Curriculum Development
In the Fairfield Public Schools

FAIRFIELD PUBLIC SCHOOLS
FAIRFIELD, CONNECTICUT

INTEGRATED ALGEBRA/GEOMETRY 13

Board of Education Approved February 28, 2006

INTEGRATED ALGEBRA/GEOMETRY 13

Statement of Purpose

This course serves as an introduction to the fundamental concepts of algebra and geometry for the college prep program. It provides the foundation for 4 years of math, where students write, solve and use equations, solve problems, and use technology to represent data and make predictions.

Audience

This course is for freshmen in the college prep program who require a pace that allows more time for reflection, practice, direction, guidance, and support. This student needs both auditory and visual learning strategies.

Prerequisites

The prerequisites are the completion of eighth grade and a teacher recommendation. Students should have had experience with computation and applications of real numbers (integers, fractions, decimals, and percents), estimation, and measurement. They should be familiar with concepts in geometry, statistics, probability, patterns, and working with unknowns.

Course Description

This is the first course of a three- or four-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. Student experiences in the first year focus on geometric figures and their properties, data explorations, graphical analysis, operations with algebraic expressions, and solving and graphing linear equations. 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:

- use the base ten number system, fractions, decimals, percents, and ratios.
- use patterns and functions to describe data and physical phenomena and solve a variety of problems.
- represent and analyze situations involving variable quantities with tables, graphs, verbal rules and equations; understand the interrelationship among these representations.
- analyze and use functional relationships to explain how a change in one quantity results in a change in another.
- use geometric relationships and measurements to solve problems and make sense of our world.
- collect, organize, and display data to analyze information and make reasonable predictions and informed decisions.

Skill Objectives

Students will:

- understand, represent and use numbers in a variety of forms (integer, fraction, decimal, percent, exponential, scientific notation) in real-world and mathematical problem situations.
- demonstrate an understanding of order and magnitude of numbers.
- recognize and utilize the relationships among whole numbers, fractions, decimals, percents, and integers.
- use arithmetic operations and understand how the operations are related to one another.
- understand and apply ratios and proportions.
- compute accurately and make estimates with whole numbers, fractions, decimals, percents, and integers.
- select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil or calculator.
- use estimation to assess the reasonableness of results.
- model situations using written, concrete, pictorial, graphical and algebraic representations.
- express mathematical ideas and arguments with clarity and coherence.
- use mathematical language and notation to represent ideas, describe relationships and model situations.
- formulate problems from situations and given data.
- develop and apply a variety of strategies to solve problems-particularly multi-step and non-routine problems.
- verify, validate and interpret results and claims and generalize solutions.
- understand and use the concepts of a variable, expression and equation.
- create and use equations and inequalities, including formulas, to model situations and solve problems.
- make and evaluate conjectures and arguments.
- represent and solve problems using geometric models.
- identify and draw 2-and 3-dimensional objects.
- understand and use the concepts of rotations, reflection and translation to demonstrate geometric figures and apply relationships of congruence and similarity.
- describe and use properties of, and relationships between, triangles and quadrilaterals.
- use coordinate representations of geometric figures.)
- estimate, make, and use measurements to describe and compare phenomena.
- between units within measurement systems.
- use the concepts of perimeter, area, volume, angle measure, capacity, weight and mass.
- explain and use the concept of rate of change.
- systematically collect, organize and describe data.
- use technology to draw a scatter plot and interpret correlation.
- differentiate continuous or discrete quantities.

- construct, read and interpret tables, charts and graphs; such as histograms, bar graphs, line graphs, pie graphs, stem-and leaf, box-and-whisker plots, and frequency distributions of data from real-world situations.
- draw and defend inferences from charts, tables and data.
- explain sampling and recognize its role in statistical claims.
- understand and use basic probability to make predictions and to evaluate the likelihood of events.

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.

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.

3.2 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.

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 are the base ten number system and fractions, decimals, percents and ratios related?

- What is algebra and what role does it play in the world of mathematics (its importance as a foundation and tool in higher mathematics and the real world)?
- How can the language of geometry be used to communicate mathematical ideas coherently and precisely?
- How can a variety of appropriate strategies be applied in solving problems?
- Given a real-world situation or set of data how can an algebraic model be created and applied?
- How can we employ technology to create and interpret models and enhance student learning?
- How do mathematical ideas interconnect?
- How do students use information and technology to express and communicate ideas?
- What type of technological tools will students use?
- How can variable and numerical expressions be evaluated using order of operations?
- How can values be estimated?
- How can percents be expressed in terms of ratios and proportions?
- How can a linear equation be solved?
- How can functions and relations be graphed in the coordinate plane?
- How can patterns and graphs be described as algebraic equations?
- How are perimeter and area calculated?
- How are proportions in similar figures used to solve measurement problems?
- How can plane figures be transformed?
- How can it be determined whether two plane figures are congruent?
- How can data be used to create tables, charts, graphs, and maps?
- How can mean, median, and mode be determined?
- How can a stem-and-leaf plot be constructed from a histogram or frequency table?
- How is a box-and-whisker plot constructed?
- How is a scatterplot constructed?

UNITS OF STUDY

1. Numerical and Proportional Reasoning

Math Standards

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 Question

- How are quantitative relationships represented by numbers?

Focus Questions

- How are the base ten number system and fractions, decimals, percents, and ratios related?
- How can a variety of appropriate strategies be applied in solving problems?
- How can we employ technology to create and interpret models and enhance student learning?
- How do mathematical ideas interconnect?
- How can variable and numerical expressions be evaluated using order of operations?
- How can values be estimated?
- How can percents be expressed in terms of ratios and proportions?

