Curriculum Development
In the Fairfield Public Schools

FAIRFIELD PUBLIC SCHOOLS
FAIRFIELD, CONNECTICUT

INTEGRATED ALGEBRA/GEOMETRY 23

Board of Education Approved February 28, 2006

INTEGRATED ALGEBRA/GEOMETRY 23

Statement of Purpose

Integrated Algebra/Geometry is the second year of a three or four year sequence based on the premise that algebra and geometry are areas of mathematics study that are connected to each other and to the real world. It has been designed so that over three high schools years the students in this program will experience the content areas contained in the NCTM Core Curriculum, the CAPT, and the SAT.

Audience

This course is primarily intended for sophomores who have successfully completed Integrated Algebra/Geometry 13.

Prerequisites

A prerequisite for this course is successful completion of Algebra/Geometry 13 or its equivalent. In order to be successful in this course students should have studied geometric figures and their properties, data exploration, graphical analysis, operations with algebraic expression, and the solutions and graphs of linear equations.

Course Description

This course is the second course of a three year sequence which integrates algebra and functions, geometry, and right triangle trigonometry enhancing them with strands of data analysis and statistics, probability, and discrete mathematics. Students experiences in the second year focus on basic trigonometry, graphing linear equations, measurement in geometry, quadratic equations, and statistics. Throughout the course, there will be an emphasis on problem solving, the use of technology, and real life applications.

Course Objectives

Students will be able to:

- verify geometric relationships using algebra, coordinate geometry, and transformations.
- solve a variety of problems involving one-two-and three-dimensional measurements using geometric relationships and trigonometric ratios.
- analyze real world problems using statistical techniques.
- apply the principle of probability in a variety of situations.
- recognize and use elementary statistical concepts and methods.
- represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.
- describe relationships and make generalizations about patterns and functions.

Skill Objectives

Students will:

- represent and solve problems using geometric and trigonometric models.
- interpret descriptions and draw 2-and 3-dimensional objects.
- understand and use the concepts of rotation, reflection, and translation to demonstrate geometric figures.
- estimate solutions and check for reasonableness of answers.

- select and use appropriate units and tools to measure, including conversion between units within measurement systems.
- determine the perimeter, area, and volume of a figure, given a formula.
- use formulas to determine circumference and area of a circle.
- use trigonometric formulas to solve right triangle problems.
- solve right triangle problems using the Pythagorean theorem.
- solve a variety of geometry problems including applications of circumference, area, volume, and right triangle trigonometry.
- determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.
- systematically collect, organize and describe data.
- construct, read, and interpret tables, charts and graphs of data from real-world situations.
- draw and defend inferences from charts, tables and data.
- understand sampling and recognize its role in statistical claim.
- understand and use basic probability to make predictions and to evaluate the likelihood of events.
- use lengths and areas to determine geometric probabilities.
- understand and use the concepts of a variable, expression and equation.
- represent and analyze situations involving variable quantities with tables, graphs, verbal rules and equations; understand the interrelationship among these representations.
- describe, analyze, extend and create a wide variety of patterns.
- understand and use direct and inverse variation.
- use tables and graphs to solve problems.
- create and use equations including formulas to model situations and solve problems.
- analyze and use functional relationships to explain how a change in one quantity results in a change in another.
- understand and use direct and inverse variation.
- operate with functions represented in a variety of ways: graphical, numerical, and verbal and understand the connections among these representations.
- communicate mathematics both orally and in well-written sentences and should be able to explain solutions to problems.
- model a written description of a physical situation with a function.
- use technology to help solve problems, experiment, interpret results, and verify conclusions.
- explain the meaning of direct variation and construct and solve mathematical models using direct variation.
- construct and solve linear and quadratic mathematical model.

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.

Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.
2.1 Students should understand that a variety of numerical representations can be used to describe quantitative relationships.
Core
2.1a Students should extend the understanding of number to include integers, rational numbers, and real numbers.
2.1b Students should interpret and represent large sets of numbers with the aid of technology.
2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.
Core
2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.
2.2b Students should solve proportional reasoning 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.
3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.
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 are quantitative relationships represented by numbers?
- 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

- How can real world situations be modeled and solved using algebra and geometry?
- How can learning be used to construct mathematical models?
- What procedures are used to determine area, lengths, volumes, and their ratios?
- How can technology be used as a tool for problem solving?
- How are the base ten number system and fractions, decimals, percents and ratios related?
- How are statistics and probability used to interpret data?
- How do you determine the areas of geometric figures?
- How do you determine measurements of length in geometric figures?
- How do you determine the volume of geometric figures?
- How can data be collected, organized, and displayed?
- How can data be used to make reasonable predictions?
- How can geometric probability be determined?
- How do you construct linear and quadratic functions from given data?
- How do you use linear functions to make predictions?

- How do you graph linear and quadratic functions?
- How do you perform algebraic operations with algebraic expressions?

UNITS OF STUDY

1. Geometry, Measurement, and Shape

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.

3.1b Students should develop and evaluate mathematical arguments using reasoning and proof.

