

Masconomet Regional High School Curriculum Guide

COURSE TITLE:	<u>Algebra 2</u>	COURSE NUMBER:	<u>1233</u>
DEPARTMENT:	<u>Mathematics</u>	GRADE LEVEL(S) & PHASE:	<u>10, H</u>
LENGTH OF COURSE:	<u>Full Year</u>		

Course Description:

Algebra II Honors studies a variety of topics, from lines to logarithms, from quadratic equations to conic sections, from functions to systems, from matrices to trigonometry, from statistics to probability. It might best be described as "what every high school graduate should know about mathematics". It contains the mathematics that educated people around the world use in conversation, and that colleges want or expect students to have studied. The properties of numbers, graphs, expressions, equations, inequalities and functions are ideas, which run throughout the program, with real-world problem applications explored often.

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. Identify arithmetic and geometric sequences and use the properties of such sequences to solve problems including finding the formula for the general term both recursively and explicitly
- H. Demonstrate an understanding of the exponential and logarithmic functions and apply this understanding to a wide range of problem solving situations
- I. Perform operations on functions including composition
- J. Find the inverse of a function and determine if the inverse is a function
- K. Given algebraic, numeric and/or graphical representations, recognize functions as polynomial, rational, exponential or logarithmic
- L. Find solutions to quadratic equations with real coefficients over the complex number system and apply to the solution of problems
- M. Solve a variety of equations and inequalities using algebraic, graphical and numerical methods including the quadratic formula and describe the relationships among the methods
- N. Use a variety of methods to solve systems of linear equations in two and three variables and apply to the solution of everyday problems
- O. Solve systems of linear and/or quadratic inequalities by graphing and apply to the solution of everyday problems
- P. Use algebraic and graphical methods to set up and solve linear programming problems
- Q. Solve everyday problems that can be modeled using polynomial, rational, exponential, logarithmic, power, step and absolute value functions
- R. 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 $y = af^2 + bx + c + d$ on absolute value, polynomial, rational, exponential and logarithmic functions
- S. 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
- T. Define the six trigonometric functions in terms of the sides of a right triangle as well as the unit circle and apply these when solving a wide range of problems
- U. Describe the relationship between degree and radian measure and use radian measure in the solution of problems
- V. Derive and apply basic trigonometric identities as well as the law of sines and the law of cosines
- W. Select, create and interpret an appropriate graphical representation for a set of data
- X. Use appropriate statistics (mean, median, mode, range) to communicate information about a set of data
- Y. Use measures of central tendency to compare different sets of data

Z. 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): McDougal Littell Algebra 2

By: Ron Larson, Laurie Boswell, Timothy D. Kanold, Lee Stiff
McDougal Littell: Evanston, IL: 2007

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

- 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:

At the end of chapter one, students will be able to:

- Identify and use the properties of real numbers and operations on them
- Evaluate and simplify expressions involving real numbers
- Solve linear equations and apply these skills to problem solving situations
- Rewrite and evaluate formulas and equations
- Solve linear inequalities and apply these skills to problem solving situations
- Solve absolute value equations and inequalities and apply these skills to problem solving situations

At the end of chapter two, students will be able to:

- Identify and represent functions through tabular, graphical and symbolic representations
- Graph linear functions
- Find slopes of lines, interpret slope as rate of change and apply the understanding to problem solving situations
- Write linear equations from information presented in a table, a graph and/or a word problem
- Fit lines to data in a scatter plot and use the resulting linear equation to predict unknown values for the data set
- Graph and write absolute value functions (graphing calculator capabilities will be used where appropriate)
- Describe all transformations to the graph of the basic absolute value function $y = |x|$ in $y = a|x - h| + k$ and identify the vertex, axis of symmetry and intercepts of the resulting function (graphing calculator capabilities will be used where appropriate)
- Graph linear inequalities in two variables

At the end of chapter three, students will be able to:

