Ganado Unified School District
Algebra 2

PACING Guide SY 2021-2022 ***Mary Montalan***

Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Fall Semester **Chapter 0** **Preparing for Advanced Algebra** McGrawHill/ Reveal Algebra 2 (2020) Online ALEKS learning program integration Triumphlearning Common Core Coach Algebra 2 (2016)	**Standards for Mathematical Practices** ***-will be applied in all units of study*** 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. **A1.A-REI.A.1** Explain each step in solving linear and quadratic equations as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.	I can -find domain and range of functions -simplify numerical and algebraic expressions -solve simple linear equations and inequalities in one variable -find probabilities of events -calculate summary statistics and analyze data	• Identify the domain and range of functions. • Use the FOIL method to multiply binomials. • Use various techniques to factor polynomials. • Find the total number of outcomes using a variety of methods. • Compute theoretical and experimental probabilities. • Compute probabilities of compound events. • Find probabilities of independent and dependent events. • Use two-way frequency tables to find conditional probabilities. • Identify and use congruent and similar figures. • Use the Pythagorean Theorem and its converse. • Find measures of center, spread, and position.	domain, range, quadrants, mapping, function, outcome, sample space, permutation, factorial, combination, theoretical probability, experimental probability, simple event. compound event, mutually exclusive, independent and dependent events, conditional probability, two-way frequency table, population, sample, mean, median, mode, range, variance, standard deviation, five-number summary, outlier

	Construct a viable argument to justify a solution method. **A1.A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A1.S-ID.A.1** Represent real-value data with plots for the purpose of comparing two or more data sets. **A1.S-ID.A.2** Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. **A1.S-CP.A.2** Use the Multiplication Rule for independent events to understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent. **A2.S-CP.A.3** Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P(B)*, and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of A, and the conditional probability of *B* given *A* is the same as the probability of *B*. **A2.S-CP.A.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-			

	way table as a sample space to decide if events are independent and to approximate conditional probabilities. **A2.S-CP.A.5** Recognize and explain the concepts of conditional probability and independence utilizing real-world context. **A2.S-CP.B.6** Use Bayes Rule to find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model. **A2.S.CP.B.7** Apply the Addition Rule, *P*(*A* or *B*) = *P(A)* + *P(B)* – *P*(*A* and *B*), and interpret the answer in terms of the model. **A2.S.CP.B.8** Apply the general Multiplication Rule in a uniform probability model, *P*(*A* and *B*) = *P(A)P(B|A)* = *P(B)P(A|B)*, and interpret the answer in terms of the model.			
Chapter 1 **Equations and Inequalities** **Lesson 1-1 Expressions and Formulas** **Lesson 1-2 Properties of Real Numbers**	**A1.A-SSE.A.1.a** Interpret parts of an expression, such as terms, factors, and coefficients. **A1.A-SSE.A.1.b** Interpret expressions by viewing one or more of their parts as a single entity. **A2.A-SSE.A.2** Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns. **A2.A-CED.A.1** Create equations and inequalities in one variable and use	I can: -use properties of real numbers to evaluate expressions and formulas. -classify real numbers. -use the properties of equality to solve equations.	• Use the order of operations to evaluate expressions. • Use formulas. • Classify real numbers. • Use the properties of real numbers to evaluate expressions. • Translate verbal expressions into algebraic expressions and equations, and vice versa. • Solve equations using the	absolute value, algebraic expressions, compound inequality, constraint, empty set, equation, extraneous solution, formula, infinity, integers, intersection, interval notation, irrational numbers, natural numbers, open sentence, order of

Lesson 1-3 Solving Absolute Value Equations **Lesson 1-5 Solving Inequalities** **Lesson 1-6 Solving Compound and Absolute Value Inequalities**	them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear, quadratic, rational, and exponential functions. **A2.A-CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. **A2.N-Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context. **A2.N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context. **A2.N-Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.	-solve absolute value equations. -solve inequalities, compound inequalities, and absolute value inequalities.	properties of equality. ● Evaluate expressions involving absolute values. ● Solve absolute equations. ● Solve one-step inequalities. ● Solve multi-step inequalities. ● Solve compound inequalities. ● Solve absolute value inequalities.	operations, rational numbers, real numbers, set-builder notation, solution, union, variables, whole numbers
Chapter 2 **Linear Relations and Functions**	**A2.F-IF.B.4** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and	I can: -identify the mathematical domains and ranges of functions	● Analyze relations and functions. ● Use equations of relations and functions.	absolute value function, bivariate data, continuous relation, correlation coefficient,

