Honors Algebra 2 Curriculum Maps

Subject: Honors Algebra 2	Unit 1: The Number System, Functions, and Systems (Sections 1-1, 1-8, 1-9, 2-7, 2-9, 3-4, 3-5, 3-6)
Big Idea/Rationale	The skills learned in this unit will help students build a strong foundation for the remainder of this course as well as Pre-Calculus and Calculus classes. These skills will also allow students to observe patterns and relationships in science and other studies. Many real-world applications exist for systems of linear equations and inequalities such as linear programming, a method commonly used in business to find ways to maximize profit, given budget and other constraints. Students will explore the effects of transformations on families of graphs, recognizing the general principle that transformations on a graph always have the same effect regardless of the type of underlying function.
Enduring Understanding (Mastery Objective)	• Understanding subsets of real numbers and ways to express them is critical in the study of Algebra. • Functions describe the relationship between a set of input values and a set of output values. They can be represented in several ways. • Identifying parent functions and their transformations helps with classification and generalizations about functions. • A linear regression model allows us to describe general trends in real-world data. • Systems of equations and inequalities occur in many real-world situations and occupations. • Systems of equations can be solved using a variety of methods whereas solutions to systems of inequalities are represented graphically. • Linear programming is an application of systems of inequalities and is used to find a maximum or minimum value.
Essential Questions (Instructional Objective)	• How are relations and functions similar and how are they different? • How does a horizontal stretch/compression differ from a vertical stretch/compression? • How can you use a function rule to determine what the parent function is? • Why is a regression line called a "line of best fit" if there are other ways to draw a line through the data points? • What are the benefits/short falls of the various methods for solving a system of equations (graphing, elimination, substitution)? • How can math skills related to graphs of inequalities be used in the real-world? • When might the correct mathematical answer not be the best decision for a business?
Content (Subject Matter)	*Student will know……….* • Key Terms – Real number subsets, relation, domain, range, function, finite set, infinite set, function notation, transformation, translation, reflection, stretch, compression, parent function, regression, correlation, line of best fit, correlation coefficient, linear system, consistent, inconsistent, dependent,

	independent, system of linear inequalities, linear programming, constraint, feasible region, objective function, corner point principle, ordered triple • 4-Step Linear Programming Process *Student will be able to…………* • Identify and classify real numbers. • Identify the domain and range of a function and write these in interval notation. • Determine whether a relation is a function. • Apply transformations to points and sets of points. • Interpret transformations of real-world data. • Identify parent functions from graphs, equations, and data sets. • Fit scatter plot data using linear models with and without technology. • Use linear regression models to make predictions. • Develop the constraints and objective function for a real-world problem. • Solve application problems using Linear Programming. • Assist a business owner with maximization or minimization and present findings using appropriate forms of media. • Solve a system in three variables using substitution and/or elimination. • Solve real-world problems represented using a system in three variables.
Skills/ Benchmarks (Standards)	A.CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*. A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.CED.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods* A.REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. F.LE.5. Interpret the parameters in a linear or exponential function in terms of a context. F.IF.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$. F.IF.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing,*

	decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. F.IF.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. F.BF.1. Write a function that describes a relationship between two quantities.* b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* F.BF.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
Materials and Resources	Holt Algebra 2 Textbook and resource materials Document camera/projector, Graph paper/rulers Graphing calculators Business Consultant problems for projects
Notes	This unit will be preceded by an assessment over the summer work packet required for Honors Algebra 2.

Subject: Honors Algebra 2	**Unit 2: Matrices**
Big Idea/Rationale	Matrix operations provide an alternate way of solving systems of equations. This method can prove more efficient especially with the aid of a graphing calculator. The skills learned in this chapter can be applied to other areas of mathematics, such as geometry, statistics, and business math. Outside of school these skills are used to set up and manipulate data as you analyze the possible effects of changes.
Enduring Understanding (Mastery Objective)	• Data from a table can be represented efficiently in a matrix. • Geometric transformations can be performed using matrix operations. • A system of equations can be efficiently solved using matrix equations and Cramer's Rule.
Essential Questions (Instructional Objective)	• What are the advantages and disadvantages to organizing data in a matrix? • Why is it necessary for matrices to have the same dimensions in order to add or subtract them but not to multiply them? • How can you determine whether a matrix product is defined? • What does the determinant tell you about a matrix and how is the determinant used to find the inverse of a matrix?
Content (Subject Matter)	*Student will know…………..* Key Terms – address, dimensions, entry, main diagonal, matrix, scalar, row matrix, square matrix, column matrix, multiplicative identify matrix, cryptography, translation matrix, reflection matrix, determinant, inverse, matrix equation form *Student will be able to…………..* • Use matrices to display real-world data. • Add and subtract matrices; perform scalar and matrix multiplication. • Use matrices to perform geometric transformations. • Solve systems of equations using matrices – Cramer's Rule and matrix equation form. • Encode and decode messages (Cryptography) using inverse matrices. • Represent directed networks in adjacency matrices and determine multi-step paths between locations.
Skills/ Benchmarks (Standards)	N.VM.6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network. N.VM.7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled. N.VM.8. (+) Add, subtract, and multiply matrices of appropriate dimensions. N.VM.9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties. N.VM.10. (+) Understand that the zero and identity matrices play a role in

	matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. N.VM.12. (+) Work with 2 × 2 matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area. A.REI.8. (+) Represent a system of linear equations as a single matrix equation in a vector variable. A.REI.9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).
Materials and Resources	Holt Algebra 2 Textbook Graphing Calculator Document Camera/Projector Holt Algebra 2 Chapter 4 Resource Materials Historical information related to Cryptography Scavenger Hunt Encoded Messages
Notes	

Subject: Honors Algebra 2	Unit 3: Polynomial Functions
Big Idea/Rationale	This unit develops the structural similarities between the system of polynomials and the system of integers. Students draw on analogies between polynomial arithmetic and base-ten computation, focusing on properties of operations, particularly the distributive property. Students connect multiplication of polynomials with multiplication of multi-digit integers, and division of polynomials with long division of integers. Students identify zeros of polynomials, including complex zeros of quadratic polynomials, and make connections between zeros of polynomials and solutions of polynomial equations. The unit culminates with the Fundamental Theorem of Algebra. Rational numbers extend the arithmetic of integers by allowing division by all numbers except 0. Similarly, rational expressions extend the arithmetic of polynomials by allowing division by all polynomials except the zero polynomial.
Enduring Understanding (Mastery Objective)	• There are several strategies to solve quadratic equations. • Simplifying expressions and solving equations allows us to take a complex situation and make it simple. • Many real-world phenomena are best modeled by a quadratic function. • Knowing the terminology and classifications for polynomials will enable you to accurately discuss mathematical ideas and problems. • The characteristics of polynomial functions and their representations are useful in solving real-world problems. • Performing basic operations (addition, subtraction, multiplication, and division) with polynomials provides for simplification of expressions making it easier to evaluate. • The roots of a polynomial function can be found using factoring and/or graphing. • Some real-world data is best modeled by higher-ordered polynomial functions.
Essential Questions (Instructional Objective)	• How do you know if a function is quadratic? • How do you graph a quadratic equation given in standard form? Vertex form? Intercept form? • How do you identify transformations from the parent graph when a parabola is given in standard form? Vertex form? • What factors do you consider when trying to decide which method to use when solving quadratics? • When is it more efficient to use standard form over vertex form (and vice versa) when graphing a parabola? • When do we use quadratic functions to solve everyday problems? • What are the important features of the graph of a polynomial function? • How can Pascal’s Triangle be used to efficiently expand a binomial? • What are the differences/similarities between long division and synthetic

	division of polynomials? • How can synthetic substitution be used to tell whether a given binomial is a factor of a polynomial? • How can you determine the multiplicity of real roots of a polynomial from its graph? • How does determining the end behavior help you sketch the graph of a polynomial function?
Content (Subject Matter)	*Student will know………* Key Terms – quadratic function, parabola, maximum/minimum, vertex, axis of symmetry, standard form, vertex form, intercept form, complex number, imaginary number, complex conjugate, zero/root, binomial, trinomial, completing the square, discriminant, end behavior, leading coefficient, local maximum, local minimum, monomial, binomial, trinomial, multiplicity, polynomial, synthetic division, turning point, even/odd functions *Student will be able to………* • Graph a quadratic function in standard, vertex, and intercept form. • Solve a quadratic equation using graphing, factoring, square roots, and the quadratic formula. • Identify, evaluate, add, subtract, classify, and graph polynomials. • Multiply and expand binomial expressions that are raised to positive integer powers. • Use long division and synthetic division to divide polynomials and rewrite rational expressions. • Use the Factor Theorem to determine factors of a polynomial. • Factor the sum and difference of two cubes. • Identify the multiplicity of roots. • Use the Rational Root Theorem and the Irrational Root Theorem to solve polynomial equations. • Use the Fundamental Theorem of Algebra and its corollary to write a polynomial equation of least degree with given roots. • Identify ALL roots of a polynomial equation. • Use properties of end behavior to analyze, describe, and graph polynomial functions. • Identify and use maxima and minima of polynomial functions to solve problems. • Describe transformations of polynomial functions as compared to the parent functions. • Identify functions as either even or odd. • Use finite differences to determine the degree of a polynomial that will fit a given set of data. • Use technology to find polynomial models for a given set of data. • Solve real-world problems modeled by polynomial functions. • Solve polynomial inequalities graphically and algebraically.

