

Title of Course: Middle School Pre-Algebra Topics
Duration: Full year

Course Description: This course is designed for students who are preparing to take Algebra I.

State Content Standards:

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS

- 1.1 Understand and describe patterns and functional relationships.
- 1.2 Represent and analyze quantitative relationships in a variety of ways.
- 1.3 Use operations, properties, and algebraic symbols to determine equivalence and solve problems.

NUMERICAL AND PROPORTIONAL REASONING

- 2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.
- 2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.

GEOMETRY AND MEASUREMENT

- 3.1 Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.
- 3.2 Use spatial reasoning, location and geometric relationships to solve problems.
- 3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measure.

WORKING WITH DATA: PROBABILITY AND STATISTICS

- 4.1 Collect, organize and display data using appropriate statistical and graphical methods.
- 4.2 Analyze data sets to form hypotheses and make predictions.
- 4.3 Understand and apply basic concepts of probability.

Essential Questions

How do you interpret and use the language of algebra to model real world situations and solve problems?

How do addition and subtraction relate when using positive and negative integers?

How and when do you use scientific notation in real world application?

Why would you convert between fractions, decimals and percents when solving real world problems?

How do you compute using rational numbers?

How do you decide which graph to use to display your data?

How can you determine whether a survey or graph contains bias?

How can you use proportions to show relationships between models and/or similar figures?

How and when do you use percents in consumer applications?

How are the characteristics of 2-dimensional and 3-dimensional shapes alike and different?

How can formulas be helpful when finding area, perimeter, volume and surface area?

How can the Pythagorean Theorem be modeled?
How can you use probability to make predictions?
How does solving a one-step equation relate to solving a multi-step equation?
How do you graph a line using a table of values?
How would you determine a rule for the n^{th} term in a pattern?

Student Learning Outcomes:

The student will be able to:

- identify alternative forms of expressing numbers using scientific notation
- determine a reasonable estimate and describe the strategy used to arrive at the estimate
- solve problems involving proportions in context
- find percents of whole numbers or the percent a given number is of another number
- measure and determine perimeters, areas and volumes.
- create and use tables to interpret and display data using various forms of graphing.
- draw, classify, describe and/or explain why figures are similar.
- solve problems involving expected outcomes or predictions and justify solutions
- represent situations with algebraic expressions or equations.
- evaluate expressions or solve equations and use formulas
- solve extended numerical statistical and spatial problems.

Course Outline/Syllabus

I. Algebra Toolbox

1. Evaluating Algebraic Expressions
2. Writing and Solving One-Step Equations and Inequalities
3. Combining Like Terms
4. Order of Operations *
5. Properties *
6. Ordered Pairs
7. Graphing in the coordinate plane

II. Integers and Exponents

1. Rules for Combining Integers for the Four Operations
2. Simplifying algebraic equations with integers
3. Absolute Value *
4. Exponents
5. Properties of Exponents
6. Scientific Notation

III. Rational and Real numbers

1. Pictorial Representation of Fractions, Decimals and Percents
2. Comparing and Ordering Rational Numbers
3. Identifying and Finding equivalent rational numbers
4. Basic Operations with decimals, fractions and mixed numbers
5. Application of skills to real-world problems

IV. Collecting, Displaying and Analyzing Data

1. Measure of Central Tendency
2. Stem and Leaf Plots
3. Line Graphs
4. Bar Graphs
5. Histograms
6. Circle Graphs
7. Scatter Plots
8. Venn Diagrams
9. Application of skills to real-world problems

V. Ratio and Similarity

1. Ratios and Proportions
2. Ratios, Rates and Unit Rates
3. Similar Figures
4. Scale Models
5. Application of skills to real-world problems

VI. Percents

1. Fractions to Decimals and Decimals to Fractions
2. Percents to Decimals
3. Percents to Fractions
4. Percents of whole numbers
5. Percent a given number is of another number
6. Percent of Increase and Decrease
7. Application of skills to real-world problems