Lesson 2-1 Relations and Functions **Lesson 2-2 Linear Relations and Functions** **Lesson 2-3 Rate of Change and Slope** **Lesson 2-4 Writing Linear Equations** **Lesson 2-5 Scatter Plots and Lines of Regression** **Lesson 2-6 Functions** **Lesson 2-7 Parent Functions and Transformations**	sketch graphs showing key features given a verbal description of the relationship. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A1.F-IF.B.5** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **A2.F-IF.B.6** Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.). Functions include	and determine reasonable domain and range values for continuous and discrete situations. -identify and sketch graphs of parent functions, including linear functions (f(x)=x) and absolute value functions (f(x)=|x|). -collect and organize data, make and interpret scatter plots, fit the graph of a function to the data, interpret the results, and proceed to model, predict, and make decisions and critical judgments. -graph linear and absolute value inequalities.	• Identify linear relations and functions. • Write linear equations in standard form. • Find rate of change. • Determine the slope of a line. • Write an equation of a line given the slope and a point on the line. • Write an equation of a line parallel or perpendicular to a given line. • Use scatter plots and prediction equations. • Model data using lines of regression. • Write and graph piecewise-defined functions. • Write and graph step and absolute value functions. • Identify and use parent functions. • Describe transformations of functions. • Graph linear inequalities. • Graph absolute value inequalities.	dependent variable, dilation, direct variation, discrete relation, family of graphs, greatest integer function, independent variable, linear equation, linear function, linear inequality, line of fit, negative correlation, nonlinear relation, parent function, piece-wise function, point-slope form, positive correlation, prediction equation, quadratic function, rate of change, reflection, regression line, scatter plot, slope, slope-intercept form, standard form, step function, translation, vertical line test

	linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A1.A-SSE.A.1.b** Interpret expressions by viewing one or more of their parts as a single entity. **A1.A-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A1.A-CED.A.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. **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A1.F-BF.B.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, k $f(x)$, 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. Focus on linear, quadratic, exponential and			

	piecewise-defined functions (limited to absolute value and step).			
Chapter 3 **Systems of Equations and Inequalities** **Lesson 3-1 Solving Systems of Equations** **Lesson 3-2 Solving Systems of Inequalities by Graphing** **Lesson 3-3 Optimization with Linear Programming** **Lesson 3-4 Systems of Equations in Three Variables** **Lesson 3-5 Operations with Matrices** **Lesson 3-6 Multiplying Matrices**	**A1.A-CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. **A2.A-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where $f(x)$ and/or $g(x)$ are polynomial, rational, exponential, and logarithmic functions. **A2.A-REI.C.7** Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	I can: -analyze situations and formulate systems of equations in two or more unknowns to solve problems. -use algebraic methods, graph, or tables to solve systems of equations or inequalities. -interpret and determine the reasonableness of solutions to systems of equations for given contexts.	• Solve systems of linear equations graphically. • Solve systems of linear equations algebraically. • Solve systems of inequalities by graphing. • Determine the coordinates of the vertices of a region formed by the graph of a system of inequalities.	bounded, break-even point, consistent, dependent, elimination method, feasible region, inconsistent, independent, optimize, ordered triple, substitution method, unbounded

