

Greensburg Community School Corporation  
Eighth Grade Math Curriculum

Eighth Grade Math

Prepared by  
Carol Boing and Charles Hoffman

May 31, 2006

Greensburg Community schools  
Eighth Grade Math

Mission Statement

The mission of the Greensburg Community School Corporation is to provide and promote lifelong learning through its commitment to quality educational programs that prepare the students to be effective, successful, and responsible citizens. This is to be accomplished in a financially prudent manner.

**Greensburg Community Schools**  
**Eighth Grade Math**

**Narrative Description**

The state of Indiana has established the following mathematics standards to make clear to teachers, students, and parents what knowledge, understanding, and skills students should acquire in Grade 8:

**Number Sense**

Understanding the number system is the basis of mathematics. Students extend their understanding of irrational numbers, such as pi and the square root of 2, learning the relationship between the nature of the decimal of a number and whether it is rational or irrational. They use negative exponents to write decimals in scientific notation, and they use the inverse relationship between squaring and finding a square root to calculate approximate square roots.

**Computation**

Fluency in computation is essential. Students add, subtract, multiply, and divide rational numbers. They use percentages to calculate simple and compound interest. They also use mental arithmetic to compute with fractions, decimals, powers, and percentages.

**Algebra and Functions**

Algebra is a language of patterns, rules, and symbols. Students at this level write and solve linear equations and inequalities, including solving pairs of linear equations by the substitution method. They use properties of the rational numbers to evaluate and simplify algebraic expressions. They further extend their understanding of the relationship between equations and graphs by connecting slopes to rates of change and by drawing graphs of quadratic functions and simple cubic functions.

**Geometry**

Students learn about geometric shapes and develop a sense of space. They learn new concepts relating to shapes, such as altitudes, bisectors, and chords and perform constructions connected with them. They further develop their sense of three-dimensional space by investigating how objects intersect in space. They draw a wide range of transformations of shapes, and they apply the Pythagorean theorem and its converse to problems in two- and three-dimensions.

**Measurements**

The study of measurement is essential because of its uses in many aspects of everyday life. Students convert common measurements for lengths, areas, volumes, weights, capacities, and times. They develop and use the concept of rate and derived measures – e.g., velocity and density. They apply the concept of similarity, ratio, and proportion to problems involving scale factors, areas and volumes. They find areas, perimeters, volumes, and surface areas, including those of irregular shapes made up of more basic shapes.

**Statistics, Data Analysis, and Probability**

Statistics are all around us – in newspapers and magazines, in television news and commercials, in quality control for manufacturing – and students need to learn how to understand these presentations. At this level, they evaluate whether claims based on data are reasonable and employ various sampling methods, analyzing their strengths and weaknesses. They understand the concepts of the median and quartiles and use these measures to draw and analyze box-and-whisker plots. They represent and analyze two-variable data using scatter plots. They understand the concept of equally likely events and use it to find probabilities. They also find the number of arrangements of objects using the Basic Counting Principle.

**Problem Solving**

In a general sense, mathematics is problem solving. In all mathematics, students use problem-solving skills: they choose how to approach a problem, they explain their reasoning, and they check their results. As they develop their skills with irrational numbers, analyzing graphs, or finding surface areas, for example, students move from simple ideas to more complex ones by taking logical steps that build a better understanding of mathematics.

## Course Concepts and Generalizations

1. Number Theory
2. Computation with fractions, decimals, and integers
3. Measurement
4. Algebra
5. Data Analysis
6. Probability and Statistics
7. Ratio, Proportion, Percent
8. Problem Solving
9. Number Sense
10. Geometry
11. Graphing

### Greensburg Community Schools Eighth Grade Math

#### Units of Study

UNITS/AREA OF STUDY	LENGTH OF TIME	
1. Decimals	5 Weeks and ongoing	
2. Fractions	5 Weeks and ongoing	
3. Algebra	5 Weeks and ongoing	
4. Ratio, Proportion, Percent	6 Weeks and ongoing	_____
5. Problem Solving	4 Weeks and ongoing	
6. Geometry	6 Weeks and ongoing	
7. Data Analysis	5 Weeks and ongoing	

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**Unit 1 Plan**

**Decimals (Unit 1)**

Individual Learner Objectives

The eighth grade math student will be able to do the following.

1. Do decimal computation (exact and estimation).
2. Write numbers in scientific notation and in standard form.
3. Use and convert units within the metric system.
4. Compare decimals.
5. Use and compute with exponents.

