

Masconomet Regional High School Curriculum Guide

COURSE TITLE:	<u>Concepts of Algebra 2</u>	COURSE NUMBER:	<u>1403</u>
DEPARTMENT:	<u>Mathematics</u>	GRADE LEVEL(S) & PHASE:	<u>11 – 12 , CP</u>
LENGTH OF COURSE:	<u>Full Year</u>		

Course Description:

Concepts of Algebra II both reinforces the essential skills, knowledge, and attitudes learned in Algebra I and extends them. In particular, the basic operations of addition, subtraction, multiplication, and division are studied in relation to real numbers- both rational and irrational - and complex numbers. Equations and inequalities in one and two variables are considered both graphically and algebraically, both individually and in systems. In addition, functions are studied in detail, with particular emphasis on quadratic and absolute value functions. A study of exponential and logarithmic functions is based on many real-world problems and situations. Finally (and as time permits), the course concludes with a consideration of the essential ideas of Probability and Statistics.

Objectives:

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

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

- A. Identify and use the properties of real numbers and operations on them
- B. Simplify numerical expressions including those involving rational exponents or absolute value and apply such simplifications in the solution of problems
- C. Use estimation to judge the reasonableness of results of computation and of solutions to problems involving real numbers
- D. Define complex numbers and operations on them
- E. Relate the system of complex numbers to the systems of real and rational numbers
- F. Describe, complete, extend, analyze, generalize and create a wide range of patterns including iterative and recursive patterns
- G. Demonstrate an understanding of the exponential and logarithmic functions and apply this understanding to a wide range of problem solving situations
- H. Perform operations on functions including composition
- I. Find the inverse of a function and determine if the inverse is a function
- J. Given algebraic, numeric and/or graphical representations, recognize functions as polynomial, exponential or logarithmic
- K. Find solutions to quadratic equations with real coefficients over the complex number system and apply to the solution of problems
- L. Solve a variety of equations and inequalities using algebraic, graphical and numerical methods including the quadratic formula and describe the relationships among the methods
- M. Use a variety of methods to solve systems of linear equations in two variables and apply to the solution of everyday problems
- N. Solve systems of linear and/or quadratic inequalities by graphing and apply to the solution of everyday problems
- O. Use algebraic and graphical methods to set up and solve linear programming problems
- P. Solve everyday problems that can be modeled using polynomial, exponential, logarithmic, power and absolute value functions
- Q. Describe the translations and scale changes of a given function $f(x)$ resulting from substitution for the various parameters a , b , c and d in $y = af(bx + c) + d$ on absolute value and polynomial functions
- R. Apply appropriate graphical, tabular, or symbolic methods to the solution of problems involving growth and decay as well as direct, inverse, joint and combined variations
- S. Select, create and interpret an appropriate graphical representation for a set of data
- T. Use appropriate statistics (mean, median, mode, range) to communicate information about a set of data
- U. Use measures of central tendency to compare different sets of data
- V. Approximate a line of best fit for a given set of data

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

Materials and Activities:

Text(s): HRW Advanced Algebra

By: Wade Ellis, Jr., James E. Schultz, Kathleen A. Hollowell
Holt, Rinehart and Winston, Inc.: Austin, TX: 1997

A significant amount of course work depends on teacher created materials including note packets, templates, in class investigations, work sheets and problem sets.

Students are expected to have and use a graphing calculator in class and when doing assignments. Parents may request that their child borrow a school owned calculator for the year.

- 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.
- Student assignments to develop proficiency in those skills and processes presented and practiced in class.
- Group and individual investigations related to understanding and applying the concepts in the central objectives.
- Independent projects such as reports and computer work may be presented by students.

Scope and Sequence: **Units will not necessarily be covered in this order.**

Unit 1: Linear Equations and Inequalities

At the end of this unit, students should be able to:

- Identify linear equations and linear relationships of variables in a table
- Write an equation describing a linear relationship, and graph it
- Write an equation in slope-intercept form, given two points on the line or the slope and a point on the line
- Graph lines using x- and y-intercepts
- Graph a scatter plot from data in a table, and identify correlation
- Use a graphing calculator to find the correlation coefficient and to make predictions using the line of best fit
- Solve problems involving direct variation
- Solve problems by writing and solving linear equations
- Solve and graph inequalities

Unit 2: Operations With Numbers, Exponents, and Functions

At the end of this chapter, students should be able to:

- Compare and identify number systems
- Identify properties of real numbers, and use these properties to perform operations with rational numbers
- Perform operations, and evaluate expressions using the properties of exponents
- Identify and compare relations and functions, and use the vertical-line test to identify functions and their graphs
- Use functions to model real-world applications, and give appropriate domain and range restrictions for the situation
- Use function notation to define, evaluate, and operate with functions
- Use the slope formula to write and identify increasing and decreasing linear functions
- Identify and use properties of functions to add, subtract, multiply, and divide functions

Unit 3: Equations and Functions

At the end of this chapter, students should be able to:

- Identify the image and pre-image points and the axis of symmetry of a set of ordered pairs
- Determine the relationship of coordinates of points reflected over the y-axis, x-axis, and the line $y = x$
- Define the inverse of a function, and use the horizontal line test to determine whether the inverse is a function
- Determine the inverse of a function
- Define the composition of functions, and describe the relationship between the dependent and independent variables of functions that are composed
- Describe in detail the graph of an absolute value function in vertex form including its orientation, vertex, axis of symmetry, domain, range and intercepts
- Solve equations involving absolute value symbols using graphing and algebraic methods
- Define step functions, and use them to model real-world applications

Unit 4: More Linear Equations, Inequalities, and Systems

At the end of this chapter, students should be able to:

- Solve systems of linear equations by graphing
- Solve systems of linear equations using elimination and substitution
- Apply methods for solving systems of linear equations to problem solving situations

- Graph linear inequalities
- Graph systems of linear inequalities and identify the appropriate solution
- Graph a feasible region determined by constraints
- Find the maximum or minimum values of the objective function determined by the feasible region
- Translate a linear programming problem into a series of constraints and the objective function
- Solve linear programming problems

Unit 5: Quadratic Functions

At the end of this chapter, students should be able to:

- Describe in detail the graph of a quadratic function in standard form including its orientation, vertex, axis of symmetry, domain, range and intercepts
- Describe in detail the graph of a quadratic function in vertex form including its orientation, vertex, axis of symmetry, domain, range and intercepts
- Describe in detail the graph of a quadratic function in intercept form including its orientation, vertex, axis of symmetry, domain, range and intercepts
- Solve quadratic equations by taking square roots, or by squaring
- Use the distance formula to find the distance between two points

Unit 6: More Quadratic Functions, Polynomial Functions

At the end of this chapter, students should be able to:

- Define and examine polynomial functions in both standard form and factored form
- Write the factored form of a polynomial
- Define and use the Factor Theorem to find the zeros of polynomial functions
- Use the Quadratic Formula to solve quadratic equations and apply this to problem solving situations
- Determine the number of real-number solutions using the discriminant
- Identify, operate with, and graph complex numbers

Unit 7: Exponential and Logarithmic Functions

At the end of this chapter, students should be able to:

- Model the growth or decay of a population using a multiplier
- Identify the behavior of exponential functions by inspection and by graphing
- Determine the growth of funds under various compounding methods
- Identify the exponential and logarithmic functions as inverse functions
- Determine equivalent forms for exponential and logarithmic equations
- Identify the product, quotient, and power properties of logarithms
- Simplify expressions and solve equations involving logarithms
- Identify and use the common logarithmic function
- Write equivalent logarithmic and exponential equations
- Evaluate expressions involving the natural number, e , and identify the relationship between the natural logarithmic and exponential functions
- Model growth and decay processes with natural exponential functions

Unit 8: Counting Principles and Probability

At the end of this chapter, students should be able to:

- Determine theoretical and experimental probabilities
- Use the Fundamental Principle of Counting to determine how many ways a decision can be made
- Determine the number of permutations of n distinct objects taken r at a time
- Find the number of distinct permutations of n objects of in which one or more of the objects is repeated
- Find the number of circular permutations of n objects
- Determine the number of combinations of n objects taken r at a time
- Find the probability that two independent events A and B will both occur
- Find the probability that either event A or event B will occur

Unit 9: Descriptive Statistics

At the end of this chapter, students should be able to:

- Find the measures of central tendency, mean, median, and mode of a given set of data
- Construct a frequency table by dividing the data into classes, and find the class mean for the data
- Construct a histogram for a given set of data

- Construct a stem-and-leaf plot to represent a given set of data
- Find the quartiles and inter-quartile range for a given set of data
- Construct a box-and-whisker plot to display a given set of data

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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