COURSE TITLE: Algebra 2　　　　　　　　　　**COURSE NUMBER:**　1322

DEPARTMENT: Mathematics　　　　　　　　**GRADE LEVEL(S) & PHASE:**　10 – 12, CP

LENGTH OF COURSE: Full Year

Course Description:

This course is a second year course in algebra that enables students to develop skills in manipulating linear, quadratic, exponential, logarithmic and trigonometric expressions and sentences. Substantial amounts of geometry are integrated with the algebra. Reading and problem solving are emphasized. Each elementary function is studied in detail for its applications to real world problems. Real life situations motivate algebraic ideas and provide the settings for practice of algebraic skills. Use of scientific calculators enhances the understanding of the concepts discussed. Emphasis is placed upon the skills involved in carrying out various algorithms, the development and use of mathematical properties and relationships, the application of mathematics in realistic situations and the representation or picturing of mathematical concepts. To insure retention, important ideas from this course and from previous courses are reviewed throughout the course. Some time will be spent in April in preparing sophomores for the MCAS.

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, 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 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, 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 $y = af \; bx + c \; + d$ on absolute value and polynomial 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. Select, create and interpret an appropriate graphical representation for a set of data
U. Use appropriate statistics (mean, median, mode, range) to communicate information about a set of data
V. Use measures of central tendency to compare different sets of data
W. 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): Algebra 2: Applications, Equations, Graphs
> By: Ron Larson, Laurie Boswell, Timothy D. Kanold, Lee Stiff
> McDougall Littell: Evanston, IL: 2001

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.
- Graphing calculators will be used to investigate such topics as direct and inverse variation, quadratic equations and matrices.
- Students may present Independent projects such as reports and computer work.

Scope and Sequence:

Chapter One:

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

- Use a number line to graph and order real numbers
- Identify properties of and use operations with real numbers
- Evaluate algebraic expressions
- Simplify algebraic expressions by combining like terms
- Solve linear equations
- Use linear equations to solve real-life problems
- Rewrite equations with more than one variable
- Rewrite common formulas
- Use a general problem solving plan to solve real-life problems
- Use other problem-solving strategies to solve real-life problems
- Solve simple inequalities
- Solve compound inequalities
- Solve absolute value equations and inequalities
- Use absolute value equations and inequalities to solve real-life problems

Chapter Two:

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

- Represent relations and functions
- Graph and evaluate linear functions
- Find slopes of lines and classify parallel and perpendicular lines
- Use the slope-intercept form of a linear equation to graph linear equations
- Use the standard form of a linear equation to graph linear equations
- Write linear equations
- Write direct variation equations
- Use a scatter plot to identify the correlation shown by a set of data
- Approximate the line of best fit for a set of data
- Graph linear inequalities in two variables
- Use linear inequalities to solve real-life problems
- Evaluate piecewise functions
- Use piecewise functions to model real-life quantities
- Evaluate and graph absolute value functions
- Describe the graph of any absolute value function as transformations to the graph of $f\ x\ = y = |x|$
- Use absolute value functions to model real-life situations

Chapter Three:

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

- Graph and solve systems of linear equations in two variables
- Use linear systems to solve real-life problems

- Use algebraic methods to solve linear systems
- Use linear systems to model real-life situations
- Graph a system of linear inequalities to find the solutions of the system
- Use systems of linear inequalities to solve real-life problems
- Graph a feasible region
- Identify the vertices of a feasible region
- Determine where the extrema of an objective function occur
- Translate a linear programming problem into a system of inequalities and an objective function
- Find the intercepts for a linear equation in three variables
- Re-write a linear equation in three variables as a function of x and y
- Determine whether an ordered triple is a solution to a system of three equations in three unknowns

Chapter Five:
At the end of this chapter, students should be able to:
- Graph quadratic functions
- Use quadratic functions to solve real-life problems
- Factor quadratic expressions
- Solve quadratic equations by factoring
- Find zeroes of quadratic functions
- Solve quadratic equations by finding square roots
- Use quadratic equations to solve real-life problems
- Solve quadratic equations with complex solutions
- Perform operations with complex numbers
- Solve quadratic equations using the quadratic formula
- Graph quadratic inequalities in two variables
- Solve quadratic inequalities in one variable
- Write quadratic functions given the characteristics of their graphs
- Use technology to find quadratic models for data

Chapter Six:
At the end of this chapter, students should be able to:
- Use properties of exponents to evaluate and simplify expressions involving powers
- Use exponents and scientific notation to solve real-life problems
- Evaluate a polynomial function
- Graph a polynomial function
- Add, subtract, and multiply polynomials
- Use polynomial operations in real-life problems
- Factor polynomial expressions
- Use factoring to solve polynomial equations
- Divide polynomials and relate the result to the remainder theorem and the factor theorem
- Use polynomial division in real-life problems
- Use technology to find rational zeroes of polynomial functions

Chapter Seven:
At the end of this chapter, students should be able to:
- Evaluate nth roots of real numbers using both radical notation and rational exponent notation
- Use nth roots to solve real-life problems
- Use properties of rational exponents to evaluate and simplify expressions
- Use properties of rational exponents to solve real-life problems
- Perform operations with functions including power functions
- Use power functions and function operations to solve real-life problems
- Find inverses of linear functions
- Find inverses of non-linear functions
- Use square root and cube root functions to find real-life quantities
- Solve equations that contain radicals or rational exponents
- Use radical equations to solve real-life problems

- Use measures of central tendency and measures of dispersion to describe data sets
- Use box and whisker plots and histograms to represent data graphically

Chapter Eight:
At the end of this chapter, students should be able to:
- Graph exponential growth functions
- Use exponential growth functions to model real-life situations
- Graph exponential decay functions
- Use exponential decay functions to model real-life situations
- Use the number e as the base of exponential functions
- Use the natural base e in real-life situations
- Evaluate logarithmic functions
- Graph logarithmic functions
- Use properties of logarithms
- Use properties of logarithms to solve real-life problems
- Solve exponential equations
- Solve logarithmic equations
- Model data with exponential functions
- Model data with power functions
- Evaluate and graph logistic growth functions
- Use logistic growth functions to model real-life quantities

Chapter Nine: (These topics will be completed prior to MCAS testing in May)
At the end of this chapter, students should be able to:
- Write and use inverse variation models
- Write and use joint variation models

Chapter Ten: (These topics will be completed prior to MCAS testing in May)
At the end of this chapter, students will be able to:
- Find the distance between two points
- Find the midpoint of the line segment joining two points Use the distance and midpoint formulas in real-life situations

Chapter Eleven: (Chapter will be covered if time permits)
At the end of this chapter, students will be able to:
- Recognize patterns involving numbers, shapes and symbols
- Describe patterns involving numbers, shapes and symbols
- Extend patterns involving numbers, shapes and symbols
- Use a recursive formula to generate terms in a sequence
- Use an explicit formula to generate terms in a sequence
- Write rules for arithmetic sequences
- Use arithmetic series in real-life problems
- Write rules for geometric sequences
- Use geometric sequences to model real-life quantities

Chapter Twelve: (These topics will be completed prior to MCAS testing in May)
At the end of this chapter, students will be able to:
- Use the fundamental counting principle to count the number of ways an event can happen
- Use permutations to count the number of ways an event can happen
- Use combinations to count the number of ways an event can happen
- Find theoretical and experimental probabilities
- Find geometric probabilities
- Find probabilities of the unions and intersections of two events

<u>Assessment:</u>
- 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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