**ALGEBRA I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**expressions and operations**

**# of items: 12**

***Essential Knowledge Skills and Processes – At a Glance***

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| **A.1** |
|
| 1. Translate verbal quantitative situations into algebraic expressions and vice versa. |
| 1. Model real-world situations with algebraic expressions in a variety of representations (concrete, pictorial, symbolic, verbal). |
| 1. Evaluate algebraic expressions for a given replacement set to include rational numbers. |
| 1. Evaluate expressions that contain absolute value, square roots, and cube roots. |

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| **A.2a-c** |
|
| 1. Simplify monomial expressions and ratios of monomial expressions in which the exponents are integers, using the laws of exponents. |
| 1. Model sums, differences, products, and quotients of polynomials with concrete objects and their related pictorial representations. |
| 1. Relate concrete and pictorial manipulations that model polynomial operations to their corresponding symbolic representations. |
| 1. Find sums and differences of polynomials. |
| 1. Find products of polynomials. The factors will have no more than five total terms (i.e. (4*x*+2)(3*x*+5) represents four terms and (*x*+1)(2*x*2 +*x*+3) represents five terms). |
| 1. Find the quotient of polynomials, using a monomial or binomial divisor, or a completely factored divisor. |
| 1. Factor completely first- and second-degree polynomials with integral coefficients. |
| 1. Identify prime polynomials. |
| 1. Use the *x*-intercepts from the graphical representation of the polynomial to determine and confirm its factors. |

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***page 2 of 2***

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| **A.3** |
|
| 1. Express square roots of a whole number in simplest form. |
| 1. Express the cube root of a whole number in simplest form. |
| 1. Express the principal square root of a monomial algebraic expression in simplest form where variables are assumed to have positive values. |

**ALGEBRA I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**equations and inequalities**

**# of items: 18**

***Essential Knowledge Skills and Processes – At a Glance***

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| **A.4a-f** |
|
| 1. Solve a literal equation (formula) for a specified variable. |
| 1. Simplify expressions and solve equations, using the field properties of the real numbers and properties of equality to justify simplification and solution. |
| 1. Solve quadratic equations. |
| 1. Identify the roots or zeros of a quadratic function over the real number system as the solution(s) to the quadratic equation that is formed by setting the given quadratic expression equal to zero. |
| 1. Solve multistep linear equations in one variable. |
| 1. Confirm algebraic solutions to linear and quadratic equations, using a graphing calculator. |
| 1. Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to find the ordered pair which satisfies both equations. |
| 1. Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection. |
| 1. Determine whether a system of two linear equations has one solution, no solution, or infinite solutions. |
| 1. Write a system of two linear equations that models a real-world situation. |
| 1. Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a real-world situation. |
| 1. Determine if a linear equation in one variable has one, an infinite number, or no solutions.† |

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**Algebra i *page 2 of 2* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **A.5a-d** |
|
| 1. Solve multistep linear inequalities in one variable. |
| 1. Justify steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers. |
| 1. Solve real-world problems involving inequalities. |
| 1. Solve systems of linear inequalities algebraically and graphically. |

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| **A.6a-b** |
|
| 1. Graph linear equations and inequalities in two variables, including those that arise from a variety of real-world situations. |
| 1. Use the parent function *y* = *x* and describe transformations defined by changes in the slope or *y*-intercept. |
| 1. Find the slope of the line, given the equation of a linear function. |
| 1. Find the slope of a line, given the coordinates of two points on the line. |
| 1. Find the slope of a line, given the graph of a line. |
| 1. Recognize and describe a line with a slope that is positive, negative, zero, or undefined. |
| 1. Use transformational graphing to investigate effects of changes in equation parameters on the graph of the equation. |
| 1. Write equation of a line when given the graph of a line. |
| 1. Write an equation of a line when given two points on the line whose coordinates are integers. |
| 1. Write an equation of a line when given the slope and a point on the line whose coordinates are integers. |
| 1. Write an equation of a vertical line as *x* = a. |
| 1. Write the equation of a horizontal line as *y* = *c*. |

