STAFFORD COUNTY PUBLIC SCHOOLS

Curriculum Overview
Advanced Algebra II

Course Description:

Advanced mathematics courses prepare students for the following courses: Dual Enrollment Calculus, Advanced Placement Calculus AB and BC, International Baccalaureate Math Studies, and International Baccalaureate Mathematics. The Advanced curriculum provides highly motivated and academically gifted students a program that challenges them. Advanced mathematics courses are designed for gifted mathematics students who have exhibited exceptional performance in their previous mathematics class and demonstrated the readiness to accept the challenge of a rigorous academic course.

Advanced Algebra II is an enriched Algebra II curriculum. A thorough treatment of advanced algebraic concepts is provided through the study of functions, "families of functions," equations, inequalities, systems of equations and inequalities, polynomials, rational expressions, complex numbers, matrices, and sequences and series. In addition, this course includes the study of step functions, natural logarithms, determinants, and conic sections. 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 also should permeate the course.

This course is designed for students who have completed middle school Algebra I and Advanced Geometry. This course is taught in a more mathematically rigorous manner and at an accelerated pace.

Students who complete this course will take the Standards of Learning Algebra II test. Students who successfully complete this course may take Math Analysis with Trigonometry.

Essential Skills/Processes:

Algebra has its own language. The vocabulary and symbols are very important to a student's understanding of algebraic concepts. Students will use mathematical skills, symbols, and vocabulary to read and communicate about algebra. Students will apply algebraic concepts in solving practical problems.

The development of problem solving skills and logical reasoning is a major goal of the mathematics program at every level. Students will develop a wide range of mathematical skills and strategies for understanding and solving a variety of problem types.

Technology is an important tool in both learning mathematics and solving problems in mathematics. To use technology appropriately and effectively, students must know the basic facts, understand concepts, and be able to estimate and reason logically. 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.

Essential Knowledge:

Expressions and Operations (13 items)

- 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
- Factor polynomials completely
- 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 (13 items)

- Solve, algebraically and graphically, absolute value equations and inequalities
- Solve, algebraically and graphically, quadratic equations over the set of complex numbers
- Solve, algebraically and graphically, equations containing rational algebraic expressions
- Solve, algebraically and graphically, equations containing radical expressions

Graphing calculators will be used for solving and for confirming the algebraic solutions.

- 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 and Statistics (24 items)

- 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^{th} term, and evaluating summation formulas. Notation will include $\sum$ and *a*
- 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.

- Investigate and analyze functions algebraically and graphically to determine domain and range, including limited and discontinuous domains and ranges; zeros; *x*- and *y*-intercepts; intervals in which a function is increasing or decreasing; asymptotes; end behavior; inverse of a function; and composition of multiple functions

Graphing calculators will be used as a tool to assist in investigation of functions.

- Investigate and describe the relationships between solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression
- 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.

- Identify, create, and solve real-world problems involving inverse variation, joint variation, and a combination of direct and inverse variations
- Identify properties of a normal distribution and apply those properties to determine probabilities associated with areas under the standard normal curve
- Compute and distinguish between permutations and combinations and use technology for applications

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Resources:

- Stafford County Public Schools: http://stafford.schoolfusion.us/
- High School Course Catalog: http://stafford.schoolfusion.us/ and click on "For Parents/Students".
- VA Mathematics Standards of Learning: http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/index.shtml
- School Report Card (VA Department of Education): http://www.doe.virginia.gov/statistics_reports/school_report_card/index.shtml
- Holt McDougal textbook: http://www.classzone.com/cz/books/algebra_2_2011_na/book_home.htm?state=VA