Unit 1 Outline

I. Place Value

- A. Reading, writing, spelling
- B. Rounding
- C. Comparing
- D. Different number bases

II. Computation

- A. Add, subtract, multiply, divide decimals
- B. Estimating answers
- C. Mental computation

III. Exponents

- A. Bases, powers, exponents ( positive and negative )
- B. Multiply/ divide by powers of ten
- C. Scientific notation ( both positive and negative exponents )
- D. Laws of exponents with same base

IV. Metric system

- A. Meter, liter, gram
- B. Prefixes
- C. Comparing
- D. Converting within the metric system
- E. Measuring within the metric system

## Unit 2 Plan

### Fractions (Unit 2)

#### Individual Learner Objectives

The eighth grade math student will be able to do the following:

1. Compute and estimate addition, subtraction, multiplication, and division problems involving fractions.
2. Find the prime factorization of a number.
3. Find the GCF and LCM of two or three given numbers.
4. Identify rational and irrational numbers.
5. Compare fractions.
6. Convert between fractions and decimals.
7. Measure and convert within customary units.

### Unit 2 Outline

#### I. Rational Numbers

- A. Define and identify rational and irrational numbers
- B. Compute with rational and irrational numbers

#### II. Number Theory

- A. Divisibility rules for 2,3,4,5,6,9,10
- B. Define and identify prime and composite numbers
- C. Prime factorization
- D. GCF
- E. LCM

#### III. Fractions/Mixed Numbers

- A. Convert fractions  $\leftrightarrow$  mixed numbers
- B. Convert decimals to fractions
- C. Define terminating and repeating decimals
- D. Convert fractions to decimals
- E. Compare fractions and decimals

#### IV. Computation of fractions / Mixed numbers

- A. Estimate add, subtract, multiply, divide
- B. Compute add, subtract, multiply, divide

- C. Compute mentally
- V. Measurement – Customary units
  - A. Measuring length, volume, weight
  - B. Comparing units
  - C. Converting within the system
  - D. Memorizing important measurement facts

### **Unit 3 Plan**

#### **Algebra (Unit 3)**

##### Individual Learner Objectives

The eighth grade math student will be able to do the following.

1. Simplify numerical and algebraic expressions using order of operations.
2. Solve one and two step equations.
3. Solve word problems by using an algebra equation.
4. Calculate slope and graph a linear function.
5. Do computation with integers.

### **Unit 3 Outline**

#### I. Expressions

- A. Terminology (variable, coefficient, equation, expression, constant, etc.)
- B. Order of operations
- C. Properties (commutative, associative, identity, zero, one, distributive)
- D. Simplify numerical expressions
- E. Simplify algebraic expressions
- F. Translating words into algebraic expressions

#### II. Solving equations

- A. Solve one step equations and inequalities by using inverse operations
- B. Solve two step equations and inequalities by using inverse operations
- C. Use algebra equations to solve word problems
- D. Use formulas
- E. Solve formula for one variable in terms of the other variables
- F. Solve systems of two equations by using substitution or graphing

#### III. Integers

- A. Definition / number line

- B. Opposites
- C. Absolute value
- D. Computation (add, subtract, multiply, divide with rules)

#### IV. Functions / Graphing

- A. Identify functions (linear or nonlinear)
- B. Graph points given the ordered pair on a rectangular coordinate system
- C. Given a point on the graph, find its ordered pair
- D. Define slope
- E. Given the equation, name the slope, y-intercept, and graph the line
- F. Given the slope and 1 point, graph the line and write its equation
- G. Given the graph of a line, find the slope
- H. Determine if a given point satisfies the equation of a line
- I. Identify and describe situations with constant or varying rates of change (know that constant rate of change describes a linear function)
- J. Graph 2 lines on the same graph to find the solution that satisfies both
- K. Represent simple linear and quadratic functions using verbal descriptions, tables, graphs, and formulas, and translate among these representations
- L. Graph quadratic and cubic functions with no linear or constant terms

### **Unit 4 Plan**

#### **Ratio, Proportion, Percent (Unit 4)**

##### Individual Learner Objectives

The eighth grade math student will be able to do the following.

1. Solve proportions.
2. Use ratios and proportions to solve word problems.
3. Use proportions or equations to solve percent problems involving discount, sales tax, interest, percent increase, etc.
4. Convert and compare fractions, decimals, and percents.

### **Unit 4 Outline**

#### I. Ratio

- A. Definition
- B. Comparing
- C. Unit rate / speed
- D. Derived measures (velocity, density)

## II. Proportion

- A. Definition
- B. Solving a proportion
- C. Similar figures
- D. Scale drawing

## III. Percents

- A. Convert fractions  $\leftrightarrow$  decimals  $\leftrightarrow$  percents
- B. Comparing fractions, decimals, and percents

## IV. Applications with percents

- A. Solving percent problems with proportions
- B. Discount
- C. Interest – simple and compound
- D. Sales tax
- E. Percent increase or decrease
- F. Equations to solve percent problems

### **Unit 5 Plan**

#### **Problem Solving (Unit 5)**

##### Individual Learner Objectives

The eighth grade math student will be able to do the following.

1. Solve word problems involving fractions, decimals, percents, and proportions using a variety of methods.
2. Use estimation to determine if an answer is reasonable.

