Curriculum Development
In the Fairfield Public Schools

FAIRFIELD PUBLIC SCHOOLS
FAIRFIELD, CONNECTICUT

INTEGRATED ALGEBRA/GEOMETRY 33

Board of Education Approved February 28, 2006

INTEGRATED ALGEBRA/GEOMETRY 33

Statement of Purpose

Integrated Algebra/ Geometry 33 is the third year of the sequential Integrated Algebra/Geometry Program. It is based on the premise that algebra and geometry are areas of mathematical study connected to each other and to the real world. It is designed to prepare students in the content areas contained in the National Council of Teachers of Mathematics (NCTM) Core Curriculum, Preliminary Scholastic Aptitude Test (PSAT), and Scholastic Aptitude Test (SAT).

Audience

This course is intended for students who have successfully completed Integrated Algebra/Geometry 23 A/B or the equivalent.

Prerequisites

The prerequisite for this course is successful completion of Integrated Algebra/Geometry 23A/B or the equivalent. In order to be successful, students should have successfully completed study in exploring geometric figures and their properties, data analysis and graphic representation, linear and quadratic functions, and applications of right triangle trigonometry.

Course Description

This is the third course of a sequence that integrates algebra, geometry, and right triangle trigonometry enhancing them with strands of data analysis and statistics, probability, and discrete mathematics. Student experiences in the third year focus on linear systems, matrices, quadratic functions and graphs, and coordinate geometry. Throughout the course, there will be an emphasis on problem solving, the use of technology, and real life application

Course Objectives

Students will be able to:

- apply algebra skills to solve and graph equations of lines and quadratics and make connections to the real world. (Technology will be incorporated where noted.)
- solve real life problems that use triangles, quadrilaterals and parallel lines. (Technology will be used to solve trigonometry problems.)
- use permutations and combinations to determine probability and odds of an event.

Skill Objectives

Students will:

- recognize parallel and perpendicular lines given the slopes.
- solve systems of linear equations by graphing using a graphing calculator.
- solve systems of linear equations by substitution.
- solve systems of linear equations by linear combinations.
- use matrices for organizing and storing information.
- determine sums and products of matrices with paper and pencil and a graphing utility.
- interpret sums and products of matrices in real life situations.
- solve matrices using a graphing calculator.
- given a quadratic function determine the direction it opens, its vertex, its line of symmetry, its y-intercept, and graph the function using pencil and paper.

- solve quadratic equations by graphing using pencil and paper and the graphing calculator.
- solve quadratic equations by factoring and using the quadratic equation.
- solve systems of equations (linear-quadratic and quadratic-quadratic equations) using a graphing utility and the substitution method.
- demonstrate an understanding of the concepts of functions, including real life models.
- review the general properties of exponents and extend these properties to negative exponents.
- explore the effects of transformations on a graph and equations of functions
- review systems of linear equations and introduce systems of linear-quadratic and quadratic-quadratic equations
- use matrices to represent data sets and perform matrix operations
- describe characteristics of quadrilaterals.
- classify quadrilaterals according to type.
- given a geometric figure, rotate, reflect and translate the figure.
- classify angles that are formed by two lines that are cut by a transversal.
- measure the angles formed by parallel lines cut by a transversal.
- determine if the lines are parallel given the measures of the angles formed by the transversal.
- find the measures of the angles in a triangle using the Triangle Sum Theorem and the Exterior Angle Theorem.
- determine if two triangles are similar.
- recognize the corresponding parts of similar triangles.
- find the lengths of sides of two similar triangles using ratios and proportions.
- determine if triangles are congruent
- recognize the correspondingly congruent parts of congruent triangles.
- find the lengths of sides of 45-45-90 and 30-60-60 triangles.
- find the measures of angles and the lengths of sides of right triangles using trigonometric ratio. (Technology)
- explore and organize properties of triangles and quadrilaterals
- investigate congruence and similarity of triangles
- investigate the relationships among angles that are formed by parallel lines and a transversal
- create a tree diagram to determine the probability of a given situation.
- discern whether a selection of ways is a permutation or a combination.
- find the probability of an event and of mutually exclusive events.
- state the likelihood of an event using odds.
- find the probability of a compound event, whether independent or dependent.
- recognize patterns using Pascal’s Triangle and relate the elements as combinations.
- calculate probability using geometrical figures.
- solve probability problems using the properties of mutually exclusive events and independent events that can be applied to theoretical and practical situations.
- model real life counting situations using combinations and permutations.