Lesson 3-7 Solving Systems of equations Using Cramer's Rule **Lesson 3-8** **Solving Systems of equations Using Inverse Matrices**				
Chapter 4 **Quadratic Functions and Relations** **Lesson 4-1 Graphing Quadratic Functions** **Lesson 4-2** **Solving Quadratic Equations by Graphing** **Lesson 4-3** **Solving Quadratic Equations by Factoring**	**A1.A-SSE.A.1.a** Interpret parts of an expression, such as terms, factors, and coefficients. **A1.A-SSE.A.1.b** Interpret expressions by viewing one or more of their parts as a single entity. **A2.A-SSE.A.2** Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns. **A1.F-IF.B.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. Include problem-solving opportunities utilizing real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or	I can: -determine the reasonable domain and range values of quadratic functions. -analyze situations involving quadratic functions and formulate quadratic equations and inequalities to solve problems. -solve quadratic equations and inequalities using graphs, tables, and algebraic methods, including the Quadratic Formula.	• Graph quadratic functions. • Find and interpret the maximum and minimum values of a quadratic function. • Solve quadratic equations by graphing. • Estimate solutions of quadratic equations by graphing. • Write quadratic equations in standard form. • Solve quadratic equations by factoring. • Perform operations with pure imaginary numbers. • Perform operations with complex numbers. • Solve quadratic equations by using the Square Root Property.	axis of symmetry, completing the square, complex conjugates, complex number, discriminant, factored form, FOIL method, imaginary unit, linear term, maximum value, minimum value, parabola, pure imaginary number, quadratic equation, quadratic formula, quadratic inequality, quadratic term, root, square root property, standard form, vertex, vertex form, zero

Lesson 4-4 Complex Numbers **Lesson 4-5 Completing the Square** **Lesson 4-6 The Quadratic Formula and the Discriminant** **Lesson 4-7 Transformations of Quadratic Graphs** **Lesson 4-8** **Quadratic Inequalities**	negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.F-IF.B.6** Calculate and interpret the average rate of change of a continuous function (presented symbolically or as a table) on a closed interval. Estimate the rate of change from a graph. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.A-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to	-use complex numbers to describe the solutions of quadratic equations. -determine a quadratic function from its zeros. -identify and sketch graphs of parent functions, including quadratic functions. -use the parent function to investigate, describe, and predict the effects of changes in *a,h,k,* on the graphs of the $y=a(x-h)^{\wedge 2}+k$ form of a function.	• Solve quadratic equations by completing the square. • Solve quadratic equations by using the Quadratic Formula. • Use the discriminant to determine the number and type of roots of a quadratic equation. • Write a quadratic function in the form $y=a(x-h)^2+k$. • Transform graphs of quadratic functions of the form $y=a(x-h)^2+k$. • Graph quadratic inequalities in two variables. • Solve quadratic inequalities in one variable.	

	cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions. **A2.F-IF.C.8.a** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. **A2.N-CN.A.1** Apply the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. Write complex numbers in the form ($a+bi$) with a and b real. **A2.N-CN.C.7** Solve quadratic equations with real coefficients that have complex solutions. **A1.F-BF.B.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, k $f(x)$, 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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).			

	A1.A-CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A1.A-CED.A.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. **A2.A-REI.B.4** Fluently solve quadratic equations in one variable. 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.			
Chapter 5 **Polynomials and Polynomial Functions** **Lesson 5-1** **Operations with Polynomials** **Lesson 5-2 Dividing Polynomials**	**A1.A-APR.A.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. **A2.A-APR.D.6** Rewrite 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	I can: -use tools including factoring and properties of exponents to simplify expressions and to transform and solve equations. -identify the mathematical domains and ranges of functions.	• Multiply, divide, and simplify monomials and expressions involving powers. • Add, subtract, and multiply polynomials. • Divide polynomials using long division. • Divide polynomials using synthetic division. • Evaluate polynomial functions. • Identify general shapes of	degree of polynomial, depressed polynomial, end behavior, extrema, leading coefficient, Location principle, polynomial function, polynomial in one variable, power function, prime polynomials, quadratic form, relative maximum, relative minimum, simplify,

Lesson 5-3 Polynomial Functions **Lesson 5-4 Analyzing Graphs of Polynomial Functions** **Lesson 5-5 Solving Polynomial Equations** **Lesson 5-6 The Remainder and Factor Theorems** **Lesson 5-7 Roots and Zeros** **Lesson 5-8 Rational Zero Theorem**	more complicated examples, a computer algebra system. **A2.F-IF.B.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. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on equations and inequalities arising from linear,	-determine the reasonable domains and range values for continuous situations.	polynomial functions. ● Graph polynomial functions and locate their zeroes. ● Find relative maxima and minima of polynomial functions. ● Factor polynomials. ● Solve polynomial equations by factoring. ● Evaluate functions by using synthetic substitution. ● Determine whether a binomial is a factor of a polynomial by using substitution. ● Determine the number and type of roots for a polynomial equation. ● Find the zeroes of a polynomial function. ● Identify possible rational zeroes of a polynomial function. ● Find all of the rational zeros of a polynomial function.	synthetic division, synthetic substitution, turning points

	quadratic, rational, and exponential functions. **A2.A-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where $f(x)$ and/or $g(x)$ are polynomial, rational, exponential, and logarithmic functions. **A2.A-APR.B.2** Know and apply the Remainder and Factor 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 $p(x)$. **A2.A-APR.B.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. Focus on quadratic, cubic, and quartic polynomials including polynomials for which factors are not provided **A2.A-APR.C.4** Prove polynomial identities and use them to describe numerical relationships.			

