

## Algebra II

The standards below outline the content for a one-year course in Algebra II. Students enrolled in Algebra II are assumed to have mastered those concepts outlined in the Algebra I standards. All students preparing for postsecondary and advanced technical studies are expected to achieve the Algebra II standards. A thorough treatment of advanced algebraic concepts will be provided through the study of functions, “families of functions,” equations, inequalities, systems of equations and inequalities, polynomials, rational and radical equations, complex numbers, and sequences and series. Emphasis will be placed on practical applications and modeling throughout the course of study. Oral and written communication concerning the language of algebra, logic of procedures, and interpretation of results should also permeate the course.

These standards include a transformational approach to graphing functions. Transformational graphing uses translation, reflection, dilation, and rotation to generate a “family of graphs” from a given graph and builds a strong connection between algebraic and graphic representations of functions. Students will vary the coefficients and constants of an equation, observe the changes in the graph of the equation, and make generalizations that can be applied to many graphs.

Graphing utilities (graphing calculators or computer graphing simulators), computers, spreadsheets, and other appropriate technology tools will be used to assist in teaching and learning. Graphing utilities enhance the understanding of realistic applications through mathematical modeling and aid in the investigation and study of functions. They also provide an effective tool for solving and verifying solutions to equations and inequalities. Any other available technology that will enhance student learning should be used.

### Expressions and Operations

- AII.1 The student, given rational, radical, or polynomial expressions, will
- add, subtract, multiply, divide, and simplify rational algebraic expressions;
  - add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents;
  - write radical expressions as expressions containing rational exponents and vice versa; and
  - factor polynomials completely.
- AII.2\* The student will investigate and apply the properties of arithmetic and geometric sequences and series to solve real-world problems, including writing the first  $n$  terms, finding the  $n^{\text{th}}$  term, and evaluating summation formulas. Notation will include  $\Sigma$  and  $a_n$ .  
\*Standard AII.2 will be assessed in the Functions and Statistics reporting category. (Revised March 2011)
- AII.3 The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of  $i$ , and identify field properties that are valid for the complex numbers.

### Equations and Inequalities

- AII.4 The student will solve, algebraically and graphically,
- absolute value equations and inequalities;
  - quadratic equations over the set of complex numbers;
  - equations containing rational algebraic expressions; and
  - equations containing radical expressions.
- Graphing calculators will be used for solving and for confirming the algebraic solutions.
- AII.5 The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. Graphing calculators will be used as a tool to visualize graphs and predict the number of solutions.

## Functions

- AII.6 The student will recognize the general shape of function (absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic) families and will convert between graphic and symbolic forms of functions. A transformational approach to graphing will be employed. Graphing calculators will be used as a tool to investigate the shapes and behaviors of these functions.
- AII.7 The student will investigate and analyze functions algebraically and graphically. Key concepts include
- a) domain and range, including limited and discontinuous domains and ranges;
  - b) zeros;
  - c)  $x$ - and  $y$ -intercepts;
  - d) intervals in which a function is increasing or decreasing;
  - e) asymptotes;
  - f) end behavior;
  - g) inverse of a function; and
  - h) composition of multiple functions.
- Graphing calculators will be used as a tool to assist in investigation of functions.
- AII.8 The student will investigate and describe the relationships among solutions of an equation, zeros of a function,  $x$ -intercepts of a graph, and factors of a polynomial expression.

## Statistics

- AII.9 The student will collect and analyze data, determine the equation of the curve of best fit, make predictions, and solve real-world problems, using mathematical models. Mathematical models will include polynomial, exponential, and logarithmic functions.
- AII.10 The student will identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations.
- AII.11 The student will identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard normal curve.
- AII.12 The student will compute and distinguish between permutations and combinations and use technology for applications.