	• Perform arithmetic operations with complex numbers. • Use complex numbers in polynomial identities and equations. • Interpret the structure of expressions. • Write expressions in equivalent forms to solve problems. • Perform arithmetic operations on polynomials. • Understand the relationship between zeros and factors of polynomials. • Use polynomial identities to solve problems. • Understand solving equations as a process of reasoning and explain the reasoning. • Analyze functions using different representations.
Skills/ Benchmarks (CCSS Standards)	N.CN.1. Know there is a complex number *i* such that $i^2 = -1$, and every complex number has the form $a + bi$ with *a* and *b* real. N.CN.2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. N.CN.7. Solve quadratic equations with real coefficients that have complex solutions. N.CN.8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$. N.CN.9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. A.SSE.1. Interpret expressions that represent a quantity in terms of its context. ★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)^n$ *as the product of P and a factor not depending on P.* A.SSE.2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$*, thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$. A.APR.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. A.APR.2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number *a*, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only *if* $(x - a)$ is a factor of p(x). A.APR.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. A.APR.4. Prove polynomial identities and use them to describe numerical relationships. For example, the polynomial identity $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ can be used to generate Pythagorean triples. A.APR.5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of *x* and *y* for a positive integer *n*, where *x* and *y* are any numbers, with coefficients determined for example by Pascal's Triangle.

	A.APR.6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. A.REI.4. Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b. A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★ F.IF.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.* F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ a. Graph linear and quadratic functions and show intercepts, maxima, and minima. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. F.BF.3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
Materials and Resources	Holt Algebra 2 Textbook and Resource Materials Graphing Calculators Document Camera/projector Graph Paper/Construction Paper
Notes	

Subject: Honors Algebra 2	**Unit 4: Exponential and Logarithmic Functions**
Big Idea/Rationale	In this unit, students will learn methods to solve problems involving unknown exponents by applying an understanding of logarithms. These skills can be used to solve problems involving compound interest, in scientific fields such as biology and sociology where you collect, organize, and analyze data, and in future math classes such as Calculus.
Enduring Understanding (Mastery Objective)	• Logarithmic functions are inverses of exponential functions. Understanding the properties of exponential functions and how inverses behave explains the properties and graphs of logarithms. • Many real-world situations, such as credit card debt and bacteria growth, can be modeled by exponential functions. • Logarithms are used to compare quantities on a very large or very small scale because they represent an exponent. • Exponential and logarithmic equations and inequalities are used to represent many real-world situations. • Natural exponential and logarithmic functions are used to describe many natural growth and decay patterns.
Essential Questions (Instructional Objective)	• How do the properties of exponents relate to the properties of logarithms? • How can the properties of logarithms be used to manipulate and solve equations with unknown exponents? • How can you differentiate between exponential growth and decay?
Content (Subject Matter)	*Student will know……….* Key Terms – asymptote, common logarithm, exponential (growth and decay), inverse function, natural logarithm *Student will be able to………..* • Write and evaluate exponential expressions to model growth and decay situations. • Graph and recognize inverses of relations and functions. • Find inverses of functions. • Write equivalent forms for exponential and logarithmic functions. • Write, evaluate, and graph logarithmic functions. • Use properties to simplify logarithmic expressions. • Translate between logarithms in any base. • Solve problems involving exponential and logarithmic equations and inequalities. • Use the number e to write and graph exponential functions representing real-world situations. • Solve equations and problems involving e or natural logarithms. • Transform exponential and logarithmic functions. • Model data by using exponential and logarithmic functions and use these

	models to analyze and predict.
Skills/ Benchmarks (Standards)	A.CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.REI.11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. F.IF.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*. F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. F.IF.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)12^t$, $y = (1.2)^{t/10}$, and classify them as representing exponential growth or decay. F.LE.1. Distinguish between situations that can be modeled with linear functions and with exponential functions. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.
Materials and Resources	Holt Algebra 2 Textbook and Resource Materials Graph paper Document camera/projector

