

\* **Subject Area:** Mathematics

\* **Category:** Algebra 1; Yr 1 of 2

\* **Grade Level  
for which this  
course has been  
designed:**

9  10  11  12

\* **Unit Value:** 1.0 (one year, 2 semesters, or 3 trimesters equiv.)

\* **Is this course classified as a Career Technical Education:** No

#### \* **Brief Course Description**

This discipline complements and expands the mathematical content and concepts of algebra I and geometry. Students who master algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.

#### **Pre-Requisites**

Grade of "C" or better in Algebra 1 - Required

Grade of "C" or better in Geometry - Required

#### **Co-Requisites**

**Context for Course  
(optional)**

**History of Course Development  
(optional)**

#### **Textbooks**

**TEXTBOOK 1**

\* **Title:** Algebra 2

\* **Edition:** CA

\*  
**Publication Date:** 2005

\*  
**Publisher:** Glencoe

\*  
**Author(s):** Barker et al

**URL Resource:**

\* **Usage:** Primary Text

Read in entirety or near entirety

**TEXTBOOK 2**

\* **Title:** Algebra 2

\* **Edition:** 1st Edition

\*  
**Publication Date:** 2004

\*  
**Publisher:** Prentice Hall

**TEXTBOOK 2**

**\* Author(s):** Bellman et al.

**URL  
Resource:**

**\* Usage:** Primary Text

Read in entirety or near entirety

**TEXTBOOK 3**

**\* Title:** Algebra 2

**\* Edition:** CA

**\*  
Publication  
Date:** 2007

**\*  
Publisher:** McDougal-Littell

**\*  
Author(s):** McDougal-Littell

**URL  
Resource:**

**\* Usage:** Primary Text

Read in entirety or near entirety

## Supplemental Instructional Materials

Solutions Manual - A complete solution for each problem in the Student Edition lessons.

### \* Course Purpose

Algebra II complements and expands the mathematical content and concepts of Algebra I and Geometry. Students who master Algebra II will gain experience with algebraic solutions of problems in various content areas, including the solution of systems of quadratic equations, logarithmic and exponential functions, the binomial theorem, and the complex number system.

The main topical objectives are:

- Absolute Value & Inequalities • Complex Numbers • Polynomials & Rational Expressions
- Quadratic Functions • Logarithms • Arithmetic & Geometric Series • Word Problems

The key content for Algebra II requires that students:

\*solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.

\*solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula.

\*apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.

when given a quadratic equation, students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.

\*demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as  $a$ ,  $b$ , and  $c$  vary in the equation  $y = a(x - b)^2 + c$ . (9.0)

\*graph quadratic functions and determine the maxima, minima, and zeros of the function.

\*understand the inverse relationship between exponents and logarithms and use

this relationship to solve problems involving logarithms and exponents.

\*know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.

\*use combination and permutations to compute probabilities.

### \* Course Outline

Coursework will include a thorough understanding and application of the following topics as they are presented in the text.

Students solve equations and inequalities involving absolute value.

Students solve systems of linear equations and inequalities (in two or three variables) by substitution, with graphs, or with matrices.

Students are adept at operations on polynomials, including long division.

Students factor polynomials representing the difference of squares, perfect square trinomials, and the sum and difference of two cubes.

Students demonstrate knowledge of how real and complex numbers are related both arithmetically and graphically. In particular, they can plot complex numbers as points in the plane.

Students add, subtract, multiply, and divide complex numbers.

Students add, subtract, multiply, divide, reduce, and evaluate rational expressions with monomial and polynomial denominators and simplify complicated rational expressions, including those with negative exponents in the denominator.

Students solve and graph quadratic equations by factoring, completing the square, or using the quadratic formula. Students apply these techniques in solving word problems. They also solve quadratic equations in the complex number system.

Students demonstrate and explain the effect that changing a coefficient has on the graph of quadratic functions; that is, students can determine how the graph of a parabola changes as  $a$ ,  $b$ , and  $c$  vary in the equation  $y = a(x-b)^2 + c$ .

Students graph quadratic functions and determine the maxima, minima, and zeros of the function.

Students prove simple laws of logarithms:

Students understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Students judge the validity of an argument according to whether the properties of real numbers, exponents, and logarithms have been applied correctly at each step.