Math Standards

Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.

1.1 Students should understand and describe patterns and functional relationships.

Core

1.1a Students should describe relationships and make generalizations about patterns and functions.

Extended

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

1.2 Students should represent and analyze quantitative relationships in a variety of ways.

Core

1.2a Students should represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.

1.3 Students should use operations, properties, and algebraic symbols to determine equivalence and solve problems.

Core

1.3a Students should manipulate equations, inequalities, and functions to solve problems.

Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.

3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.

Core

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.

Core

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.

Core

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

Extended

3.3a Students should approximate measurements that can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

Working with Data: Probability and Statistics - Data can be analyzed to make informed decisions using a variety of strategies, tools and technology.

4.1 Students should collect, organize and display data using appropriate statistical and graphical methods.

Core
4.1a Students should create the appropriate visual or graphical representation of real data.
4.2 Students should analyze data sets to form hypotheses and make predictions.
Core
4.2a Students should analyze real world problems using statistical techniques.
4.3 Students should understand and apply basic concepts of probability.
Core
4.3a Students should understand and apply the principles of probability in a variety of situations.

Information and Technology Standards (to be added)

Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How do geometric relationships and measurements help us to solve problems and make sense of our world?
- How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

Focus Questions

- What are the connections between algebra and geometry?
- How can algebra and geometry be used to understand patterns that permeate the world around us?
- How can graphing calculators be used to learn algebra and geometry?
- How can important concepts in mathematics be applied to solve a wide variety of problems in daily life and in careers?
- How are the base ten number system and fractions, decimals, percents and ratios related?
- How can students apply algebra skills to solve and graph equations of lines and quadratics as they make connections to life problems?
- How can the study of triangles, quadrilaterals, and parallel lines be used to solve real life problems?
- How can technology help to solve problems using trigonometry?
- How can permutations and combinations be used to solve real life problems?

UNITS OF STUDY

1. Algebra

Math Standards

Algebraic Reasoning: Patterns and Functions - Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools, and technology.

1.1 Students should understand and describe patterns and functional relationships.

Core

1.1a Students should describe relationships and make generalizations about patterns and functions.

Extended

1.1a Students should model real world situations and make generalizations about mathematical relationships using a variety of patterns and functions.

1.2 Students should represent and analyze quantitative relationships in a variety of ways.

Core

1.2a Students should represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.

1.3 Students should use operations, properties, and algebraic symbols to determine equivalence and solve problems.

Core

1.3a Students should manipulate equations, inequalities, and functions to solve problems.

Essential Question

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?

Focus Questions

- What are the connections between algebra and geometry?
- How can algebra and geometry be used to understand patterns that permeate the world around us?
- How can graphing calculators be used to learn algebra and geometry?
- How can important concepts in mathematics be applied to solve a wide variety of problems in daily life and in careers?
- How can students apply algebra skills to solve and graph equations of lines and quadratics as they make connections to life problems?

Core Topics

- Slope and graphing
- Systems of equations
- Matrices
- Quadratic equations and their graphs

Unit Objective

Students will be able to:

- apply algebra skills to solve and graph equations of lines and quadratics and make connections to the real world. (Technology will be incorporated where noted.)

Skill Objectives

Students will:

- recognize parallel and perpendicular lines given the slopes.
- solve systems of linear equations by graphing using a graphing calculator. (Technology)
- solve systems of linear equations by substitution.
- solve systems of linear equations by linear combinations.
- use matrices for organizing and storing information.
- determine sums and products of matrices with paper and pencil and a graphing utility.
- interpret sums and products of matrices in real life situations.
- solve matrices using a graphing calculator. (Technology)
- given a quadratic function determine the direction it opens, its vertex, its line of symmetry, its y-intercept, and graph the function using pencil and paper.
- solve quadratic equations by graphing using pencil and paper and the graphing calculator. (Technology)
- solve quadratic equations by factoring and using the quadratic equation.
- solve systems of equations (linear-quadratic and quadratic-quadratic equations) using a graphing utility and the substitution method. (Technology)
- demonstrate an understanding of the concepts of functions, including real life models.
- review the general properties of exponents and extend these properties to negative exponents.
- explore the effects of transformations on a graph and equations of functions
- review systems of linear equations and introduce systems of linear-quadratic and quadratic-quadratic equations
- use matrices to represent data sets and perform matrix operations

Sample Assessments

Two sales jobs with commission or Phone cards

Pacing

18 weeks

2. Geometry

Math Standards

Geometry and Measurement - Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools, and technology.