	Logarithm Packet and Answer Packet Graphing Calculator
Notes	

<table>
<tr><td>Subject: Honors Algebra 2</td><td>Unit 5: Rational and Radical Functions</td></tr>
<tr><td>Big Idea/Rationale</td><td>The focus of this using is solving rational and radical functions. The skills learned in this chapter will be needed for success in future math classes such as Precalculus. These skills are also application in Chemistry, Physics, and Biology. Outside of school students can use these skills to make predictions involving time, money, or speed.</td></tr>
<tr><td>Enduring Understanding (Mastery Objective)</td><td>Many real-world situations, from geometry and chemistry to engineering and agriculture, can be modeled by variation functions.
Performing operations with rational expressions is a fundamental skill for solving rational equations and inequalities.
Operations with rational expressions follow the same rules as operations with fractions.
Radical equations and inequalities are found in many scientific formulas.</td></tr>
<tr><td>Essential Questions (Instructional Objective)</td><td>How do we decide which method is most appropriate when solving rational equations?
When are asymptotes used to graph rational functions?
What is the relationship between the vertical asymptote and the domain of a rational function? Between the horizontal asymptote and the range of a rational function?
How does the domain help you determine whether the solution to a radical or rational equation is extraneous?</td></tr>
<tr><td>Content (Subject Matter)</td><td>Student will know……
Key Terms – complex fraction, constant of variation, continuous function, direct variation, discontinuous function, extraneous solution, hole (in a graph), horizontal asymptote, inverse variation, radical function, rational function, vertical asymptote

Student will be able to…….
Solve problems involving direct, inverse, joint, and combined variation.
Simplify, add, subtract, multiply, and divide rational expressions.
Simplify complex fractions.
Graph rational functions.
Solve rational equations and inequalities.
Rewrite radical expressions by using rational exponents.
Simplify and evaluate radical expressions and expressions containing rational exponents.
Graph radical functions and inequalities.
Solve radical equations and inequalities.</td></tr>
</table>

Skills/ Benchmarks (Standards)	N.RN.1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.* N.RN.2. Rewrite expressions involving radicals and rational exponents using the properties of exponents. A.APR.6. Rewrite simple rational expressions in different forms; write ${}^{a(x)}/_{b(x)}$ in the form $q(x) + {}^{r(x)}/_{b(x)}$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system. A.APR.7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. A.CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. A.REI.2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
Materials and Resources	Holt Algebra 2 Textbook and Resource Materials Kuta Software Website Graph paper Document camera/projector Graphing Calculator
Notes	

Subject: Honors Algebra 2	**Unit 6: Modeling With Functions**
Big Idea/Rationale	In this unit students synthesize and generalize what they have learned about a variety of function families. They identify appropriate types of functions to model a situation, they adjust parameters to improve the model, and they compare models by analyzing appropriateness of fit and making judgments about the domain over which a model is a good fit. *The description of modeling as "the process of choosing and using mathematics and statistics to analyze empirical situations, to understand them better, and to make decisions" is at the heart of this unit. The narrative discussion and diagram of the modeling cycle should be considered when knowledge of functions, statistics, and geometry is applied in a modeling context.*
Enduring Understanding (Mastery Objective)	• Real-world data can be model using different functions. • Sometimes one representation of a function is more useful than another. • A real-world function may be a combination of other functions. • A mathematical model of a data set can be used to make predictions.
Essential Questions (Instructional Objective)	• How do you determine the differences and similarities between the families of functions? • How can you use my mathematical tools to create models for real-world situations and then solve them efficiently for a given set of conditions?
Content (Subject Matter)	*Student will know……* Key Terms – Composition of functions, piecewise function, one-to-one functions, step function, nonlinear system *Student will be able to………* • Translate between various representations of functions. • Analyze functions using different representations. • Build a function that models a relationship between two quantities. • Interpret functions that arise in applications in terms of a context. • Solve problems using various representations of functions. • Construct and compare linear, quadratic, and exponential models and solve problems involving nonlinear systems. • Write and graph piecewise functions. • Use piecewise functions to describe real-world situations. • Add, subtract, multiply, and divide functions. • Write and evaluate composite functions. • Determine whether the inverse of a function is a function. • Write rules for the inverses of functions. • Apply functions to problems situations. • Use mathematical models to make predictions.

