IDAHO CONTENT STANDARDS
ALGEBRA II
MATHEMATICS

Students are expected to know content and apply skills from Algebra I and prior math courses.

Mathematical reasoning and problem solving processes will be incorporated throughout all mathematics standards. When solving problems, students should think ahead about a strategy, form conjectures, test ideas with special cases, try different approaches, check for errors and reasonableness of solutions as a regular part of routine work, and devise independent ways to verify results. Students will demonstrate knowledge and communicate mathematical thinking through words, numbers, symbols, charts, graphs, tables, diagrams, and models.

Objectives provide the focus for this course. They will be taught using a variety of methods and applications so that students attain a deep understanding of these concepts and are able to apply them to solve contextual situations.

Skill Statements provide clarity and direction to achieve each objective. Students need to demonstrate proficiency in these skills upon completion of this course.

The appropriate use of technological tools is encouraged to assist students in solving problems and the formation and testing of conjectures.

Standard 1: Number and Operation

Goal 1.1: Understand numbers, ways of representing numbers, relationships among numbers, and number system.

Objective(s): By the end of Algebra II, the student will be able to:

AII.1.1.1 Compare and contrast the properties of numbers and number systems within the complex number system to include rational, irrational, and imaginary numbers and factorials.

Skill Statements:

a. Define and explain the meaning of i as a solution to the equation $x^2 = -1$.
b. Identify expressions of the form $a + bi$ as complex numbers.
c. Identify complex conjugates.
d. Demonstrate the meaning of $x!$.

AII.1.1.2 Demonstrate meaning of complex numbers as solutions to polynomial equations that do not have real solutions.

Skill Statements:

a. Identify real and imaginary roots for polynomial equations.

AII.1.1.3 Recognize matrices as a method of arranging data.

Skill Statement:

a. Identify the dimensions of a matrix.

AII.1.1.4 Develop an understanding of the properties of logarithmic expressions and expressions with rational exponents.

Skill Statements:

a. Identify a logarithmic function as the inverse of an exponential function.
b. Convert between expressions containing radical form and those containing rational exponents.

Goal 1.2: Understand meanings of operations and how they relate to one another.

Objective(s): By the end of Algebra II, the student will be able to:

AII.1.2.1 Develop an understanding of the properties of, and representations for, the addition, subtraction, and multiplication of matrices.

Skill Statement:

a. Identify which real number properties apply to matrices.

Goal 1.3: Compute fluently and make reasonable estimates.

Objective(s): By the end of Algebra II, the student will be able to:

AII.1.3.1 Simplify expressions within the complex number system.

Skill Statements:

a. Simplify rational expressions, expressions with rational exponents, and logarithmic expressions.
b. Simplify and estimate radical expressions having various indices.
c. Express the square root of a negative number in the form *bi*, where *b* is real.
d. Simplify complex fractions.
e. Convert between radical expressions andexpressions with rational exponents.
f. Use properties of logarithms to evaluate and simplify logarithmic expressions.

AII.1.3.2 Perform computations on expressions ~~with matrices~~ <u>within the complex number system</u>.

Skill Statements:

a. Perform operations with matrices to include scalar multiplication, addition, subtraction, and matrix multiplication (2 by 2).
b. Add, subtract, and multiply radical expressions and expressions containing rational exponents.
c. Use long division or synthetic division to divide a polynomial by a lower degree polynomial.
d. Add, subtract, multiply, and divide rational expressions.
e. Perform computations ~~with complex numbers~~ in the complex number system.

Standard 2: Concepts and Principles of Measurement

Goal 2.1: Understand measurable attributes of objects and the units, systems, and processes of measurement.

Objective(s): By the end of Algebra II, the student will be able to:

AII.2.1.1 Recognize the relationship between radian and degree measures.

Skill Statements:
a. Convert between degree and radian measures.

Goal 2.2: Apply appropriate techniques, tools, and formulas to determine measurements.

Objective(s): By the end of Algebra II, the student will be able to:

No objectives at this course level.

