

Curriculum Development  
In the Fairfield Public Schools

**FAIRFIELD PUBLIC SCHOOLS**  
FAIRFIELD, CONNECTICUT

**GRADE 7 MATH**

Board of Education Approved February 28, 2006

### **Statement of Purpose**

The Grade 7 Math course will firmly establish the foundation for Pre-Algebra in grade 8. This course will build on the skills and knowledge from grade 6. Students will be introduced to the language and concepts that align with the NCTM and Connecticut State Standards for 7<sup>th</sup> grade. Emphasis will be placed on the following four strands: data analysis/probability, number sense, geometry and algebraic concepts.

Manipulatives and models will be used to the understanding of math topics. This course will be supplemented with technology as a tool to enhance the concepts when appropriate and available. In addition, writing and basic skills will be integrated throughout the four strands. Mathematics will be used with other disciplines for real life applications.

### **Audience**

The course is intended for 7<sup>th</sup> grade students. It is expected that student's taking this course will go on to study pre-Algebra in 8<sup>th</sup> grade.

### **Prerequisite**

Completion of 6<sup>th</sup> grade math program.

### **Course Description**

7<sup>th</sup> grade math offers a study of the four areas of mathematics. These include an emphasis on number systems, their numerical relationships, and fluent computations of the operations. Students will work with data analysis and probability. Students will investigate spatial relationships, which include geometry and measurement. Algebra concepts include representing and analyzing mathematical situations and structure using algebraic symbols with an introduction to slope as a rate of change.

### **Course Objectives**

Students will be able to:

- compute and solve real life problems with rational numbers.
- graph on a number line and on a coordinate plane
- write and solve simple equations
- determine the slope of a line and recognize that it is rate of change
- solve geometric and measurement problems
- determine symmetry and use transformations
- represent three-dimensional objects in two-dimensional diagrams
- use appropriate tools, techniques and strategies to solve problems involving measurement
- create visual representations of data
- analyze data and make predictions
- determine outcomes based on theoretical and experimental probability
- model and describe patterns and functional relationships
- model and analyze quantitative data
- use algebraic symbols to represent and interpret data and physical phenomenon

- use a variety of numerical representations in the base ten system to describe quantitative relationships
- use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities
- develop and apply units, systems, formulas and appropriate tools to estimate and measure
- use spatial reasoning, location and geometric relationships to solve problems
- use attributes of two- and three- dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems
- collect, organize and display data using appropriate statistical and graphical methods
- understand and apply basic concepts of probability
- analyze data sets to form hypotheses and make predictions

### **Skill Objectives**

Students will:

- use number theory concepts (primes, factors, multiples, divisibility) to estimate and solve problems.
- use models and number lines to solve problems that involve integers, powers and roots.
- use the order of operations to compute and solve a variety of multi-step problems, including those with parentheses and exponents.
- solve problems involving absolute value.
- create word problems, write number sentences and matching equations and explain and solve a variety of multi-step word problems.
- use powers of ten and negative exponents to write decimal fractions.
- use powers of ten and positive and negative exponents to express and compare magnitude of very large and very small numbers and connect to scientific notation.
- use the rules for exponents to find the result of multiplication and division with powers of ten.
- use and explain estimation strategies that involve powers of ten and scientific notation.
- develop, describe and use a variety of methods to estimate and calculate with very large numbers.
- identify equivalent division problems with models, pictures and in written fraction and decimal forms and use that information to estimate reasonable answers.
- use number patterns and the distributive property to estimate and find percents, including percents greater than 100%.
- choose and use a variety of linear, area, and ratio models and diagrams to estimate, round, locate, order, compare and identify equivalent forms of fractions, decimals, mixed numbers, improper fractions, ratios and percents.
- use models, diagrams, number patterns and common factors to rewrite a rational number in its equivalent fraction, decimal, ratio and percent forms, as powers of ten and in scientific notation.