VII. Plane Geometry

1. Points, Lines, Planes and Angles
2. Parallel and Perpendicular Lines
3. Triangles
4. Polygons
5. Coordinate Geometry
6. Congruence
7. Transformations
8. Symmetry

VIII. Perimeter, Area and Volume

1. The Metric System *
2. Customary and Metric Conversion *
3. Perimeter and Area of Rectangles and Parallelograms
4. Perimeter and Area of Triangles and Trapezoids
5. Pythagorean Theorem
6. Circles
7. Volume of Prisms and Cylinders

IX. Probability

1. Certain Probability
2. Impossible Probability
3. Experimental Probability
4. Theoretical Probability
5. Tree Diagrams and the Fundamental Counting Principle
6. Permutations and Combinations
7. Independent and Dependent Events

X. Equations

1. Multi-step problems using algebraic concepts
2. Variables on Both Sides
3. Solve for an indicated variable

XI. Graphing Lines

1. Identify and graph linear equations
2. Introduction to slope
3. Direct Variation

XII. Sequences and Functions

1. Functions
2. Arithmetic Sequences
3. Geometric Sequences

* See **Textbooks**, Supplemental Materials

District Writing Expectation

1 writing process paper per marking period.

Example:

You are the treasurer of your club. Your club has decided to have a fund raising program to sell goods using The Loewser Company. The Company allows you to keep 25% of the total cost of all items sold. In order to participate, your club must pay \$120 to the Company.

Your club needs \$1075 for a New York City trip, \$250 for a St. Patrick's Day Dance and \$150 for academic prizes. Show all mathematical computations.

- a. How much money do you need to raise in order to fund all of the costs for your club?
- b. Including you, there are ten club members. Write a report to your club members explaining whether this will be a practical fund raiser.

Students will have a minimum of 2 written assignments per semester.

**Milford Schools Writing Standard, 1998.

Integration of Technology: Holt Pre-Algebra Internet Resources @ <http://www.go.hrw.com> may be used for whole class, small group, or individual instruction. Students with internet access may utilize this resource at home.

- Chapter Openers
- Homework Help – an excellent guided and independent practice resource for each lesson in the Holt textbook
- CNN activities – real-world problem solving applications for each chapter of the Holt textbook
- Multilingual Glossary
- Calculator Keystroke Guide

Evaluation:

- Homework
- Class work – individual and small groups
- Quizzes
- Tests
- CMT Vocabulary sheet from Fourth Generation Handbook used to design assessments
- CMT prototype questions, 2nd half of grade 8 CAPT prototype questions

Textbooks/books:

Pre-Algebra, Holt, Rinehart, Winston, 2004

- Supplemental materials for Chapter 1: Properties, Review Skills Bank, page 769
- Supplemental materials for Chapter 1: Order of Operations: Holt Course 2, Section 2-3; Pre-Algebra Review Skills Bank, page 768
- Supplemental materials for Chapter 2: Absolute Value and Opposites, Review Skills Bank, page 771
- Supplemental materials for Metric System: Holt Course 2 Section 8.1; Pre-Algebra Review Skills Bank, page 782
- Supplemental materials for Pictorial Representation: Fourth Generation CMT Handbook
- Supplemental materials for Comparing and Ordering Rational Numbers: Course 2, Section 3-10; Pre-Algebra Review Skills Bank, page 770

Fourth Generation CMT Mathematics Handbook

Other Key Materials:

- Pre-Algebra Lesson Presentations on CD-Rom
- Pre-Algebra Dynamic Test Generator
- Integrated Learning Systems program (ILS)

Essential Questions	Content	Assessment	Skills	CMT Course Alignment
Chapter 1 How do you interpret and use the language of algebra to model real-world situations and solve problems?	Represent and analyze mathematical situations and structures using algebraic symbols	Homework Class work Oral Review Quizzes Tests	a. Write and evaluate algebraic expressions. b. Combine like terms. c. Solve one-step equations d. Solve and graph solutions of one –step inequalities e. Make and interpret graphs and tables. f. Make connections between linear functions or two-variable equations and graphs.	a. CMT 7 & 8 c. CMT 7 & 8 d. Grade 8 e. CMT 7 & 8

