

Masconomet Regional High School Curriculum Guide

COURSE TITLE: Algebra I (continued)

COURSE NUMBER: 1123

DEPARTMENT: Mathematics

GRADE LEVEL(S) & PHASE: 9, CP

LENGTH OF COURSE: Full Year

Course Description:

After a brief review of the basic operations on real numbers and monomials, solving single step equations and inequalities in one variable is considered. This provides a natural lead-in to the careful development of techniques for solving equations and inequalities that require multiple steps. As these techniques are studied, the reason for studying them is provided through the consideration of real world situations that give rise to algebraic sentences of these types. Linear equations in two variables are then considered in depth. Properties that can be determined from their graphs in the coordinate plane give rise to the study of the Pythagorean Theorem and its extension to the distance formula. This is then used as a lead-in to studying the properties of square roots. Linear equations are also studied in order to determine the information that makes graphing them easy. Finally, consideration is given to developing linear equations from given information. The important application of fitting a line to data is used to summarize this study. Properties of exponents are studied and then extended to include negative exponents. This leads to the development of polynomials and a brief introduction to factoring is considered. If time permits, a variety of methods for solving systems of linear equations are studied and real world situations that give rise to them are considered. In addition, a unit on probability and statistics will be covered.

Objectives:

(Some are adapted from the Massachusetts Mathematics Curriculum Framework – November 2000)

At the end of the course, students should be able to:

- A. Identify and use the properties of real numbers and the operations performed on them.
- B. Simplify numerical expressions, including those involving positive integer exponents or the absolute value and apply such simplifications in the solution of problems.
- C. Find the approximate value for solutions to problems involving square roots.
- D. Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers.
- E. Describe, complete, extend, analyze, generalize and create a wide variety of patterns, including iterative, recursive, linear, quadratic, and exponential functional relationships.
- F. Use properties of the real number system to judge the validity of equations and inequalities, to prove or disprove statements and to justify every step in a sequential argument
- G. Demonstrate an understanding of relations and functions including being able to identify the domain, range, dependent and independent variables of functions.
- H. Translate between different representations of functions and relations: graphs, equations, point sets and tabular.
- I. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y- intercepts from its graph or from a linear equation representing the line.
- J. Find a linear equation that represents a line either perpendicular or parallel to a given line and through a point, for example, point-slope or slope-intercept form for a linear equation.
- K. Add, subtract, and multiply polynomials. Divide a polynomial by a monomial.
- L. Demonstrate a facility in symbolic manipulation of polynomials.
- M. Find the solutions to quadratic equations (with real roots) by factoring, applying the zero product property or using the quadratic formula. Demonstrate an understanding of the equivalence of these methods.
- N. Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. Apply appropriate tabular, graphical, or symbolic methods to the solution. Include compound interest, and direct and inverse variation problems.
- O. Solve equations and inequalities involving absolute value and apply to the solution of problems.
- P. Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Include mixture, rate, and work problems.
- Q. Select an appropriate graphical representation for a set of data and use appropriate statistics to communicate information about the data.
- R. Approximate a line of best fit given a set of data.
- S. Describe how a sample size and population size affect the validity of predictions from a set of data.

These objectives address the Academic Expectations relating to effective communication, mathematical competency and problem solving skills.

Materials and Activities:

Text(s): Algebra I: Applications, Equations, Graphs

By: Ron Larson, Laurie Boswell, Timothy D. Kanold, Lee Stiff

McDougal Littell: Evanston, IL: 2001

Students are expected to have and use a scientific calculator in class and when doing assignments.

- Discovery activities to introduce the central concepts of each unit and to provide hands on experience concerning the usefulness of these concepts.
- Lecture and class discussion to explain concepts and processes.
- Individual and group work to practice skills presented in class, to apply them to various problem-solving situations and to develop the ability to work cooperatively in such situations.
- Group and individual investigations related to understanding and applying the concepts in the central objectives.
- Projects, reports and computer work may be presented by students, either individually or as a group.

Scope and Sequence:

The course begins with a review of the skills and concepts that have been covered extensively in the middle school courses that precede this course. The order in which these units are covered is subject to change and is dependent on the skills / abilities of the class.

At the end of Unit One, students will be able to:

- Use signed numbers to represent real world quantities
- Add, subtract, multiply and divide signed numbers
- Translate simple problem situations into algebraic expressions, equations and inequalities
- Solve numerical problems by using signed numbers
- Evaluate numerical expressions by applying the correct order of operations
- Substitute given numerical values in algebraic expressions
- Use order of operations to simplify algebraic expressions
- Combine like terms in algebraic expressions where the distributive property is not required
- Identify functions
- Identify domain and range
- Interpret charts, tables and graphs

At the end of Unit Two, students will be able to:

- Use the distributive property to simplify expressions
- Add and subtract integers
- Multiply and divide real numbers
- Square a number
- Find two whole numbers that the square root of a non-perfect square would be between
- Evaluate expressions involving square roots
- Recognize squaring and taking the square root as inverse operations
- Combine like terms using the distributive property
- Identify coefficients and constant terms in an algebraic expression or equation
- Simplify expressions using absolute value
- Solve one step equations using inverse operations

At the end of Unit Three, students will be able to:

- Solve multi-step linear equations
- Solve linear equations that require combining like terms
- Solve linear equations that include using the distributive property
- Solve linear equations that begin with the variable on both sides of the equal sign
- Solve word problems that can be represented by linear equations or inequalities
- Check the reasonableness of word problem solutions in relation to the situation described in the original problem
- Write a reasonable word problem that could have led to a given equation
- Change numbers from fractions to decimals to percents
- Calculate rates
- Set up proportions
- Solve proportions

- Use percents in real world applications (calculate percent discounts, etc.)