- explore, identify and classify fractions as terminating or repeating decimals.
- use equivalent forms and proportions to find what percent one amount is of another amount.
- estimate and use the calculator to do computations involving fractions, decimals, mixed numbers, improper fractions, ratios, proportions and percents.
- use the distributive property to estimate, multiply and divide mixed numbers and decimals.
- use the associative, commutative, distributive properties, identities and inverses to simplify computations with fractions and decimals and to write and solve multi-step problems.
- select and describe strategies for estimating reasonable answers to computations with fractions, mixed numbers, decimals, and percents.
- determine when a situation involving fractions, decimals and percents requires an exact answer, or when an estimate is sufficient.
- use proportions to identify equivalent ratios and solve practical problems involving rates, scale factors, mixtures and percents.
- use estimation to predict outcomes and determine reasonableness of results, and describe situations where it is important to recognize whether the estimate is an over-or underestimate.
- explore alternative ways to express decimal fractions in expanded form.
- solve problems involving simple linear equations using concrete, verbal, graphical and tabular representations.
- recognize and generate equivalent forms for simple algebraic expressions and equations.
- use graphs, tables and equations to represent and analyze changes in linear and nonlinear relationships.
- identify the independent and dependent variables in a given situation.
- recognize that the constant rate of change of a function is the slope.
- identify how change in the values of data patterns in tables affects changes in the corresponding equations and graphs of linear functions.
- identify points on the graph where the x or y values are equal to zero as representing the x- or y-intercepts, respectively.
- estimate and develop formulas to find the surface area and volume of prisms and cylinders.
- develop and use estimation and measurement strategies to solve problems involving the areas of irregular polygons and volumes of irregular solids.
- explore the relationships among angles, sides, perimeters and areas of congruent and similar polygons using models and diagrams on the rectangular coordinate plane.
- understand the relationship of a cubic centimeter and a milliliter. Explore ways to determine the volume of irregular solids using the relationship.
- explore constructing various angles and polygons using either technology or a compass and straightedge.
- examine and describe the effect of transformations on polygons with line and/or rotational symmetry.

- draw and interpret nets, cross-sections and front, side, top views of various solids.
- choose appropriate units and use standard and nonstandard referents as benchmarks when estimating length, area, volume, weight, mass, time, temperature and angle.
- make conjectures, design surveys and samplings. Select appropriate representations for the data, including histograms and scatter plots. Organize and analyze the data and defend the analysis.
- find, use and interpret measures of central tendency and spread including mode, median, mean, range and outliers. Decide which measure(s) may be most appropriate for a given situation.
- compare two sets of data based on their distributions and measures of central tendency.
- distinguish between combinations and permutations as ways to predict possible outcomes.
- identify the two ways of obtaining probabilities-by gathering data from experiments (experimental probability) and by analyzing the possible and likely outcomes (theoretical probability).
- conduct experiments and compare experimental to theoretical probabilities.

### **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.**

1.1a Students should analyze physical phenomena and patterns to identify relationships and make generalizations.

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

1.2a Students should describe the affects of characteristics of mathematical relationships and the way the relationship is represented.

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

1.3a Students should solve problems using a variety of algebraic methods.

1.3b Students should maintain equivalence in equations to determine solutions.

***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.**

2.1a Students should represent real world situations and solutions to problems using the appropriate symbolic form (fractions, decimals or percents).

2.1b Students should understand the use of scientific notation as related to powers of ten as an efficient method for writing and comparing very large numbers.

2.1c Students should use percents to make comparisons between groups of unequal size.

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

2.2a Students should extend the operations of addition, subtraction, multiplication and division to negative numbers.

*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.**

3.1a Students should describe and classify polygons according to their transformational properties.

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

3.2a Students should understand how three-dimensional objects can be represented in two-dimensions using base plans (footprints), orthogonal views, nets, and isometric drawings.

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

3.3a Students should solve geometric and measurement problems through the use of a variety of 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.**

4.1a Students should select the appropriate visual representation of data based on the kind of data collected and the purpose for its use.

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

4.2a Students should understand that measures of central tendency and spread can be used to describe data sets and justify conclusions.

**4.3 Students should understand and apply basic concepts of probability.**

4.3a Students should compare and determine experimental and theoretical probabilities.

### **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?

- How can computation with positive and negative numbers be modeled in the real world?
- How is scientific notation applied in the field of science?
- How are the equivalency of fractions, percents and decimals used to describe relationships and solve problems?
- How can you model the operations of fractions?
- How can algebraic equations be used as problem solving tools?
- How can rate of change between two unknowns be used to yield linear or nonlinear graphs?
- What is the difference between continuous and non-continuous graphs?
- How can the concepts of slope and intercepts be used to write equations and graph lines?
- How can you solve geometric and measurement problems by subdividing polygons and solids into simpler shapes and prisms?
- How do the properties of polygons influence transformations?
- How can three-dimensional objects be represented in two-dimensional diagrams?
- How do you select the appropriate tools, techniques and strategies to solve problems involving measurement?
- How do you determine the appropriate visual representation of data based on the data collected?
- How do you decide whether order matters when determining possible outcomes?
- What is the difference between experimental probability and theoretical probability?

