHENOMENA.

### **4.2 Geometry and Measurement**

- A. Geometric Properties
- B. Transforming Shapes
- C. Coordinate Geometry
- D. Units of Measurement
- E. Measuring Geometric Objects

STANDARD 4.3 (PATTERNS AND ALGEBRA) ALL STUDENTS WILL REPRESENT AND ANALYZE RELATIONSHIPS AMONG VARIABLE QUANTITIES AND SOLVE PROBLEMS INVOLVING PATTERNS, FUNCTIONS, AND ALGEBRAIC CONCEPTS AND PROCESSES.

### **4.3 Patterns and Algebra**

- A. Patterns and Relationships
- B. Functions
- C. Modeling
- D. Procedures

STANDARD 4.4 (DATA ANALYSIS, PROBABILITY, AND DISCRETE MATHEMATICS) ALL STUDENTS WILL DEVELOP AN UNDERSTANDING OF THE CONCEPTS AND TECHNIQUES OF DATA ANALYSIS PROBABILITY, AND DISCRETE MATHEMATICS, AND WILL USE THEM TO MODEL SITUATIONS, SOLVE PROBLEMS, AND ANALYZE AND DRAW APPROPRIATE INTERFERENCES FROM DATA.

**4.4 Data Analysis, Probability, and Discrete Mathematics**

- A. Data Analysis (Statistics)
- B. Probability
- C. Discrete Mathematics—Systemic Listing and Counting
- D. Discrete Mathematics—Vertex-Edge Graph and Algorithms

STANDARD 4.5 (MATHEMATICAL PROCESSES) ALL STUDENTS WILL USE MATHEMATICAL PROCESSES OF PROBLEM SOLVING, COMMUNICATION, CONNECTIONS, REASONING, REPRESENTATIONS, AND TECHNOLOGY TO SOLVE PROBLEMS AND COMMUNICATE MATHEMATICAL IDEAS.

**4.5 Mathematical Processes**

- A. Problem Solving
- B. Communication
- C. Connections
- D. Reasoning
- E. Representations
- F. Technology

# College Algebra I

## Course Contents:

### **II. Proportional Reasoning and Variation**

- 2.1 Proportions
- 2.3 Proportions and Measurement Systems
- 2.7 Evaluating Expressions
- 2.8 Undoing Operations

### **III. Linear Equations**

- 3.1 Recursive Sequence
- 3.2 Linear Plots
- 3.4 Linear Equations and the Intercept Form
- 3.5 Linear Equations and Rate of Change
- 3.6 Solving Equations Using the Balancing Method
- 3.7 Modeling Data

### **IV. Fitting a Line to Data**

- 4.1 A Formula for Slope
- 4.2 Write a Linear Equation to Fit Data
- 4.3 Point-Slope Form of a Linear Equation
- 4.4 Equivalent Algebraic Equations
- 4.5 Writing Point-Slope Equations for Fit Data
- 4.8 Data Collection and Modeling

### **V. Systems of Equations and Inequalities**

- 5.1 Solving Systems of Equations
- 5.2 Solving Systems of Equations Using Multiplication
- 5.3 Solving Systems of Equations Using Elimination
- 5.5 Inequalities in One Variable
- 5.6 Graphing Inequalities in Two Variables

## **VI. Exponents and Exponential Models**

- 6.1 Recursive Routine
- 6.2 Exponential Equations
- 6.3 Multiplication and Exponents
- 6.4 Scientific Notation for Large Numbers
- 6.5 Looking Back with Exponents
- 6.6 Zero and Negative Exponents
- 6.7 Fitting Exponential Models to Data

## **VII. Functions**

- 7.2 Graphs of Real –World Situations
- 7.3 Graphs of Real-World Situations
- 7.4 Functions Notation
- 7.5 Defining the Absolute Function

## **VIII. Polynomials and Factoring**

- 8.1 Adding and Subtracting Polynomials
- 8.2 Multiplying Polynomials
- 8.3 Special Products of Polynomials
- 8.4 Solving Polynomial Equations in Factored Form
- 8.5 Factor  $x^2 + bx + c$
- 8.6 Factor  $ax^2 + bx + c$
- 8.7 Factor Special Products
- 8.8 Factor using the Distributive Property

**Chapter 2: Proportional Reasoning and Variation****The students will be able to:**

- |   |        |
|---|--------|
| 2.1 Write ratios and proportions that express relationships in data<br>Solve problems using proportions | 4.1 B1 |
| 2.3 Find a conversion factor to change measurements from<br>centimeters to inches                       | 4.1B1  |
| Use dimensional analysis to do conversions involving several steps                                      | 4.1B1  |
| 2.7 Apply the order of operations to evaluate expressions   | 4.1B1  |
| 2.8 Build toward symbolic equation solving by working<br>backward and undoing operations                | 4.1B1  |

**Chapter 3: Linear Equations****The students will be able to:**

- |   |       |
|---|-------|
| 3.1 Graph scatter plots of recursive sequences<br>Find the missing values in recursive sequences<br>Write recursive routines that generate sequences  | 4.3C3 |
| 3.2 Use the graphing calculator to apply several recursive<br>routines at once<br>Graph values generated by recursive routines<br>See how the start value and rule of a recursive routine are<br>reflected in the graph | 4.3C3 |
| 3.4 Write a linear equation in intercept form given a recursion<br>routine, a graph or data<br>Determine the slope and y-intercept point  | 4.3C3 |
| 3.5 Interpret equations in intercept form using input and output values<br>Use the rate of change to write a linear equation for a situation  | 4.3C3 |
| 3.6 Learn the balancing method to solve equations by doing the<br>same thing to both sides<br>Solve linear equations  | 4.3C3 |
| 3.7 Find an equation that fits a set of real world data<br>Use mathematical model to make predictions   | 4.3C3 |