### **Unit 5 Outline**

#### I. Word problems involving fractions, decimals, percents, proportions

#### II. Methods

- A. Analyze information / determine relevant information from irrelevant information
- B. Estimating answer
- C. Work backwards

- D. Use diagrams, charts, pictures
- E. Break problem into simpler parts
- F. Apply method of solving a simpler problem to a more complex one
- G. Make and justify a conjecture based on a general description of a problem
- H. Solve similar problem using concept of solving already tested
- I. Make and test conjectures by inductive and deductive reasoning
- J. Use graphing to estimate solutions and check the estimates with analytic approaches

### III. Solutions

- A. Estimate to see if answer is reasonable
- B. Make sure the exact answer is valid in the problem
- C. Express solution clearly and logically by using mathematical symbols
- D. Determine the advantage and appropriateness of either an exact or approximate answer
- E. Make and test conjectures by inductive and deductive reasoning

## Unit 6 Plan

### Geometry (Unit 6)

#### INDIVIDUAL LEARNER OBJECTIVES

The eighth grade math student will be able to do the following.

1. Identify and use common geometric terms.
2. Measure and classify angles.
3. Calculate perimeter and area of common polygons using formulas.
4. Calculate surface area and volume of 3-dimensional figures using formulas and models.
5. Classify polygons according to sides and angles.
6. Calculate and estimate square root.
7. Use the Pythagorean Theorem.
8. Define and use transformations of geometric figures.

## Unit 6 Outline

### I. Definitions

- A. Angle, line, ray, acute, parallel, perpendicular, etc.

### II. Polygons

- A. Polygons – classify by number of sides

- B. Quadrilaterals – classify by parallel sides/ congruent sides and angles
- C. Triangles – classify by sides or angles
- D. Circles – radius, diameter, circumference, chord, central angle, inscribed angle
- E. Congruent angles / sides / figures
- F. Similar polygons / corresponding angles and sides
- G. Diagonals
- H. Sum of interior angles

### III. Angles

- A. Measuring
- B. Classifying (right, obtuse, straight, acute )
- C. Constructing / Bisecting
- D. Constructing a perpendicular bisector

### IV. Lines

- A. Transversals
- B. Intersecting lines

### V. Perimeter

- A. Perimeter of polygons
- B. Circumference of circles

### VI. Area

- A. Areas of rectangles, parallelograms, triangles, trapezoids using formulas
- B. Circles
- C. Complex figures – by breaking down into simpler polygons

### VII. Three-dimensional objects

- A. Identify parts of geometric objects (diagonals, etc.)
- B. Describe how two or more figures intersect in a plane

### VIII. Surface area

- A. Rectangular / triangular prisms
- B. Cylinders
- C. Pyramids
- D. Build 3-dimensional objects with blocks to help compute surface area
- E. Construct 2-dimensional patterns for 3-dimensional objects

### IX. Volume

- A. Rectangular / triangular prisms
- B. Cylinders
- C. Estimate and compute volumes of irregular shapes by breaking into simpler shapes

### X. Square Roots

- A. Square roots – perfect squares, using tables, using calculators
- B. Pythagorean Theorem

### XI. Transformations

- A. Translations (slides)
- B. Reflections ( flips )
- C. Rotations ( turns )

- D. Dilations
- E. Figures stay congruent through translations, reflections, and rotations

### **Unit 7 Plan**

### **Data Analysis ( Unit 7 )**

#### INDIVIDUAL LEARNER OBJECTIVES

The eighth grade math student will be able to do the following.

1. Calculate mean, median, mode, and range for a set of data.
2. Interpret data, make predictions, and identify misleading information from a variety of types of graphs and statistics.
3. Construct bar, line, circle, stem and leaf, and box and whisker graphs.
4. Calculate the probability of a simple event.

### **Unit 7 Outline**

#### I. Graphs (Box-and-whisker, bar, line, circle, stem-and-leaf, scatter plot)

- A. Interpret data
- B. Make predictions
- C. Recognize misleading data
- D. Constructing graphs listed above
- E. Collecting, organizing, and presenting data
- F. Scatter plot – draw trend line
- G. Methods of selecting samples ( biased vs. unbiased )

#### II. Statistics

- A. Mean
- B. Median
- C. Mode
- D. Range
- E. Effect of an outlier on the above statistics
- F. Quartiles
- G. Extremes (maximum / minimum)

#### III. Combinations

- A. Tree diagrams
- B. Making lists
- C. Counting Principle

#### IV. Venn diagrams

- A. Union

- B. Intersection
- C. Null set
- D. Universe
- E. Disjoint events

V. Probability

- A. Random selection
- B. Probability of one event occurring  $P(A)$
- C.  $P(\text{not } A) = 1 - P(A)$
- D.  $P(A \cup B) = P(A) + P(B)$  if  $P(A \cap B) = 0$

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**Modifications**

Modifications of instructional content in this course may include, but are not limited to, the following:

- Modified pace
- Modified homework assignments
- Modified tests ( as to length or type of problems)
- Adaptive equipment
- Use of a calculator
- Use of Resource Staff
- Addition of more challenging material (for gifted / interested students)
- Other modifications as specified in a student's IEP