**ALGEBRA I Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Functions and statistics**

**# of items: 20**

***Essential Knowledge Skills and Processes – At a Glance***

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| **A.7a-f** |
|
| 1. Solve a literal equation (formula) for a specified variable. |
| 1. Simplify expressions and solve equations, using the field properties of the real numbers and properties of equality to justify simplification and solution. |
| 1. Solve quadratic equations. |
| 1. Identify the roots or zeros of a quadratic function over the real number system as the solution(s) to the quadratic equation that is formed by setting the given quadratic expression equal to zero. |
| 1. Solve multistep linear equations in one variable. |
| 1. Confirm algebraic solutions to linear and quadratic equations, using a graphing calculator. |
| 1. Given a system of two linear equations in two variables that has a unique solution, solve the system by substitution or elimination to find the ordered pair which satisfies both equations. |
| 1. Given a system of two linear equations in two variables that has a unique solution, solve the system graphically by identifying the point of intersection. |
| 1. Determine whether a system of two linear equations has one solution, no solution, or infinite solutions. |
| 1. Write a system of two linear equations that models a real-world situation. |
| 1. Interpret and determine the reasonableness of the algebraic or graphical solution of a system of two linear equations that models a real-world situation. |
| 1. Determine if a linear equation in one variable has one, an infinite number, or no solutions.† |

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**Algebra i *page 2 of 2* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **A.5a-d** |
|
| 1. Solve multistep linear inequalities in one variable. |
| 1. Justify steps used in solving inequalities, using axioms of inequality and properties of order that are valid for the set of real numbers. |
| 1. Solve real-world problems involving inequalities. |
| 1. Solve systems of linear inequalities algebraically and graphically. |

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| **A.6a-b** |
|
| 1. Graph linear equations and inequalities in two variables, including those that arise from a variety of real-world situations. |
| 1. Use the parent function *y* = *x* and describe transformations defined by changes in the slope or *y*-intercept. |
| 1. Find the slope of the line, given the equation of a linear function. |
| 1. Find the slope of a line, given the coordinates of two points on the line. |
| 1. Find the slope of a line, given the graph of a line. |
| 1. Recognize and describe a line with a slope that is positive, negative, zero, or undefined. |
| 1. Use transformational graphing to investigate effects of changes in equation parameters on the graph of the equation. |
| 1. Write equation of a line when given the graph of a line. |
| 1. Write an equation of a line when given two points on the line whose coordinates are integers. |
| 1. Write an equation of a line when given the slope and a point on the line whose coordinates are integers. |
| 1. Write an equation of a vertical line as *x* = a. |
| 1. Write the equation of a horizontal line as *y* = *c*. |

**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**reasoning, lines, and transformations**

**# of items: 18**

***Essential Knowledge Skills and Processes – At a Glance***

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| **G.1a-d** |
|
| 1. Identify the converse, inverse, and contrapositive of a conditional statement. |
| 1. Translate verbal arguments into symbolic form, such as (*p* → *q*) and (~*p* → ~*q*). |
| 1. Determine the validity of a logical argument. |
| 1. Use valid forms of deductive reasoning, including the law of syllogism, the law of the contrapositive, the law of detachment, and counterexamples. |
| 1. Select and use various types of reasoning and methods of proof, as appropriate. |
| 1. Use Venn diagrams to represent set relationships, such as intersection and union. |
| 1. Interpret Venn diagrams. |
| 1. Recognize and use the symbols of formal logic, which include →, ↔, ~, , , and . |

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| **G.2a-c** |
|
| 1. Use algebraic and coordinate methods as well as deductive proofs to verify whether two lines are parallel. |
| 1. Solve problems by using the relationships between pairs of angles formed by the intersection of two parallel lines and a transversal including corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles. |
| 1. Solve real-world problems involving intersecting and parallel lines in a plane. |

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**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **G.3a-d** |
|
| 1. Find the coordinates of the midpoint of a segment, using the midpoint formula. |
| 1. Use a formula to find the slope of a line. |
| 1. Compare the slopes to determine whether two lines are parallel, perpendicular, or neither. |
| 1. Determine whether a figure has point symmetry, line symmetry, both, or neither. |
| 1. Given an image and preimage, identify the transformation that has taken place as a reflection, rotation, dilation, or translation. |
| 1. Apply the distance formula to find the length of a line segment when given the coordinates of the endpoints. |