## Chapter 4: Fitting a Line to Data

### The students will be able to:

- |     |  |       |
|-----|--|-------|
| 4.1 | Calculate the slope of a line given two points on a line   | 4.3B2 |
| 4.2 | Find and draw a line that fits or models a set of points<br>Use a linear model to make predictions<br>Write an equation in slope-intercept form                            | 4.3C1 |
| 4.3 | Write an equation in point-slope form<br>Find the equation of a line given one point on the line and the slope<br>Find the equation of a line given two points on the line | 4.3C1 |
| 4.4 | Apply the distributive property<br>Determine whether equations are equivalent<br>Use mathematical properties to rewrite and solve equations                                | 4.3D2 |
| 4.5 | Write point-slope equations for data<br>Compare two methods for fitting line to data   | 4.3D2 |

## Chapter 5: Systems of Equations and Inequalities

### The students will be able to:

- |     |  |        |
|-----|--|--------|
| 5.1 | Represent situations with systems of equations<br>Use tables and graphs to solve systems of linear equations   | 4.3 D2 |
| 5.2 | Represent situations with systems of equations<br>Use the substitution method to solve systems of linear equations.  | 4.3 D2 |
| 5.3 | Use the elimination method to solve systems of linear equations  | 4.3 D2 |
| 1.8 | Use a matrix to represent a two variable data set<br>Set up a calculator matrix, enter data, and perform operations on matrices.<br>Multiply a matrix by a number<br>Add and Subtract matrices | 4.3D2  |
| 5.4 | Use matrices to solve systems of linear equations  | 4.3D2  |
| 5.5 | Write inequalities to represent situations<br>Solve a problem by writing and solving an inequality   | 4.3D2  |
| 5.6 | Graph linear inequalities in two variables   | 4.3D2  |
| 5.7 | Graph solutions of systems of inequalities   | 4.3D2  |

## Chapter 6 : Recursive Routines

### The students will be able to:

- 6.1 Explore patterns involving repeated multiplication 4.3C1  
Write recursive routines for situations involving repeated multiplication.  
Look at tables and graphs for situations involving repeated multiplication
- 6.2 Write exponential equations to represent situations involving a constant multiplier 4.3C1  
Use exponential equations to model exponential growth
- 6.3 Use the multiplication property of exponents to rewrite expressions 4.3C1  
Use the power properties of exponents to rewrite expressions
- 6.4 Write large numbers in scientific notation 4.3D1  
Convert between scientific notation and standard notation  
Use scientific notation to simplify calculations with large numbers
- 6.5 Use the division property of exponents to rewrite expressions 4.3D1
- 6.6 Rewrite expressions involving negative exponents 4.3D1  
Write very small numbers in scientific notation
- 6.7 Fit exponential models to data 4.3D1  
Use exponential models to make predications

## Chapter 7: Functions

### The students will be able to:

- 7.2 Represent relationships with tables, graphs and equations 4.3B1  
Use the vertical line test to determine whether a relationships is A function
- 7.3 Describe graphs using the words increasing, decreasing, linear and nonlinear.  
Match graphs with descriptions of real-world situations 4.3C1  
Identify continuous and discrete functions  
Use the terminology for independent and dependent variables  
Use intervals of the domain to help you describe a function's behavior
- 7.4 Use function notation 4.3B1  
Use a graph to evaluate a function for various input values  
Use and equation to evaluate a function for various input values
- 7.5 Evaluate numerical expression involving absolute value 4.3C1

## Chapter : Polynomials and Factoring

### The students will be able to:

- |   |       |
|---|-------|
| 1.1 Add and subtract polynomials.   | 4.3D1 |
| 1.2 Multiply two polynomials  | 4.3D1 |
| 1.3 Use special product patterns for the product of sum and a difference, and for the square of a binomial. | 4.3D1 |
| 1.4 Solve a polynomials equation in factored form.  | 4.3D2 |
| 1.5 Factor $x^2 + x + c$  | 4.3D2 |
| 1.6 Factor $ax^2 + x + c$   | 4.3D2 |
| 1.7 Factor special products   | 4.3D2 |
| 1.8 Factor using distributive property  | 4.3D2 |

## Chapter 8: Transformations

- |  |       |
|--|-------|
| 8.1 Graph polygons on the graphing calculator<br>Write list definitions to describe translations of points   | 4.3B3 |
| 8.2 Graph and recognize translations of the absolute value<br>Squaring function<br>Graph family of functions | 4.3B3 |

## **PROFICIENCY**

Satisfactory student achievement in each of the proficiencies listed in this curriculum shall be determined by student attainment of the 70% district passing-standard. Such proficiency shall be measured by a multiplicity of evaluation techniques and activities that include, but are not restricted to the following:

- 1 Teacher-made tests/quizzes
- 2 Class participation
- 3 Homework Assignments
- 4 Reports and Projects
- 5 Oral reports and presentations
- 6 Notebook/Journal
- 7 Cooperative group project/activities

## INSTRUCTIONAL RESOURCES

Murdock, Jerald, and Kamischke Ellen and Eric, **Discovering Algebra**,  
Key Curriculum Press, 2007

TI 83 Plus Graphing Calculator, Texas Instrument

## COLLEGE ALGEBRA I PACING CHART

A Pacing Chart is a Teaching Time Frame Guide

First Marking Period	Chapter 2 8 days	Chapter 3 17 days	Chapter 4 10 days	Chapter 5 10 days
Second Marking Period	Chapter 6 10 days	Chapter 7 8 days	Polynomials 20 days	Final Exam

Number of actual instructional days will vary due to school activities, school holidays, etc.