SPRING SEMESTER **Chapter 6** **Inverses and Radical Functions and Relations** **Lesson 6-1 Operations on Functions** **Lesson 6-2 Inverse Functions and Relations** **Lesson 6-3 Square Root Functions and Inequalities** **Lesson 6-4 Nth Roots** **Lesson 6-5 Operations with Radical Expressions** **Lesson 6-6** **Rational Exponents**	**A2.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A1.F-BF.A.1** Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **F.IF.4** Find inverse functions. **A2.F-BF.4.a** Understand that an inverse function can be obtained by expressing the dependent variable of one function as the independent variable of another, recognizing that functions *f* and g are inverse functions if and only if $f(x) = y$ and $g(y) = x$ for all values of x in the domain of f and all values of y in the domain of g. **A2.F-.IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine,	I can: -relate representations of square root functions -connect inverses of square root functions with quadratic functions -determine solutions of square root equations and inequalities using graphs, tables, and algebraic methods -determine the reasonable domain and range values of square root functions, and interpret and determine the reasonableness of solutions to square root equations and inequalities -use the parent function to investigate , describe, and predict the effects of parameter changes on graphs of square root functions and describe limitations on the domains and ranges	• Find the sum, difference, product, and quotient of functions. • Find the composition of functions. • Find the inverse of a function or relation. • Determine whether two functions or relations are inverses. • Graph and analyze square root functions. • Graph square root inequalities. • Simplify radicals. • Use a calculator to approximate radicals. • Simplify radical expressions. • Add, subtract, multiply, and divide radical expressions. • Write expressions with rational exponents in radical form and vice versa. • Simply expressions in exponential or radical form. • Solve equations containing radicals. • Solve inequalities containing radicals.	composition of functions, conjugates, extraneous solution, index, inverse function, inverse relation, like radical expression, nth root, principal root, radical equation, radical function, radical inequality, radical sign, radicand, rationalizing the denominator, square root function, square root inequality

Lesson 6-7 **Solving Radical Equations and Inequalities**	cosine, tangent, square root, cube root and piecewise-defined functions. **A2-F.BF.B.3** Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *kf(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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.A-SSE.A.2** Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns. **A2.A-REI.A.2** Solve rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. **A2.A-REI.D.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 problems in real-world context. Extend from linear,			

	quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions. **A2.N-RN.A.1** Explain how the definition 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. **A2.N-RN.A.2** Rewrite expressions involving radicals and rational exponents using properties of exponents. **A2.A-SSE.B.3** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. Include problem-solving opportunities utilizing real-world context and focus on expressions with rational exponents. c. Use the properties of exponents to transform expressions for exponential functions. **A2.F-BF.A.1 b.** Combine function types using arithmetic operations and function composition.			
Chapter 7 **Exponential and Logarithmic Functions and Relations**	**A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine,	I can: -analyze a situation modeled by an exponential function, formulate an equation or inequality , and solve the problem	● Graph exponential growth and decay functions. ● Solve exponential equations. ● Solve exponential inequalities. ● Evaluate logarithmic	asymptote, change of base formula, common logarithm, compound interest, decay factor, exponential decay, exponential function, exponential growth,

