Math - Algebra II

Idaho Department of Education Content Standards	Objective	Sub Objectives	Task Analysis	Essential Vocabulary	Assessment	Resources
Cognitive level codes: • B: Memorize • C: Perform procedures • D: Demonstrate understanding • E: Conjecture, generalize, prove • F: Solve non-routine problems, make connections	Bloom's Equivalent • B = Knowledge • C = Comprehension • D = Comprehension • E = Application and Analysis • F = Synthesis	Calculator codes: NO: student MUST NOT have a calculator while completing this item in order to assess this objective.				General Resource: Math.com, wolframalpha.com webmath.com (click algebra tab) sosmath.com
Standard 1: Number and Operation						
Goal 1.1: Understand numbers, ways of representing numbers, relationships among numbers, and number systems.	• 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.		• Define and explain the meaning of *i* s a solution to the equation $x^2 = -1$. -the square root of -1 is the basis of the imaginary number system. • Identify expressions of the form a + b*i* as complex numbers. - Every real number, a, is a complex number expressed as a + 0*i*. -Identify the real element and the imaginary element of a complex number. • Identify complex conjugates • Demonstrate the meaning of x! - Evaluate factorials with and without calculators.	real number • imaginary number • complex number • rectangular form (a+bi) • conjugates • factorial	• Simplify $\sqrt{-9}$ • Rewrite (1+3i)/9 in rectangular form • Rewrite 6 in rectangular form • Identify the complex conjugate of (3-7i) • Expand 5! • Simplify (5!)/(3!)	
	• AII.1.1.2 Demonstrate meaning of complex numbers as solutions to polynomial equations that do not have real solutions.		• Identify real and imaginary roots for polynomial equations. -Simplify those roots with negative radicands	radicand • roots	• Solve $x^2 + 5 = 0$ • Solve $x^2 + 2x + 5 = 0$ • Solve $x^3 - x^2 + 25x - 25 = 0$	
	• AII.1.1.3 Recognize matrices as a method of arranging data.		• Identify the dimensions of a matrix.	matrix • row • column		
	• AII 1.1.4 Develop an understanding of the properties of logarithmic expressions and expressions with rational exponents.		• Identify a logarithmic function as the inverse of an exponential function. -Identify logarithmic and exponential functions graphically. -Define *e* • Apply the laws of exponents to algebraic expressions, including those involving rational and negative exponents, to order and rewrite them in alternative forms. - i.e. $z^{\frac{2}{3}} = \sqrt[3]{z^2} = \left(\sqrt[3]{z}\right)^2, \frac{a^{-4}}{b^3} = \frac{1}{a^4 b^3}$	inverse function • logarithmic function • exponential function • logarithm base • rational exponent	• Rewrite $\text{Log}_x 8=3$ as an exponential function • Rewrite $\sqrt[3]{x^2}$ as an expression with a rational exponent • Find the inverse of LN X+1 = Y	math.com/tables/algebra/exponents.htm
Goal 1.2: Understand meanings of operations and how they relate to one another.	• AII 1.2.1 Develop an understanding of the properties of, and representations for, the addition, subtraction, and multiplication of matrices.		• Identify which properties of real numbers apply to matrices.		• Let A and B be any two different 2x2 matrices. • Show that A + B = B + A • Show A(B+C) = AB + AC • Show that $AB \neq BA$ • Show A - B ≠ B - A • Show A(B+C) ≠ (B+C)A • Show A(BC) = (AB)C • Show (A+B)C = AC + BC	

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Goal 1.3: Compute fluently and make reasonable estimates.	• AII.1.3.1 Simplify expressions within the complex number system.		• Simplify rational expressions, expressions with rational exponents, and logarithmic expressions. -Simplify rational expressions containing monomials in the numerator and denominator. -Simplify rational expressions that contain polynomials in the numerator and denominator that require factoring. - Simplify complex fractions. • Simplify and estimate radical expressions having various indices. • Express the square root of a negative number in the form *bi*, where *b* is real. • Simplify rational expressions containing complex numbers. • Use properties of logarithms to simplify logarithmic expressions. -Expand single logarithmic expressions. -Write expanded logarithmic expressions as single logarithmic expressions. -Apply change of base formula to convert a logarithmic expression to an appropriate base.	indices • rational exponent • rational expression • logarithm • complex fraction	• Simplify x^2/x, x/x^3 • Simplify $(x^2+2x+1)/(x^2+4x+3)$ • Simplify $(x^2+x)/(x+1)$ • Simplify $\sqrt{-4}$, $\sqrt{-5}$, $\sqrt{-32}$ • Simplify $\sqrt[4]{n^2}$, $\sqrt[3]{n^4}$, $\sqrt[4]{16}$, $\sqrt{x^2+4x+4}$, $\sqrt[4]{32}$, $\sqrt[3]{24x^5y^3}$ • Expand LN $x^{1/2}y^3$ • Condense 3(LN3 - LNx)+(LNx - LN9) • Use change of base to approximate $\text{Log}_2 5$ to the nearest thousandth.	
	• AII 1.3.2 Perform computations on expressions within the complex number system.		• Perform operations with matrices to include scalar multiplication, addition, subtraction, and matrix multiplication (2 by 2). • Add, subtract, and multiply radical expressions and expressions containing rational exponents. • Use long division or synthetic division to divide a polynomial by a lower degree polynomial. • Add and subtract rational expressions with and without common denominators. • Multiply and divide rational expressions. - Recognize the difference between a factor and a term when simplifying rational expressions.	scalar • radical expression • synthetic division • degree of a polynomial • factors • terms • like radical expressions		
Standard 2: Concepts and Principles of Measurement						
Goal 2.1: Understand measurable attributes of objects and the units, systems, and processes of measurement.	• AII.2.1.1 Recognize the relationship between radian and degree measures.		• Convert between degree and radian measures.	degree • radian		
Goal 2.2: Apply appropriate techniques, tools, and formulas to determine measurements.	No objectives at this course level.					
Standard 3: Concepts and Language of Algebra and Functions						
Goal 3.1: Understand patterns, relations, and functions.	• AII.3.1.1. Represent patterns and functional relationships in a table and as a graph.		• Graph absolute value functions. • Graph quadratic equations and inequalities. • Graph polynomial functions. - Determine end behavior and x- and y-intercepts. • Graph exponential functions. • Graph circles. - Identify the coordinates of the center and determine the length of the radius. • Graph functions by plotting points. • Determine domain and range using algebraic and graphing techniques.	absolute value function • quadratic function • domain • range • end behavior	• State the domain and range, and sketch the graph: $Y = \|x-2\|+1$ $Y = x^2 + 4x - 1$ $Y \geq 2x^2 - 10x + 3$ $Y = x^3 - 2x + 1$ $Y = \%e^{x-1}$ $X^2 + y^2 = 9$ $Y = -\sqrt{4-x^2}$	