At the end of Unit Four, students will be able to:

- Plot points in the coordinate plane
- Name points on a graph in the coordinate plane
- Find ordered pairs that satisfy an equation by completing a table
- Graph an equation from points found by using a table
- Find the slope of a line given two points on it
- Find the slope of a line from its graph
- Interpret the meaning of slope including positive, negative, zero and no slope
- Find the coordinates for the intercepts of a given line
- Re – write the equation for a line in slope intercept form
- Graph a line given its slope and y – intercept
- Graph a line given its slope and any point on the line
- Graph a line given its equation

At the end of Unit Five, students will be able to:

- Find the equation of a line given its slope and y – intercept
- Find the equation of a line given its slope and any point on it
- Find the equation of a line given two points on it
- Find the equation of a line given its graph
- Graph horizontal and vertical lines in the coordinate plane given the line's equation
- Give the equation for a horizontal and/or vertical line that contains a given ordered pair
- Give the equation for a horizontal or vertical line from its graph
- Find a linear equation that approximates a set of data points
- Determine whether there is a positive or negative correlation in a set of real-life data

At the end of Unit Six, students will be able to:

- Change a number from expanded form to exponential form
- Change a number from exponential form to expanded form
- Explain scientific notation
- Change a number from scientific notation to decimal notation
- Change a number from decimal notation to scientific notation
- Use the product rule to simplify exponential expressions
- Use the power rule to simplify exponential expressions
- Use the quotient rule to simplify exponential expressions
- Use more than one rule to simplify exponential expressions
- Interpret negative exponents
- Re-write expressions so that all exponents are positive
- Use the product rule to multiply a multi-term expression by an exponential term
- Use the quotient rule to divide a multi-term expression by an exponential term
- Use the definition of zero exponent to simplify expressions

At the end of Unit Seven, students will be able to:

- Identify a term
- Identify the coefficient of a term
- Identify a constant term
- Determine the degree of a term
- Determine the degree of a polynomial
- Determine whether an algebraic expression is a polynomial
- Identify a polynomial as a monomial, binomial, trinomial or other
- Identify a polynomial as linear, quadratic, cubic or other
- Combine like terms
- Add two or more polynomials
- Subtract two or more polynomials
- Do addition and subtraction of polynomials in the same example
- Use polynomials to model real life situations

- Multiply a polynomial by a monomial
- Multiply a polynomial by a polynomial
- Use FOIL to multiply binomials
- Use polynomial multiplication in real life situations
- Use special product patterns for the difference of two squares and for the square of a binomial
- Use special products as real life models
- Divide a polynomial by a monomial
- Factor a polynomial into the product of a monomial and a polynomial
- Use the zero product property to solve polynomial equations
- Identify a quadratic equation in standard form
- Factor a quadratic polynomial
- Solve a quadratic equation by factoring
- Solve a quadratic equation by using the quadratic formula

At the end of Unit Eight, students will be able to:

- Make and use a stem and leaf plot to put data in order
- Find the mean, median, mode and range of data
- Apply the concepts of mean, median, mode and range to generate a data set
- Draw a box and whisker plot to organize real life data
- Read and interpret a box and whisker plot of real life data
- Compute simple probabilities
- Create tree diagrams to represent the sample space for a probability experiment
- Create tables to represent the sample space for a probability experiment
- Use the counting principle to determine the number of possible outcomes for a probability experiment
- Use distance and area formulas to determine geometric probabilities

At the end of Unit Nine, students will be able to:

- Determine whether data fits a direct variation model
- Determine the direct variation equation given specific information
- Solve direct variation problems
- Determine whether data fits an inverse variation model
- Determine the inverse variation equation given specific information
- Solve inverse variation problems
- Use direct and inverse variation to model real life situations
- Recognize number, shape and symbol patterns
- Extend number, shape and symbol patterns
- Generalize number, shape and symbol patterns
- Use a recursive formula to generate terms in a sequence
- Use an explicit formula to generate terms in a sequence

At the end of Unit Ten, students will be able to:

- Solve a system of linear equations by graphing
- Model a real life problem using a linear system
- Use substitution to solve a linear system
- Use linear combinations to solve a system of linear equations
- Identify linear systems as having one solution, no solution or infinitely many solutions
- Model and solve real life problems using a linear system
- Solve a system of linear inequalities
- Use a system of linear inequalities to model real life situations

Assessment:

- Daily assignments to be evaluated in light of completeness, care of presentation and the student's ability to explain the results. Late or incomplete assignments can earn at most half credit. Generally, no credit will be given for any assignment not completed within one day of the time it was due.
- Individual and group classwork/investigations to be evaluated in light of their completeness, care of presentation, student participation in the process and the student's ability to discuss the results/conclusions.

- Frequent quizzes to assess the student's progress in achieving course objectives on a short-term basis.
- Chapter tests to assess the student's ability to synthesize several classes and achieve course objectives on a long-term basis.
- Semester exams given in January and June.
- Assessments designed to determine how the student has met the Academic Expectations relating to effective communication, mathematical competency and problem solving skills.

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