Lesson 7-1 Graphing Exponential Functions **Lesson 7-2 Solving exponential Equations and Inequalities** **Lesson 7-3 Logarithms and Logarithmic Functions** **Lesson 7-4 Solving Logarithmic Equations and Inequalities** **Lesson 7-5 Properties of Logarithms** **Lesson 7-6 Common Logarithms** **Lesson 7-7 Base e and Natural Logarithms** **Lesson 7-8 Using Exponential and Logarithmic Functions**	tangent, square root, cube root and piecewise-defined functions. **A2.F-IF.C.8.b** Use the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay. **A2.A-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where $f(x)$ and/or $g(x)$ are polynomial, rational, exponential, and logarithmic functions. **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.F-LE.A.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 logarithms that are not readily found	- develop the definition of logarithms by exploring and describing the relationships between exponential functions and their inverses -use parent functions to investigate , describe , and predict the effects of parameter changes on the graphs of exponential and logarithmic functions, describe limitations on the domains and ranges , and examine asymptotic behavior -determine solutions of exponential and logarithmic equations using graphs , tables, and algebraic methods -interpret and determine the reasonableness of solutions to exponential and logarithmic equations and inequalities	expressions. ● Graph logarithmic functions. ● Solve logarithmic equations. ● Solve logarithmic inequalities. ● Simplify and evaluate expressions using the properties of logarithms. ● Solve logarithmic equations using the properties of logarithms. ● Solve exponential equations and inequalities using common logarithms. ● Evaluate logarithmic expressions using the Change of Base Formula. ● Evaluate expressions involving the natural base and natural logarithm. ● Solve exponential equations and inequalities using natural logarithms. ● Use logarithms to solve problems involving exponential growth and decay. ● Use logarithms to solve problems involving logistic growth.	exponential inequality, growth factor, logarithm, logarithmic equation, logarithmic function, logarithmic inequality, logistic growth model, natural base (e), natural base exponential function, natural logarithm, rate of continuous decay, rate of continuous growth

	by hand or observation using technology. **A2-F.BF.B.3** Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *kf(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. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.A-SSE.A.2** Use structure to identify ways to rewrite polynomial and rational expressions. Focus on polynomial operations and factoring patterns. **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where *f(x)* and/or *g(x)* are polynomial, rational, exponential, and logarithmic functions. **A2.F-IF.C.8.b** Use the properties of exponents to interpret expressions for exponential functions and classify those functions as exponential growth or decay. **A2.F-LE.A.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 logarithms that are not readily found by hand or observation using technology. **A1.F-BF.A.1** Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.F-LE.B.5** Interpret the parameters in an exponential function with rational exponents utilizing real-world context. **A2.S-ID.C.10** Interpret parameters of exponential models.			

Chapter 8 **Rational Functions and Relations** **Lesson 8-1 Multiplying And Dividing Rational Expressions** **Lesson 8-2 Adding and Subtracting Rational Expressions** **Lesson 8-3 Graphing Reciprocal Functions** **Lesson 8-4 Graphing Rational Functions** **Lesson 8-5 Variation Functions** **Lesson 8-6 Solving Rational Equations and Inequalities**	**A1.A-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. **A1.F-BF.B.3** Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, k $f(x)$, 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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions.). Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A1.A-CED.A.1** Create equations and inequalities in one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.A-REI.A.2** Solve rational and radical equations in one variable, and	I can: -determine properties of reciprocal functions and graph their transformations -use quotients of polynomials to describe the graphs of rational functions, describe limitations on the domains and ranges, and examine asymptotic behavior -determine the reasonable domain and range values of rational functions and determine the reasonableness of solutions to rational equations and inequalities -analyze a modeled by a rational function, formulate an equation composed of a linear or quadratic function, and solve the problem -use functions to model and make predictions in problem situations involving direct and inverse variation	• Simplify rational expressions. • Simplify complex fractions. • Determine the LCM of polynomials. • Add and subtract rational expressions. • Determine properties of reciprocal functions. • Graph transformations of reciprocal functions. • Graph rational functions with vertical and horizontal asymptotes. • Graph rational functions with oblique asymptotes. • Graph rational functions with oblique asymptotes and point discontinuity. • Recognize and solve direct and joint variation problems. • Recognize and solve inverse and combined variation problems. • Solve rational equations. • Solve rational inequalities.	combined variation, complex fraction, constant of variation, horizontal asymptote, hyperbola, inverse variation, joint variation, oblique asymptote, point discontinuity, rational equation, rational expression, rational function, rational inequality, reciprocal function, vertical asymptote, weighted average