# UNITS OF STUDY

## 1. Numerical & 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.**

2.1a Students should represent real world situations and solutions to problems using the appropriate symbolic form (fractions, decimals or percents).

2.1b Students should understand the use of scientific notation as related to powers of ten as an efficient method for writing and comparing very large numbers.

2.1c Students should use percents to make comparisons between groups of unequal size.

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

2.2a Students should extend the operations of addition, subtraction, multiplication and division to negative numbers.

### 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 computation with positive and negative numbers be modeled in the real world?
- How is scientific notation applied in the field of science?
- How are the equivalency of fractions, percents and decimals used to describe relationships and solve problems?
- How can you model the operations of fractions?

### Core Topics

- Operations with positive and negative numbers
- Graphing rational numbers on a number line
- Scientific notation
- Division with fractions
- Percents as ratios
- Using equivalent fractions, decimals, and percents

### Unit Objectives

Students will be able to:

- compute and solve real life problems with rational numbers.



## **Skill Objectives**

Students will:

- use number theory concepts (primes, factors, multiples, divisibility) to estimate and solve problems.
- use models and number lines to solve problems that involve integers, powers and roots.
- use the order of operations to compute and solve a variety of multi-step problems, including those with parentheses and exponents.
- solve problems involving absolute value.
- create word problems, write number sentences and matching equations and explain and solve a variety of multi-step word problems.
- use powers of ten and negative exponents to write decimal fractions.
- use powers of ten and positive and negative exponents to express and compare magnitude of very large and very small numbers and connect to scientific notation.
- use the rules for exponents to find the result of multiplication and division with powers of ten.
- use and explain estimation strategies that involve powers of ten and scientific notation.
- develop, describe and use a variety of methods to estimate and calculate with very large numbers.
- identify equivalent division problems with models, pictures and in written fraction and decimal forms and use that information to estimate reasonable answers.
- use number patterns and the distributive property to estimate and find percents, including percents greater than 100%.
- choose and use a variety of linear, area, and ratio models and diagrams to estimate, round, locate, order, compare and identify equivalent forms of fractions, decimals, mixed numbers, improper fractions, ratios and percents.
- use models, diagrams, number patterns and common factors to rewrite a rational number in its equivalent fraction, decimal, ratio and percent forms, as powers of ten and in scientific notation.
- explore, identify and classify fractions as terminating or repeating decimals.
- use equivalent forms and proportions to find what percent one amount is of another amount.
- estimate and use the calculator to do computations involving fractions, decimals, mixed numbers, improper fractions, ratios, proportions and percents.
- use the distributive property to estimate, multiply and divide mixed numbers and decimals.
- use the associative, commutative, distributive properties, identities and inverses to simplify computations with fractions and decimals and to write and solve multi-step problems.
- select and describe strategies for estimating reasonable answers to computations with fractions, mixed numbers, decimals, and percents.
- determine when a situation involving fractions, decimals and percents requires an exact answer, or when an estimate is sufficient.

- use proportions to identify equivalent ratios and solve practical problems involving rates, scale factors, mixtures and percents.
- use estimation to predict outcomes and determine reasonableness of results, and describe situations where it is important to recognize whether the estimate is an over-or underestimate.
- explore alternative ways to express decimal fractions in expanded form.

**Sample Assessment**

Daily Math Homework

**Pacing**

14 weeks

## **2. Algebraic Reasoning: Patterns & 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.**

1.1a Students should analyze physical phenomena and patterns to identify relationships and make generalizations.

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

1.2a Students should describe the affects of characteristics of mathematical relationships and the way the relationship is represented.

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

1.3a Students should solve problems using a variety of algebraic methods.

1.3b Students should maintain equivalence in equations to determine solutions.

### **Essential Question**

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

### **Focus Questions**

- How can algebraic equations be used as problem solving tools?
- How can rate of change between two unknowns be used to yield linear or nonlinear graphs?
- What is the difference between continuous and non-continuous graphs?
- How can the concepts of slope and intercepts be used to write equations and graph lines?