- Solve systems of linear equations in two variables by graphing
- Solve systems of linear equations in two variables algebraically and apply these methods to problem solving situations
- Graph systems of linear inequalities in two variables and apply these methods to problem solving situations (graphing calculator capabilities will be used where appropriate)
- Solve systems of linear equations in three variables algebraically and apply these methods to problem solving situations
- Add and subtract matrices, perform scalar multiplication on a matrix and solve matrix equations
- Multiply matrices and evaluate the determinant of a matrix (graphing calculator capabilities will be used where appropriate)
- Use matrices to solve systems of linear equations and apply these methods to problem solving situations (graphing calculator capabilities will be used where appropriate)

At the end of chapter four, students will be able to:

- Describe the graph (orientation, vertex, axis of symmetry, domain, range, intercepts) and use this information to graph a quadratic function in standard form
- Describe the graph (orientation, vertex, axis of symmetry, domain, range, intercepts) and use this information to graph a quadratic function in vertex form

- Describe the graph (orientation, vertex, axis of symmetry, domain, range, intercepts) and use this information to graph a quadratic function in intercept form
- Solve quadratic equations by factoring, finding square roots and using the quadratic formula and apply these methods to problem solving situations
- Perform operations on complex numbers
- Graph and solve quadratic inequalities
- Write quadratic functions to meet given conditions
- Find and apply quadratic models for problem solving situations

At the end of chapter five, students will be able to:

- Simplify expressions involving integer exponents
- Evaluate, analyze and graph polynomial functions
- Add, subtract, multiply and divide polynomials
- Use factoring and other techniques (graphing calculator capabilities will be used where appropriate) to solve polynomial equations and apply these methods to problem solving situations
- Find all real and complex zeroes of polynomial functions
- Use intercepts and end behavior to graph polynomial functions

At the end of chapter six, students will be able to:

- Evaluate n^{th} roots and expressions involving rational exponents
- Simplify expressions involving rational exponents and n^{th} roots
- Perform operations with functions – including composition of functions
- Find the inverse of a function and determine whether the inverse is a function
- Graph square root and cube root functions
- Solve radical equations

At the end of chapter seven, students will be able to:

- Graph exponential growth functions and apply them to problem solving situations
- Graph exponential decay functions and apply them to problem solving situations
- Use functions involving the natural base e $y = ae^x$ and $y = \ln x$ and apply them to problem solving situations
- Recognize exponential and logarithmic functions as inverses
- Evaluate logarithms, graph logarithmic functions and apply them to problem solving situations
- Solve exponential and logarithmic functions and apply them to problem solving situations
- Write and apply exponential and logarithmic functions

At the end of a unit on data analysis and probability (primarily from chapters 10 and 11), 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, permutations and combinations to determine the number of possible outcomes for a probability experiment
- Find probabilities of compound events
- Distinguish between independent and dependent events and find the probabilities of each
- Use distance and area formulas to determine geometric probabilities

At the end of a unit on variation and patterns (including material from portions of chapters 2, 8 and 10), students will be able to:

- Write and graph direct variation equations and apply direct variation to appropriate problem solving situations
- Write and graph inverse variation equations and apply inverse variation to appropriate problem solving situations

- Write and interpret joint and combined variation equations and apply them to appropriate problem solving situations
- Recognize and extend patterns involving numbers, shapes and symbols
- Recognize and extend arithmetic sequences and find the common difference for an arithmetic sequence
- Recognize and extend geometric sequences and find the common ratio for a geometric sequence
- Use recursive and explicit rules to generate terms in a sequence

At the end of a section on trigonometry (primarily from chapters 13 and 14), students will be able to:

- Define the six trigonometric functions in terms of the sides of a right triangle and rotations in the unit circle
- Evaluate the six trigonometric functions in terms of the sides of a right triangle and rotations in the unit circle
- Use trigonometric functions to find unknown sides or angles in a right triangle
- Derive the equations that relate radian and degree measure and apply these in problem solving situations
- Evaluate inverse trigonometric functions to find unknown rotations/angles
- Use basic identities to find the value of unknown trigonometric functions
- Use the law of sines to find unknown measures of triangles with no right angles
- Use the law of cosines to find unknown measures of triangles with no right angles

If time permits,

At the end of chapter eight, students will be able to:

- Graph rational functions
- Multiply and divide rational expressions
- Add and subtract rational expressions
- Solve rational equations and apply them to problem solving 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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