3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.

Core

3.1a Students should investigate relationships among plane and solid geometric figures using geometric models, constructions and tools.

3.2 Students should use spatial reasoning, location and geometric relationships to solve problems.

Core

3.2a Students should verify geometric relationships using algebra, coordinate geometry, and transformations.

3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure.

Core

3.3a Students should solve a variety of problems involving one- two- and three-dimensional measurements using geometric relationships and trigonometric ratios.

Extended

3.3a Students should approximate measurements that can not be directly determined with some degree of precision using appropriate tools, techniques and strategies.

Essential Question

- How do geometric relationships and measurements help us to solve problems and make sense of our world?

Focus Questions

- What are the connections between algebra and geometry?
- How can algebra and geometry be used to understand patterns that permeate the world around us?
- How can graphing calculators be used to learn algebra and geometry?
- How can important concepts in mathematics be applied to solve a wide variety of problems in daily life and in careers?
- How can the study of triangles, quadrilaterals, and parallel lines be used to solve real life problems?
- How can technology help to solve problems using trigonometry?

Core Topics

- Quadrilaterals
- Parallel lines and their angles
- Transformations
- Triangles and their exterior angles
- Similarity
- Trigonometry

Unit Objectives
Students will be able to:

- solve real life problems that use triangles, quadrilaterals and parallel lines. (Technology will be used to solve trigonometry problems.)

Skill Objectives
Students will:

- describe characteristics of quadrilaterals.
- classify quadrilaterals according to type.
- given a geometric figure, rotate, reflect and translate the figure.
- classify angles that are formed by two lines that are cut by a transversal.
- measure the angles formed by parallel lines cut by a transversal.
- determine if the lines are parallel given the measures of the angles formed by the transversal.
- find the measures of the angles in a triangle using the Triangle Sum Theorem and the Exterior Angle Theorem.
- determine if two triangles are similar.
- recognize the corresponding parts of similar triangles.
- find the lengths of sides of two similar triangles using ratios and proportions.
- determine if triangles are congruent
- recognize the correspondingly congruent parts of congruent triangles.
- find the lengths of sides of 45-45-90 and 30-60-60 triangles.
- find the measures of angles and the lengths of sides of right triangles using trigonometric ratio. (Technology)
- explore and organize properties of triangles and quadrilaterals
- investigate congruence and similarity of triangles
- investigate the relationships among angles that are formed by parallel lines and a transversal

Sample Assessments
Discount store problem or Soda cups at the movies

Pacing
15 weeks

3. Combinatorics and Probability

Math Standards

Working with Data: Probability and Statistics - Data can be analyzed to make informed decisions using a variety of strategies, tools and technology.

4.1 Students should collect, organize and display data using appropriate statistical and graphical methods.

Core

4.1a Students should create the appropriate visual or graphical representation of real data.

4.2 Students should analyze data sets to form hypotheses and make predictions.

Core

4.2a Students should analyze real world problems using statistical techniques.

4.3 Students should understand and apply basic concepts of probability.

Core

4.3a Students should understand and apply the principles of probability in a variety of situations.

Essential Question

- How can collecting, organizing and displaying data help us analyze information and make reasonable predictions and informed decisions?

Focus Questions

- How can important concepts in mathematics be applied to solve a wide variety of problems in daily life and in careers?
- How can permutations and combinations be used to solve real life problems?

Core Topics

- Probability and combinatorics
- Combinations and Pascal's Triangle

Unit Objective

Students will be able to:

- use permutations and combinations to determine probability and odds of an event.

Skill Objectives

Students will:

- create a tree diagram to determine the probability of a given situation.
- discern whether a selection of ways is a permutation or a combination.
- find the probability of an event and of mutually exclusive events.
- state the likelihood of an event using odds.
- find the probability of a compound event, whether independent or dependent.
- recognize patterns using Pascal's Triangle and relate the elements as combinations.
- calculate probability using geometrical figures.
- solve probability problems using the properties of mutually exclusive events and independent events that can be applied to theoretical and practical situations.
- model real life counting situations using combinations and permutations.

Sample Assessment

Carnival games

Pacing
2 weeks