### **Core Topics**

- Simple algebraic expressions and equations
- Rate of change
- Graphing data points
- Writing and graphing linear equations using slope and intercept

### **Unit Objectives**

Students will be able to:

- graph on a number line and on a coordinate plane
- write and solve simple equations
- determine the slope of a line and recognize that it is rate of change

### **Skill Objectives**

Students will:

- solve problems involving simple linear equations using concrete, verbal, graphical and tabular representations.
- recognize and generate equivalent forms for simple algebraic expressions and equations.

- use graphs, tables and equations to represent and analyze changes in linear and nonlinear relationships.
- identify the independent and dependent variables in a given situation.
- recognize that the constant rate of change of a function is the slope.
- identify how change in the values of data patterns in tables affects changes in the corresponding equations and graphs of linear functions.
- identify points on the graph where the x or y values are equal to zero as representing the x- or y-intercepts, respectively.

### **Sample Assessment**

We All Have Baggage (Airline Ticket Agent)

### **Pacing**

7 weeks

### **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.**

3.1a Students should describe and classify polygons according to their transformational properties.

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

3.2a Students should understand how three-dimensional objects can be represented in two-dimensions using base plans (footprints), orthogonal views, nets, and isometric drawings.

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

3.3a Students should solve geometric and measurement problems through the use of a variety of 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 you solve geometric and measurement problems by subdividing polygons and solids into simpler shapes and prisms?
- How do the properties of polygons influence transformations?
- How can three-dimensional objects be represented in two-dimensional diagrams?
- How do you select the appropriate tools, techniques and strategies to solve problems involving measurement?

#### **Core Topics**

- Surface area and volume of prisms and cylinders
- Area of irregular polygons
- Volume of irregular solids
- Line and rotational symmetry, and transformations
- Use base plans, orthogonal views, and isometric drawings

#### **Unit Objectives**

Students will be able to:

- solve geometric and measurement problems
- determine symmetry and use transformations
- represent three-dimensional objects in two-dimensional diagrams
- use appropriate tools, techniques and strategies to solve problems involving measurement

## **Skill Objectives**

Students will:

- estimate and develop formulas to find the surface area and volume of prisms and cylinders.
- develop and use estimation and measurement strategies to solve problems involving the areas of irregular polygons and volumes of irregular solids.
- explore the relationships among angles, sides, perimeters and areas of congruent and similar polygons using models and diagrams on the rectangular coordinate plane.
- understand the relationship of a cubic centimeter and a milliliter. Explore ways to determine the volume of irregular solids using the relationship.
- explore constructing various angles and polygons using either technology or a compass and straightedge.
- examine and describe the effect of transformations on polygons with line and/or rotational symmetry.
- draw and interpret nets, cross-sections and front, side, top views of various solids.
- choose appropriate units and use standard and nonstandard referents as benchmarks when estimating length, area, volume, weight, mass, time, temperature and angle.

## **Sample Assessment**

Oreo, The Dog On A Run

## **Pacing**

8 weeks

#### **4. Working with Data: Probability & Statistics**

##### **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.**

4.1a Students should select the appropriate visual representation of data based on the kind of data collected and the purpose for its use.

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

4.2a Students should understand that measures of central tendency and spread can be used to describe data sets and justify conclusions.

**4.3 Students should understand and apply basic concepts of probability.**

4.3a Students should compare and determine experimental and theoretical probabilities.

##### **Essential Question**

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

##### **Focus Questions**

- How do you determine the appropriate visual representation of data based on the data collected?
- How do you decide whether order matters when determining possible outcomes?
- What is the difference between experimental probability and theoretical probability?

##### **Core Topics**

- Visual representations of data including histograms, scatterplots, and measures of central tendency
- Combinations and permutations
- Experimental and theoretical probability

##### **Unit Objectives**

Students will be able to:

- create visual representations of data
- analyze data and make predictions
- determine outcomes based on theoretical and experimental probability

##### **Skill Objectives**

Students will:

- make conjectures, design surveys and samplings. Select appropriate representations for the data, including histograms and scatter plots. Organize and analyze the data and defend the analysis.
- find, use and interpret measures of central tendency and spread including mode, median, mean, range and outliers. Decide which measure(s) may be most appropriate for a given situation.

6/30/2010

Draft

- compare two sets of data based on their distributions and measures of central tendency.
- distinguish between combinations and permutations as ways to predict possible outcomes.
- identify the two ways of obtaining probabilities-by gathering data from experiments (experimental probability) and by analyzing the possible and likely outcomes (theoretical probability).
- conduct experiments and compare experimental to theoretical probabilities.

**Sample Assessment**

Antonio's Pizza Restaurant

**Pacing**

5.5 weeks