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	• 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.		• Determine the nature of the roots of an equation by using the discriminant. • Recognize contexts in which quadratic models are appropriate. i.e. height as a function of time; the relationship between the length of a side of a cube and its surface area. • Identify the graphs of absolute value functions and identify their key characteristics. • Determine the degree of a polynomial function. • Determine the vertex and axis of symmetry of a quadratic function. • Identify the graphs of polynomial functions. i.e. parent graphs • Find the x- and y-intercepts for applicable functions.	x- and y-intercepts • zeros • discriminant • polynomial function • parent graph • vertex • axis of symmetry	• Use the discriminant or any other method to determine if $y = x^2 + 5x + 3$ has any x-intercepts. • Find the max height attained by a baseball thrown upwards (vertically) from an initial height of 3 feet and initial velocity of 60 f/s. • Find the vertex of $y = \|x + 7\| - 2$ • Find the vertex and axis of symmetry of $y = 3x^2 + 12x - 7$ • What is the degree of $y = 7 - 3x^4 + 7x - 10x^2$ • Find the x & y intercept of: $y = x^2 - 5x + 1$ $y = \|x-2\| - 3$	
	AII 3.1.3. Perform operations on functions including composition of functions and finding inverse functions.		A. Combine functions by addition, subtraction, multiplication, and division. B. Determine the composition of two functions, including any necessary restrictions on the domain. C. Determine and graph the inverse relation of a function. - Determine if the inverse relation is a function.	composition of functions • inverse relation • inverse function		
Goal 3.2: Represent and analyze mathematical situations and structures using algebraic symbols.	• AII.3.2.1. Write equations and inequalities in multiple forms.		• Rewrite equations of parabolas and circles in standard form by completing the square as necessary. i.e. Use different forms of the function to extract information. For parabolas: $y = x^2 - 6x + 8$ makes the y-intercept obvious, $y = (x - 2)(x - 4)$ provides access to the zeros, and $y = (x - 3)^2 - 1$ makes it easy to find the vertex and sketch the graph.	perfect square trinomial • complete the square • vertex form: $y = a(x-h)^2 + k$	• Write $y = 3x^2 - 12x + 7$ in vertex form by completing the square.	
	• AII.3.2.2. Recognize and generate equivalent forms of algebraic expressions and solve equations, inequalities, and systems of equations and inequalities.		• Solve systems of linear equations by graphing and algebraic processes. - Determine the number of solutions for a system of equations. • Solve systems of linear inequalities by graphing. • Determine if an ordered pair satisfies a system of linear equations or inequalities. • Solve radical equations and inequalities. - Determine the domain and range of radical equations. - Determine if extraneous solutions exist. • Solve rational equations. - Determine the domain and range of rational equations. - Determine if extraneous solutions exist. • Solve logarithmic equations. • Solve equations containing a variable in the exponent. • Use the quadratic formula, factoring, and completing the square to solve quadratic equations. • Determine a single variable quadratic equation given its solutions.	systems of equations • radical equations • extraneous solutions • quadratic formula		

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Goal 3.3: Use mathematical models to represent and understand quantitative relationships.	No objectives at this course level.					
Goal 3.4: Analyze change in various contexts.	• AII.3.4.1. Interpret how changes to an equation effect the parent graph of the equation.		• Compare and contrast the graphs of $f(x) = x^2$ to $f(x) = a(x-h)^2 + k$. • Recognize graphs of the following: $y = x, y = x^2, y = \frac{1}{x}, y = \sqrt{x}, y = \lvert x \rvert.$ • Identify vertical and horizontal translations and reflections about the x-axis.	translation • reflection		
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.	• AII.4.1.1 Use trigonometric relationships to determine lengths and angle measures.		• Solve right triangles using the Pythagorean theorem and trigonometric ratios. • Demonstrate the proper use of the Law of Sines and the Law of Cosines to solve triangles.	sine • cosine • tangent • secant • cosecant • cotangent		
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.		• 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.					
Standard 5: Data Analysis, Probability, and Statistics						
	No objectives at this course level.					