Core Topics

- Integers, rational numbers, and real numbers
- Properties of number systems
- Computations and estimation
- Proportions, ratios, and percents

Unit Objective

Students will be able to:

- use the base ten number system, fractions, decimals, percents, and ratios.

Skill Objectives

Students will:

- understand, represent and use numbers in a variety of forms (integer, fraction, decimal, percent, exponential, scientific notation) in real-world and mathematical problem situations.
- demonstrate an understanding of order and magnitude of numbers.
- recognize and utilize the relationships among whole numbers, fractions, decimals, percents, and integers.
- use arithmetic operations and understand how the operations are related to one another.
- understand and apply ratios and proportions.
- compute accurately and make estimates with whole numbers, fractions, decimals, percents, and integers.
- select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil or calculator.
- use estimation to assess the reasonableness of results.

Sample Assessment

"Hit and Run"

Pacing

9 weeks

2. Algebraic Reasoning: Patterns and Functions

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.

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 is algebra and what role does it play in the world of mathematics (its importance as a foundation and tool in higher mathematics and the real world)?
- Given a real world situation or set of data how can an algebraic model be created and applied?
- How can we employ technology to create and interpret models and enhance student learning?
- How do mathematical ideas interconnect?
- How can a linear equation be solved?
- How can functions and relations be graphed in the coordinate plane?
- How can patterns and graphs be described as algebraic equations?

Core Topics

- Patterns with tables, graphs, words, and symbolic rules
- Predictions based on patterns.
- Symbolic representations functions and relations
- Linear equations

Unit Objectives

Students will be able to:

- use patterns and functions to describe data and physical phenomena and solve a variety of problems.

- represent and analyze situations involving variable quantities with tables, graphs, verbal rules and equations; understand the interrelationship among these representations.
- analyze and use functional relationships to explain how a change in one quantity results in a change in another.

Skill Objectives

Students will:

- model situations using written, concrete, pictorial, graphical and algebraic representations.
- express mathematical ideas and arguments with clarity and coherence.
- use mathematical language and notation to represent ideas, describe relationships and model situations.
- formulate problems from situations and given data.
- develop and apply a variety of strategies to solve problems-particularly multi-step and non-routine problems.
- verify, validate and interpret results and claims and generalize solutions.
- understand and use the concepts of a variable, expression and equation.
- create and use equations and inequalities, including formulas, to model situations and solve problems.

Sample Assessment

"Distance Formula: Tortoise and the Hare"

Pacing

12 week

3. Geometry and Measurement

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.

Essential Question

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

Focus Questions

- How can the language of geometry be used to communicate mathematical ideas coherently and precisely?
- How can a variety of appropriate strategies be applied in solving problems?
- How can we employ technology to create and interpret models and enhance student learning?
- How do mathematical ideas interconnect?
- How are perimeter and area calculated?
- How are proportions in similar figures used to solve measurement problems?
- How can plane figures be transformed?
- How can it be determined whether two plane figures are congruent?

Core Topics

- Properties and classes of polygons
- Congruence, similarity, and transformations of plane figures
- Units of measurement
- Proportions and similar figues
- Volume
- Perimeter, area, and angle measure

Unit Objective

Students will be able to:

- use geometric relationships and measurements to solve problems and make sense of our world.

Skill Objectives

Students will:

- make and evaluate conjectures and arguments.
- represent and solve problems using geometric models.
- identify and draw 2-and 3-dimensional objects.
- understand and use the concepts of rotations, reflection and translation to demonstrate geometric figures and apply relationships of congruence and similarity.
- describe and use properties of, and relationships between, triangles and quadrilaterals.
- use coordinate representations of geometric figures.)
- estimate, make, and use measurements to describe and compare phenomena.
- select and use appropriate units and tools to measure, including conversions between units within measurement systems.
- use the concepts of perimeter, area, volume, angle measure, capacity, weight and mass.
- explain and use the concept of rate of change.

Sample Assessments

Graph Paper Area Worksheet

Pacing

9 weeks

4. Working with Data

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 a variety of appropriate strategies be applied in solving problems?
- How can we employ technology to create and interpret models and enhance student learning?
- How do mathematical ideas interconnect?
- How can data be used to create tables, charts, graphs, and maps?
- How can mean, median, and mode be determined?
- How can a stem-and-leaf plot be constructed from a histogram or frequency table?
- How is a box-and-whisker plot constructed?
- How is a scatterplot constructed?

Core Topics

- Tables, charts, graphs, and maps
- Probability and statistics
- Mean, median, mode
- Histograms, frequency tables, and stem-and-leaf plots
- Box-and-whisker plots
- Scatterplots

Unit Objective

Students will be able to:

- collect, organize, and display data to analyze information and make reasonable predictions and informed decisions.

Skill Objectives

Students will:

- systematically collect, organize and describe data.
- use technology to draw a scatter plot and interpret correlation.
- differentiate continuous or discrete quantities.
- construct, read and interpret tables, charts and graphs; such as histograms, bar graphs, line graphs, pie graphs, stem-and leaf, box-and-whisker plots, and frequency distributions of data from real-world situations.
- draw and defend inferences from charts, tables and data.
- explain sampling and recognize its role in statistical claims.
- understand and use basic probability to make predictions and to evaluate the likelihood of events.

Sample Assessment

"Mars" Project

"Where Have All the Farmers Gone?"

Pacing

5 weeks