Prior knowledge	Course 2 Resource	Pre-Algebra Resource
Order of Operations	Section 2-3	Review Skills Bank, page 768
Properties		Review Skills Bank, page 769

Essential Questions	Content	Assessment	Skills	CMT Course Alignment
<p>Chapter 2 How do addition and subtraction relate when using positive and negative integers? How and when do you use scientific notation in real world application?</p>	<p>Compute fluently and make reasonable estimates.</p> <p>Understand meanings of operations and how they relate to one another</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Add, subtract, multiply and divide integers.</p> <p>b. Solve one-step equations and inequalities with integers.</p> <p>c. Apply properties of exponents</p> <p>d. Evaluate expressions with zero and negative exponents.</p> <p>e. Express large and small numbers in scientific notation.</p>	<p>a. CMT 8 (addition and multiplication only) CMT 7 (addition of integers from -20 to 20)</p> <p>b. CMT 7 & 8 (no inequalities)</p> <p>e. CMT 7 & 8 (include negative exponents in Grade 8)</p>

Prior knowledge	Course 2 Resource	Pre-Algebra Resource
Absolute Value and Opposites	Section 3-1	Review Skills Bank, page 771

Essential Questions	Content	Assessment	Skills	CMT Course Alignment
<p>Chapter 3 Why would you convert between fractions, decimals and percents when solving real world problems?</p> <p>How do you compute using rational numbers?</p>		<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Write equivalent rational numbers.</p> <p>b. Add, subtract, multiply and divide decimals and rational numbers.</p> <p>c. Solve equations and inequalities containing rational numbers</p> <p>d. Estimate and find square roots and solve problems involving square roots.</p> <p>e. Determine whether a number is rational or irrational.</p>	<p>a. CMT 7 & 8</p> <p>b. CMT 7 & 8</p> <p>c. CMT 7 & 8 (no inequalities)</p>

Prior knowledge	Course 2 Resource	Pre-Algebra Resource
Customary and Metric Measurements	Course 2 Section 8.1	Review Skills Bank, pages 780 and 782

Pictorial Representation of Fractions, Decimals and Percents	N/A (See CMT Handbook)	N/A (See CMT Handbook)
Comparing and Ordering Rational Numbers	Course 2, Section 3 -10	Review Skills Bank, page 770

Essential Questions	Content	Assessment	Skills	CMT Course Alignment
<p>Chapter 4 How do you decide which graph to use to display your data? How can you determine whether a survey or graph contains bias?</p>	<p>Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.</p> <p>Select and use appropriate statistical methods to analyze data</p> <p>Develop and evaluate inferences and predictions that are based on data</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Recognize biased samples and identify sampling methods.</p> <p>b. Organize data in tables, stem-and –leaf plots, bar graphs, histograms, box and whisker plots and line graphs.</p> <p>c. Find appropriate measures of central tendency and variability</p>	<p>a. CMT 7 & 8</p> <p>b. CMT 7 & 8</p> <p>c. CMT 7 & 8</p> <p>d. CMT 7 & 8</p>
<p>Chapter 14</p>	<p>Crease and use representations to organize, record and communicate mathematical ideas.</p>		<p>d. Recognize misleading graphs and statistics.</p> <p>e. Create and interpret scatter plots.</p> <p>14a. Make and use Venn Diagrams.</p>	<p>e. CMT 7 & 8</p> <p>14a. CMT 7 & 8</p>