Skills/ Benchmarks (Standards)	A.CED.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. F.IF.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*★ F.IF.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. F.BF.1. Write a function that describes a relationship between two quantities.★ (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.* F.BF.4. Find inverse functions. (+) Verify by composition that one function is the inverse of another. F.LE.5. Interpret the parameters in a linear or exponential function in terms of a context.
Materials and Resources	Holt Algebra 2 Textbook and Resource Materials Kuta Software Website Graph paper Document camera/projector Graphing Calculator
Notes	

Subject: Honors Algebra 2	**Unit 7: Trigonometric Functions**
Big Idea/Rationale	Building on their previous work with functions, and on their work with trigonometric ratios and circles in Geometry, students now use the coordinate plane to extend trigonometry to model periodic phenomena.
Enduring Understanding (Mastery Objective)	• Trigonometric functions and their reciprocals are used in many real-world careers that involve angular measures. • Angles can be measured in degrees and radians with radians having an advantage since there are real-number measures. • Inverse trigonometric functions can be used to solve equations involving angle measures. • Many natural phenomena can be modeled using trigonometric functions. • Trigonometric identities can be used to simplify processes when finding angle measures.
Essential Questions (Instructional Objective)	• How can you determine the values of the six trigonometric functions for an angle in standard position? • When an angle is drawn in standard position, how do you know which angle is its reference angle? How do you determine angles that are coterminal with the angle? • What is the advantage of representing an angle measure in radians versus degrees? • How can you use the unit circle to determine the values of trigonometric functions? • How can trigonometric equations and inverse trigonometric functions be used to solve problems? • What are the distinguishing features of the graphs of the sine, cosine, and tangent functions? • How can fundamental trigonometric identities be used to simplify, rewrite and evaluate expressions and to verify other identities?
Content (Subject Matter)	*Student will know….* Key Terms – sine, cosine, tangent, secant, cosecant, cotangent, angle of elevation, angle of depression, standard position, initial side, terminal side, angle of rotation, coterminal angles, reference angle, unit circle, radian, inverse sine function, inverse cosine function, inverse tangent function, amplitude, period, periodic function, phase shift, trigonometric identity *Student will be able to….* • Extend the domain of trigonometric functions using the unit circle. • Model periodic phenomena with trigonometric function. • Prove and apply trigonometric identities.

Skills/ Benchmarks (CCSS Standards)	F.TF.1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. F.TF.2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. F.TF.5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ F.TF.8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$, and the quadrant of the angle.
Materials and Resources	Holt Algebra 2 Textbook and Resources Protractor/Ruler Handouts Graphing Calculator Graph Paper
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Subject: Honors Algebra 2	**Unit 8: Inferences and Conclusions from Data**
Big Idea/Rationale	In this unit, students see how the visual displays and summary statistics they learned in earlier grades relate to different types of data and to probability distributions. They identify different ways of collecting data—including sample surveys, experiments, and simulations—and the role that randomness and careful design play in the conclusions that can be drawn.
Enduring Understanding (Mastery Objective)	• There are infinite numbers of normal distributions with data but only one standard normal distribution based upon z-scores. • Percentiles can be used to find specific values in a normal distribution using z-scores. • In a normal model, the majority of data lies within two standard deviations of the mean. • The normal model can be used to predict specific outcomes with a distribution of symmetrical data. • Well-designed experiments can yield causal relationships whereas observational studies cannot. • Randomization allows data from samples to represent the views of entire populations. • Margin of error can be used to determine statistical significance.
Essential Questions (Instructional Objective)	• What are the parameters needed to create a standard normal distribution of data? • How are z-scores used in the analysis of data? • How can the normal model be used to predict outcomes? • How do qualitative and quantitative data differ? • How do experimental and observational studies differ? • What are the components of good experimental design? • How do sampling methodologies differ?
Content (Subject Matter)	*Student will know….* Key Terms – data, statistics, population, sample, parameter, descriptive statistics, inferential statistics, quantitative data, qualitative data, experimental design, observational study, experiment, simulation, survey, census, sampling, random sample, simple random sample, stratified sample, cluster sample, systematic sample, convenience sample, mean, standard deviation, standard (z) score, 68-95-99.7 Rule, normal distribution, normal curve, inflection points, standard normal distribution, unimodal, independent events, statistical significance *Student will be able to….* • Summarize, represent, and interpret data on single count or measurement variable. • Understand and evaluate random processes underlying statistical

	experiments. • Make inferences and justify conclusions from sample surveys, experiments and observational studies. • Use probability to evaluate outcomes of decisions.
Skills/ Benchmarks (CCSS Standards)	S.ID.4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. S.IC.1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population. S.IC.2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?* S.IC.3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. S.IC.4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. S.IC.5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. S.IC.6. Evaluate reports based on data.
Materials and Resources	Textbook: Elementary Statistics (Larson and Farber) Holt Algebra 2 Textbook Dice/Coins Note Packet Practice Handouts Graphing Calculator Document Camera/Projector
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