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| **G.4a-g** |
|
| 1. Construct and justify the constructions of 2. a line segment congruent to a given line segment; 3. the perpendicular bisector of a line segment; 4. a perpendicular to a given line from a point not on the line; 5. a perpendicular to a given line at a point on the line; 6. the bisector of a given angle; 7. an angle congruent to a given angle; and 8. a line parallel to a given line through a point not on the given line. |
| 1. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.† |
| 1. Construct the inscribed and circumscribed circles of a triangle.† |
| 1. Construct a tangent line from a point outside a given circle to the circle.† |

**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**triangles**

**# of items: 14**

***Essential Knowledge Skills and Processes – At a Glance***

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| **G.5a-d** |
|
| 1. Order the sides of a triangle by their lengths when given the measures of the angles. |
| 1. Order the angles of a triangle by their measures when given the lengths of the sides. |
| 1. Given the lengths of three segments, determine whether a triangle could be formed. |
| 1. Given the lengths of two sides of a triangle, determine the range in which the length of the third side must lie. |
| 1. Solve real-world problems given information about the lengths of sides and/or measures of angles in triangles. |

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| **G.6** |
|
| 1. Use definitions, postulates, and theorems to prove triangles congruent. |
| 1. Use coordinate methods, such as the distance formula and the slope formula, to prove two triangles are congruent. |
| 1. Use algebraic methods to prove two triangles are congruent. |

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| **G.7** |
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| 1. Use definitions, postulates, and theorems to prove triangles similar. |
| 1. Use algebraic methods to prove that triangles are similar. |
| 1. Use coordinate methods, such as the distance formula, to prove two triangles are similar. |

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**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **G.8** |
|
| 1. Determine whether a triangle formed with three given lengths is a right triangle. |
| 1. Solve for missing lengths in geometric figures, using properties of 45°-45°-90° triangles. |
| 1. Solve for missing lengths in geometric figures, using properties of 30°-60°-90° triangles. |
| 1. Solve problems involving right triangles, using sine, cosine, and tangent ratios. |
| 1. Solve real-world problems, using right triangle trigonometry and properties of right triangles. |
| 1. Explain and use the relationship between the sine and cosine of complementary angles.† |

**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**polygons, circles, and three-dimensional figures**

**# of items: 18**

***Essential Knowledge Skills and Processes – At a Glance***

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| **G.9** |
|
| 1. Solve problems, including real-world problems, using the properties specific to parallelograms, rectangles, rhombi, squares, isosceles trapezoids, and trapezoids. |
| 1. Prove that quadrilaterals have specific properties, using coordinate and algebraic methods, such as the distance formula, slope, and midpoint formula. |
| 1. Prove the characteristics of quadrilaterals, using deductive reasoning, algebraic, and coordinate methods. |
| 1. Prove properties of angles for a quadrilateral inscribed in a circle.† |

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| **G.10** |
|
| 1. Solve real-world problems involving the measures of interior and exterior angles of polygons. |
| 1. Identify tessellations in art, construction, and nature. |
| 1. Find the sum of the measures of the interior and exterior angles of a convex polygon. |
| 1. Find the measure of each interior and exterior angle of a regular polygon. |
| 1. Find the number of sides of a regular polygon, given the measures of interior or exterior angles of the polygon. |

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**geometry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***page 2 of 3***

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| **G.11a-c** |
|
| 1. Find lengths, angle measures, and arc measures associated with 2. two intersecting chords; 3. two intersecting secants; 4. an intersecting secant and tangent; 5. two intersecting tangents; and 6. central and inscribed angles. |
| 1. Calculate the area of a sector and the length of an arc of a circle, using proportions. |
| 1. Solve real-world problems associated with circles, using properties of angles, lines, and arcs. |
| 1. Verify properties of circles, using deductive reasoning, algebraic, and coordinate methods. |