<p>Chapter 7 How can you use proportions to show relationships between models and/or similar figures?</p>	<p>Analyze change in various contexts</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Find equivalent rates and ratios, and write and solve proportions.</p> <p>b. Identify similar figures and create dilations of plane figures.</p> <p>c. Compare and use scale drawings and scale factors and make scale models.</p> <p>d. Use dimensional analysis to solve problems.</p>	<p>a. CMT 7 & 8</p> <p>b. CMT 7 & 8</p> <p>c. CMT 7 & 8</p> <p>d. CMT 7 & 8</p>
<p>Chapter 8 How and when do you use percents in consumer applications?</p>	<p>Compute fluently and make reasonable estimates</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Write equivalent percents, decimals and fractions.</p> <p>b. Estimate percents, and find the missing value in a percent problem.</p> <p>c. Find the percent of increase or decrease and solve percent problems involving commission or taxes.</p>	<p>a. CMT 7 & 8</p> <p>b. CMT 7 & 8</p> <p>c. CMT 7 & 8 (application may differ)</p> <p>d. CMT 7 & 8 (application of formulas)</p>

			d. Find the amount of simple or compound interest.	
<p>Chapter 5 How are the characteristics of 2-dimensional and 3-dimensional shapes alike and different?</p>	<p>Analyze characteristics and properties of two and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.</p> <p>Apply transformations and use symmetry to analyze mathematical situations</p> <p>Use visualization, spatial reasoning, and geometric modeling to solve problems.</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Classify and construct plane figures</p> <p>b. Classify and find unknown angle measures in polygons</p> <p>c. Identify polygons in a coordinate plane</p> <p>d. Use properties of congruent figures to solve problems.</p> <p>e. Describe and show geometric transformations, symmetry, and tessellations.</p>	<p>a. CMT 7 & 8</p> <p>c. CMT 7 & 8</p> <p>e. CMT 7 & 8</p>
<p>Chapter 6 How can formulas be helpful when finding area, perimeter, volume and surface area?</p> <p>How can the Pythagorean theorem be modeled?</p>	<p>Apply appropriate techniques, tools, and formulas to determine measurements</p> <p>Use visualization, spatial reasoning, and geometric</p>	<p>Homework Class work Oral Review Quizzes Tests</p>	<p>a. Find perimeter or circumference and area of rectangles, parallelograms, triangles, trapezoids and circles.</p> <p>b. Use the Pythagorean Theorem and its</p>	<p>a. CMT 7 & 8</p> <p>b. CMT 8</p>

	modeling to solve problems.		converse to solve problems. c. Draw and identify parts of three-dimensional figures. d. Find the volume and surface area of prisms, cylinders, pyramids, cones and spheres.	c. CMT 7 & 8 d. CMT 7 & 8 (rectangular prisms and cylinders)
Chapter 9 How can you use probability to make predictions?	Understand apply basic concepts of probability. Develop and evaluate inferences and predictions that are based on data.	Homework Class work Oral Review Quizzes Tests	a. Find theoretical probabilities including dependent and independent events. b. Estimate probabilities using experiments and simulations. c. Use the Fundamental Counting Principle, permutations and combinations to find probabilities.	a. CMT 7 & 8 b. CMT 7 & 8 c. CMT 7 & 8
Chapter 10 How does solving a one-step equation relate to solving a	Represent and analyze mathematical situations and structures using algebraic	Homework Class work Oral Review Quizzes Tests	a. Solve two-step and multistep equations. b. Solve	a. CMT 7 & 8

multi-step equation?	symbols. Use mathematical models to represent and understand quantitative relationships		equations with variables on both sides of the equation. c. Solve equations for a variable.	c. CMT 7 & 8
Chapter 11 How do you graph a line using a table of values?	Understand patterns, relations and functions. Use representations to model and interpret physical, social, and mathematical phenomena.	Homework Class work Oral Review Quizzes Tests	a. Identify and graph linear equations. b. Introduction of linear equations in slope-intercept form or point-slope form, and finding the x-y-intercepts. c. Use direct variation.	
Chapter 12 How would you determine a rule for the n^{th} term in a pattern?	Understand patterns, relations and functions	Homework Class work Oral Review Quizzes Tests	a. Find terms in arithmetic, geometric and other sequences	a. CMT 7 & 8