Suggested Vocabulary and Symbols
radian measure

Standard 3: Concepts and Language of Algebra and Functions

Goal 3.1: Understand patterns, relations, and functions.

Objective(s): By the end of Algebra II, the student will be able to:

AII.3.1.1 Represent patterns and functional relationships in a table and as a graph.

Skill Statements:
a. Graph absolute value functions.
b. Graph quadratic equations and inequalities.
c. Graph polynomial functions.
d. Graph exponential functions.

e. Graph circles.

AII.3.1.2 Describe the graphs of polynomial and absolute value functions and discuss their attributes in terms of the basic concepts of maximum, minimum, intercepts, and roots.

Skill Statements:

a. Determine the nature of the roots of an equation by using the discriminant.
b. Recognize contexts in which quadratic models are appropriate.
c. Identify the graphs of absolute value functions and identify their key characteristics.
d. Identify a polynomial function by its degree.
e. Identify the graphs of polynomial functions.
f. Relate the solutions of polynomial functions to the points where the graphs cross the x-axis.

Goal 3.2: Represent and analyze mathematical situations and structures using algebraic symbols.

Objective(s): By the end of Algebra II, the student will be able to:

AII.3.2.1 Write equations and inequalities in multiple forms.

Skill Statement:

a. Rewrite equations of parabolas and circles in standard form.

AII.3.2.2 Recognize and generate equivalent forms of algebraic expressions and solve equations, inequalities, and systems of equations and inequalities.

Skill Statements:

a. Solve systems of linear equations and linear inequalities.
b. Solve radical equations and inequalities.
c. Solve rational equations.
d. Solve logarithmic equations.
e. Solve equations containing a variable in the exponent.
f. Use the quadratic formula, factoring, and completing the square to solve ~~any~~ quadratic equations.
g. Find all roots of polynomial~~s~~ functions using various methods.

Goal 3.3: Use mathematical models to represent and understand quantitative relationships.

Objective(s): By the end of Algebra II, the student will be able to:

No objectives at this course level.

Goal 3.4: Analyze change in various contexts.

Objective(s): By the end of Algebra II, the student will be able to:

AII.3.4.1 Interpret how changes to an equation affect the parent graph of the equation.

Skill Statements:

a. Compare and contrast the graphs of $f(x) = x^2$ to $f(x) = a(x-h)^2 + k$.
b. Recognize graphs of the following and how changes impact them:
$y = x,\ y = x^2, y = x^3,\ y = \frac{1}{x},\ y = \sqrt{x}$, and $y = |x|$.

Suggested Vocabulary and Symbols
complex fraction, rational expression, degree, extraneous roots, inverse, constraints, feasible region, independent variables, dependent variables, factor (verb and noun), zeros of a function, root, domain, range, coincident, consistent systems, inconsistent systems, maximum, minimum, bounded regions, unbounded regions, f(x), discriminant, linear programming, vertex form of a quadratic, synthetic division, synthetic substitution, standard form, parabola, focus of parabola, joint variation, direct variation, inverse variation, exponential growth and decay, cubic, quartic, quadratic, vertex, vertices, focus, directrix, axis of symmetry

Standard 4: Concepts and Principles of Geometry

Goal 4.1 Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Objective(s): By the end of Algebra II, the student will be able to:

AII.4.1.1 Use trigonometric relationships to determine lengths and angle measures.

Skill Statements:

a. Demonstrate the proper use of the Law of Sines and the Law of Cosines to solve triangles.

Goal 4.2 Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

AII.4.2.1 Analyze the graphs of circles and parabolas.

Skill Statement:

a. Graph circles and parabolas and their transformations.

Goal 4.3: Apply transformations and use symmetry to analyze mathematical situations.

No objectives at this course level.

Goal 4.4: Use visualization, spatial reasoning, and geometric models to solve problems.

No objectives at this course level.

Suggested Vocabulary and Symbols
sine, cosine, tangent, secant, cosecant, cotangent

Standard 5: Data Analysis, Probability, and Statistics

No objectives at this course level.