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| **G.12** |
|
| 1. Identify the center, radius, and diameter of a circle from a given standard equation. |
| 1. Use the distance formula to find the radius of a circle. |
| 1. Given the coordinates of the center and radius of the circle, identify a point on the circle. |
| 1. Given the equation of a circle in standard form, identify the coordinates of the center and find the radius of the circle. |
| 1. Given the coordinates of the endpoints of a diameter, find the equation of the circle. |
| 1. Given the coordinates of the center and a point on the circle, find the equation of the circle. |
| 1. Recognize that the equation of a circle of given center and radius is derived using the Pythagorean Theorem.† |

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**GEometry *page 3 of 3* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **G.13** |
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| 1. Find the total surface area of cylinders, prisms, pyramids, cones, and spheres, using the appropriate formulas |
| 1. Calculate the volume of cylinders, prisms, pyramids, cones, and spheres, using the appropriate formulas. |
| 1. Solve problems, including real-world problems, involving total surface area and volume of cylinders, prisms, pyramids, cones, and spheres as well as combinations of three-dimensional figures. |
| 1. Calculators may be used to find decimal approximations for results. |

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| **G.14a-d** |
|
| 1. Compare ratios between side lengths, perimeters, areas, and volumes, given two similar figures. |
| 1. Describe how changes in one or more dimensions affect other derived measures (perimeter, area, total surface area, and volume) of an object. |
| 1. Describe how changes in one or more measures (perimeter, area, total surface area, and volume) affect other measures of an object. |
| 1. Solve real-world problems involving measured attributes of similar objects.. |

**algebra ii Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**expressions and operations**

**# of items: 13**

***Essential Knowledge Skills and Processes – At a Glance***

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| **AII.1a-d** |
|
| 1. Add, subtract, multiply, and divide rational algebraic expressions. |
| 1. Simplify a rational algebraic expression with common monomial or binomial factors. |
| 1. Recognize a complex algebraic fraction, and simplify it as a quotient or product of simple algebraic fractions. |
| 1. Simplify radical expressions containing positive rational numbers and variables. |
| 1. Convert from radical notation to exponential notation, and vice versa. |
| 1. Add and subtract radical expressions. |
| 1. Multiply and divide radical expressions not requiring rationalizing the denominators. |
| 1. Factor polynomials by applying general patterns including difference of squares, sum and difference of cubes, and perfect square trinomials. |
| 1. Factor polynomials completely over the integers. |
| 1. Verify polynomial identities including the difference of squares, sum and difference of cubes, and perfect square trinomials.† |

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**ALgebra ii Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **AII.3** |
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| 1. Recognize that the square root of –1 is represented as *i*. |
| 1. Determine which field properties apply to the complex number system. |
| 1. Simplify radical expressions containing negative rational numbers and express in a+b*i* form. |
| 1. Simplify powers of *i*. |
| 1. Add, subtract, and multiply complex numbers. |
| 1. Place the following sets of numbers in a hierarchy of subsets: complex, pure imaginary, real, rational, irrational, integers, whole, and natural. |
| 1. Write a real number in a+b*i* form. |
| 1. Write a pure imaginary number in a+b*i* form. |

**algebra II Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**equations and inequalities**

**# of items: 13**

***Essential Knowledge Skills and Processes – At a Glance***

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| **AII.4a-d** |
|
| 1. Solve absolute value equations and inequalities algebraically and graphically. |
| 1. Solve a quadratic equation over the set of complex numbers using an appropriate strategy. |
| 1. Calculate the discriminant of a quadratic equation to determine the number of real and complex solutions. |
| 1. Solve equations containing rational algebraic expressions with monomial or binomial denominators algebraically and graphically. |
| 1. Solve an equation containing a radical expression algebraically and graphically. |
| 1. Verify possible solutions to an equation containing rational or radical expressions. |
| 1. Apply an appropriate equation to solve a real-world problem. |
| 1. Recognize that the quadratic formula can be derived by applying the completion of squares to any quadratic equation in standard form.† |

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| **AII.5** |
|
| 1. Predict the number of solutions to a nonlinear system of two equations. |
| 1. Solve a linear-quadratic system of two equations algebraically and graphically. |
| 1. Solve a quadratic-quadratic system of two equations algebraically and graphically. |