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

- How can real world situations be modeled and solved using algebra and geometry?
- How can learning be used to construct mathematical models?
- What procedures are used to determine area, lengths, volumes, and their ratios?
- How can technology be used as a tool for problem solving?
- How are the base ten number system and fractions, decimals, percents and ratios related?
- How do you determine the areas of geometric figures?
- How do you determine measurements of length in geometric figures?
- How do you determine the volume of geometric figures?

Core Topics

- Pythagorean Theorem
- Area, circumference, and perimeter of geometric figures
- Surface area and volume of geometric figures

- Geometric probability
- Right triangle trigonometry

Unit Objectives
Students will be able to:
- verify geometric relationships using algebra, coordinate geometry, and transformations.
- solve a variety of problems involving one-two-and three-dimensional measurements using geometric relationships and trigonometric ratios.

Skill Objectives
Students will:
- represent and solve problems using geometric and trigonometric models.
- interpret descriptions and draw 2-and 3-dimensional objects.
- understand and use the concepts of rotation, reflection, and translation to demonstrate geometric figures.
- estimate solutions and check for reasonableness of answers.
- select and use appropriate units and tools to measure, including conversion between units within measurement systems.
- determine the perimeter, area, and volume of a figure, given a formula.
- use formulas to determine circumference and area of a circle.
- use trigonometric formulas to solve right triangle problems.
- solve right triangle problems using the Pythagorean theorem.
- solve a variety of geometry problems including applications of circumference, area, volume, and right triangle trigonometry.
- determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.

Sample Assessment
Feeding off of the Profits of Feeders

Pacing
15 weeks

2. Statistics, Probability, and Data

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.

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 Questions

- 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

- How can real world situations be modeled and solved using algebra and geometry?
- How can learning be used to construct mathematical models?
- What procedures are used to determine area, lengths, volumes, and their ratios?
- How can technology be used as a tool for problem solving?
- How are the base ten number system and fractions, decimals, percents and ratios related?
- How are statistics and probability used to interpret data?
- How can data be collected, organized, and displayed?
- How can data be used to make reasonable predictions?
- How can geometric probability be determined?

Core Topics

- Geometric Probability
- Surveys and samples
- Simulation

Unit Objectives

Students will be able to:

- analyze real world problems using statistical techniques.
- apply the principle of probability in a variety of situations.
- recognize and use elementary statistical concepts and methods.

Skill Objectives

Students will:

- systematically collect, organize and describe data.
- construct, read, and interpret tables, charts and graphs of data from real-world situations.
- draw and defend inferences from charts, tables and data.
- understand sampling and recognize its role in statistical claims.
- understand and use basic probability to make predictions and to evaluate the likelihood of events.
- use lengths and areas to determine geometric probabilities.

Sample Assessment

Color Samples

Pacing

2 weeks

3. Relations, Functions, and 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.

Numerical and Proportional Reasoning - Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technology.

2.1 Students should understand that a variety of numerical representations can be used to describe quantitative relationships.

Core

2.1a Students should extend the understanding of number to include integers, rational numbers, and real numbers.

2.1b Students should interpret and represent large sets of numbers with the aid of technology.

2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.

Core

2.2a Students should develop strategies for computation and estimation using properties of number systems to solve problems.

2.2b Students should solve proportional reasoning problems.

Essential Questions

- How do patterns and functions help us describe data and physical phenomena and solve a variety of problems?
- How are quantitative relationships represented by numbers?

Focus Questions

- How can real world situations be modeled and solved using algebra and geometry?
- How can learning be used to construct mathematical models?
- How can technology be used as a tool for problem solving?
- How are the base ten number system and fractions, decimals, percents and ratios related?

- How do you construct linear and quadratic functions from given data?
- How do you use linear functions to make predictions?
- How do you graph linear and quadratic functions?
- How do you perform algebraic operations with algebraic expressions?

Core Topics
- Linear functions
- Quadratic functions
- Algebraic operations

Unit Objectives
Students will be able to:
- represent and analyze linear and non-linear functions and relations symbolically and with tables and graphs.
- describe relationships and make generalizations about patterns and functions.

Skill Objectives
Students will:
- understand and use the concepts of a variable, expression and equation.
- represent and analyze situations involving variable quantities with tables, graphs, verbal rules and equations; understand the interrelationship among these representations.
- describe, analyze, extend and create a wide variety of patterns.
- understand and use direct and inverse variation.
- use tables and graphs to solve problems.
- create and use equations including formulas to model situations and solve problems.
- analyze and use functional relationships to explain how a change in one quantity results in a change in another.
- understand and use direct and inverse variation.
- operate with functions represented in a variety of ways: graphical, numerical, and verbal and understand the connections among these representations.
- communicate mathematics both orally and in well-written sentences and should be able to explain solutions to problems.
- model a written description of a physical situation with a function.
- use technology to help solve problems, experiment, interpret results, and verify conclusions.
- explain the meaning of direct variation and construct and solve mathematical models using direct variation.
- construct and solve linear and quadratic mathematical model.
- determine the reasonableness of solutions, including sign, size, relative accuracy, and units of measurement.

Sample Assessment
Fame and Fortune

Pacing
18 weeks