Students know the laws of fractional exponents, understand exponential functions, and use these functions in problems involving exponential growth and decay.

Students use the definition of logarithms to translate between logarithms in any base.

Students understand and use the properties of logarithms to simplify logarithmic numeric expressions and to identify their approximate values.

Students determine whether a specific algebraic statement involving rational expressions, radical expressions, or logarithmic or exponential functions is sometimes true, always true, or never true.

Students demonstrate and explain how the geometry of the graph of a conic section (e.g., asymptotes, foci, eccentricity) depends on the coefficients of the quadratic equation representing it.

Given a quadratic equation of the form  $ax^2 + by^2 + cx + dy + e = 0$ , students can use the method for completing the square to put the equation into standard form and can recognize whether the graph of the equation is a circle, ellipse, parabola, or hyperbola. Students can then graph the equation.

Students use fundamental counting principles to compute combinations and permutations.

Students use combinations and permutations to compute probabilities.

Students know the binomial theorem and use it to expand binomial expressions that are raised to positive integer powers.

Students apply the method of mathematical induction to prove general statements about the positive integers.

Students find the general term and the sums of arithmetic series and of both finite and infinite geometric series.

Students derive the summation formulas for arithmetic series and both finite and infinite geometric series.

Students solve problems involving functional concepts, such as composition, defining the inverse function and performing arithmetic operations on functions.

Students use properties from number systems to justify steps in combining and simplifying functions.

Unit 1 First-Degree Equations and Inequalities

Chapter 1 Equations and Inequalities

Chapter 2 Linear Relations and Functions

Chapter 3 Systems of Equations and Inequalities

Chapter 4 Matrices

Unit 2 Quadratic, Polynomial, and Radical Equations and Inequalities

Chapter 5 Quadratic Functions and Inequalities

Chapter 6 Polynomial Functions

Chapter 7 Radical Equations and Inequalities

Unit 3 Advanced Functions and Relations

Chapter 8 Rational Expressions and Equations

Chapter 9 Exponential and Logarithmic Relations

Chapter 10 Conic Sections

Unit 4 Advanced Expressions and Data Analysis

Chapter 11 Sequences and Series

Chapter 12 Probability and Statistics

Unit 5 Trigonometry

Chapter 13 Trigonometric Functions

Chapter 14 Trigonometric Graphs and Identities

### \* Key Assignments

Unit by unit problem set and Unit tests.

Written exams: Chapter quizzes, comprehensive midterm/final.

Applied concepts projects as determined by teacher.

### \* Instructional Methods and/or Strategies

College Model of Education: Personalized Learning Model emphasizes independent study while attending Resource Center classes twice weekly. Students may choose

to meet weekly with their Personalized Learning Teacher and/or Highly Qualified Teacher instead. The same instructional methods are used in either case.

\*Direct Instruction

\*Project/Group Work

\*On-line/interactive instruction

- Presentation: Concepts are introduced, explained, and demonstrated during weekly class/teacher (Personalized Learning and Highly Qualified) meetings.

Following the information, corresponding questions, writing assignments, and activities are given to evaluate comprehension.

- Discussion: Students analyze, discuss, and respond to issues and ideas stimulated by presentations and readings. Students work in small groups or one-on-one whenever possible to increase participation.

- Oral Presentation: Students present information during weekly class meetings both formally and informally. Presentations include Power Point, debate, and discussion, and always include an outline or handout and audio-visual aides.

- Library/Internet Research: Students research topics that are relevant to the reading assignments and give written and oral reports of their findings.

### \* Assessment Methods and/or Tools

- Attendance at Resource Center Class twice weekly OR weekly review of work



by Personalized Learning Teacher/Highly Qualified Teacher

- Oral presentations
- Discussions: classroom participation and small group work. If not enrolled in Resource Center class then weekly discussions with Personalized Learning Teacher/Highly Qualified Teacher.
- Weekly homework assignments
- Chapter/Unit tests
- Comprehensive midterm/final

Assessment tools may also include the following:

- Participation in weekly lab activity with graded lab manual (science courses)
- Student demonstrations
- Student work samples
- Research Projects
- Projects: Power Point Presentation, brochures, community service, etc.

Exams, homework assignments, discussions, oral presentations, and writing assignments are used to assess student progress. All work is corrected by the course instructor and/or Personalized Learning Teacher/Highly Qualified Teacher.

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