**algebra ii Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**functions and statistics**

**# of items: 24**

***Essential Knowledge Skills and Processes – At a Glance***

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| **AII.2** |
|
| 1. Distinguish between a sequence and a series. |
| 1. Generalize patterns in a sequence using explicit and recursive formulas. |
| 1. Use and interpret the notations ∑, *n*, *n*th term, and *an*. |
| 1. Given the formula, find *an* (the *n*th term) for an arithmetic or a geometric sequence. |
| 1. Given formulas, write the first *n* terms and find the sum, *Sn*, of the first *n* terms of an arithmetic or geometric series. |
| 1. Given the formula, find the sum of a convergent infinite series. |
| 1. Model real-world situations using sequences and series. |

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| **AII.6** |
|
| 1. Recognize graphs of parent functions. |
| 1. Given a transformation of a parent function, identify the graph of the transformed function. |
| 1. Given the equation and using a transformational approach, graph a function. |
| 1. Given the graph of a function, identify the parent function. |
| 1. Given the graph of a function, identify the transformations that map the preimage to the image in order to determine the equation of the image. |
| 1. Using a transformational approach, write the equation of a function given its graph. |

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**ALGEBRA II *page 2 of 4* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **AII.7a-h** |
|
| 1. Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. |
| 1. Describe restricted/discontinuous domains and ranges. |
| 1. Given the graph of a function, identify intervals on which the function is increasing and decreasing. |
| 1. Find the equations of vertical and horizontal asymptotes of functions. |
| 1. Describe the end behavior of a function. |
| 1. Find the inverse of a function. |
| 1. Graph the inverse of a function as a reflection across the line *y* = *x*. |
| 1. Investigate exponential and logarithmic functions, using the graphing calculator. |
| 1. Convert between logarithmic and exponential forms of an equation with bases consisting of natural numbers. |
| 1. Find the composition of two functions. |
| 1. Use composition of functions to verify two functions are inverses. |

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| **AII.8** |
|
| 1. Describe the relationships among solutions of an equation, zeros of a function, *x*-intercepts of a graph, and factors of a polynomial expression. |
| 1. Define a polynomial function, given its zeros. |
| 1. Determine a factored form of a polynomial expression from the x-intercepts of the graph of its corresponding function. |
| 1. For a function, identify zeros of multiplicity greater than 1 and describe the effect of those zeros on the graph of the function. |
| 1. Given a polynomial equation, determine the number of real solutions and nonreal solutions. |

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***page 3 of 4***

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| **AII.9** |
|
| 1. Collect and analyze data. |
| 1. Investigate scatterplots to determine if patterns exist and then identify the patterns. |
| 1. Find an equation for the curve of best fit for data, using a graphing calculator. Models will include polynomial, exponential, and logarithmic functions. |
| 1. Make predictions, using data, scatterplots, or the equation of the curve of best fit. |
| 1. Given a set of data, determine the model that would best describe the data. |

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| **AII.10** |
|
| 1. Translate “*y* varies jointly as *x* and *z*” as *y* = *kxz*. |
| 1. Translate “*y* is directly proportional to *x*” as *y* = *kx*. |
| 1. Translate “*y* is inversely proportional to *x*” as *y* = . |
| 1. Given a situation, determine the value of the constant of proportionality. |
| 1. Set up and solve problems, including real-world problems, involving inverse variation, joint variation, and a combination of direct and inverse variations. |

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**ALGEBRA II *page 4 of 4* Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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| **AII.11** |
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| 1. Identify the properties of a normal probability distribution. |
| 1. Describe how the standard deviation and the mean affect the graph of the normal distribution. |
| 1. Compare two sets of normally distributed data using a standard normal distribution and z-scores. |
| 1. Represent probability as area under the curve of a standard normal probability distribution. |
| 1. Use the graphing calculator or a standard normal probability table to determine probabilities or percentiles based on z-scores. |

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| **AII.12** |
|
| 1. Compare and contrast permutations and combinations. |
| 1. Calculate the number of permutations of *n* objects taken *r* at a time. |
| 1. Calculate the number of combinations of *n* objects taken *r* at a time. |
| 1. Use permutations and combinations as counting techniques to solve real-world problems. |