	give examples showing how extraneous solutions may arise. **A2-REI.D.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 problems in real-world context. Extend from linear, quadratic, and exponential functions to cases where $f(x)$ and/or $g(x)$ are polynomial, rational, exponential, and logarithmic functions.			
Chapter 10 **Sequences and Series**	**A2.F-.IF.B.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. Include problem-solving opportunities utilizing a real-world context. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions.	I can: -relate arithmetic sequences to linear functions and relate geometric sequences to exponential functions -find specific terms and sums of arithmetic and geometric series -find the sum of an infinite geometric series and write repeating decimals as fractions -recognize and use special sequences and iterate functions -use Pascal's triangle and the Binomial	• Relate arithmetic sequences to linear functions. • Relate geometric sequences to exponential functions. • Use arithmetic sequences. • Find sums of arithmetic series. • Use geometric sequences. • Find sums of geometric series. • Find sums of infinite geometric series. • Write repeating decimals as fractions. • Recognize and use special sequences. • Iterate functions..	arithmetic means, arithmetic sequence, arithmetic series, common difference, common ratio, convergent series, divergent series, explicit formula, Fibonacci sequence, finite sequence, geometric means, geometric sequence, geometric series, induction hypothesis, infinite geometric series, infinite sequence, infinity, iteration, partial sum, recursive formula,

Lesson 10-1 Sequences as Functions **Lesson 10-2 Arithmetic Sequences and Series** **Lesson 10-3 Geometric Sequences and Series** **Lesson 10-4 Infinite Geometric Series** **Lesson 10-5 Recursion and Iteration** **Lesson 10-6 The Binomial Theorem** **Lesson 10-7 Proof by Mathematical Induction**	**A1.A-CED.A.4** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.* **A2.A-SSE.B.4** Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.* **A1.A-SSE.A.1.b** Interpret expressions by viewing one or more of their parts as a single entity. **A2.F-BF.A.1** Write a function that describes a relationship between two quantities. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. Include problem-solving opportunities utilizing real-world context. a. Determine an explicit expression, a recursive process, or steps for calculation from a context. **A2.F-BF.A.2** Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.	Theorem to expand powers of binomials -use mathematical inductions to prove statements		recursive sequence, sequence, series, sigma notation, term
Chapter 11 **Probability and Statistics**	**A2.S-IC.B.3** Recognize the purposes of and differences between designed experiments, sample surveys and observational studies.	I can: -use a measure of central tendency to represent a set of data	● Classify study types. ● Design statistical studies. ● Use the shapes of distributions to select	alternative hypothesis H_a, bias, binomial distribution, confidence interval, continuous

Lesson11-1 Designing a Study **Lesson 11-2 Distributions of Data** **Lesson 11-3 Probability Distributions** **Lesson 11-4 The Binomial Distribution** **Lesson 11-5 The Normal Distribution** **Lesson 11-6 Confidence Intervals and Hypothesis Testing** McGrawHill/ Reveal Algebra 2 (2020), as well as McGrawHill / Reveal Geometry (2020) as supplemental resources	**A2.S-IC.B.4** Use data from a sample survey to estimate a population mean or proportion; recognize that estimates are unlikely to be correct and the estimates will be more precise with larger sample sizes. **A2.S-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. **A2.S-ID.A.4** Use the mean and standard deviation of a data set to fit it to a normal curve, and use properties of the normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, or tables to estimate areas under the normal curve. **A2.S-CP.A.3** Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P(B)*, and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of A, and the conditional probability of *B* given *A* is the same as the probability of *B*. **A2.S-CP.A.4** Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.	and find measures of variations for a set of data -determine whether a sample is biased and find margins of sampling error -create and use graphs of probability distributions -solve problems involving normally distributed data -use binomial expressions to find probabilities -use confidence intervals to estimate population parameters - Find conditional probabilities of events - Classify events as dependent or independent -	appropriate statistics. ● Use the shapes of distributions to compare data. ● Construct a probability distribution. ● Analyze a probability distribution and its summary statistics. ● Identify and conduct a binomial experiment. ● Find probabilities using binomial distributions. ● Use the Empirical Rule to analyze normally distributed variables. ● Apply the standard normal distribution and z-values. ● Find confidence intervals for normally distributed data. ● Perform hypothesis tests on normally distributed data. • Calculate conditional probabilities. • Interpret events as dependent or independent	random variable, discrete random variable, Empirical Rule, expected value E(X), experiment, experimental probability distribution, hypothesis test, inferential statistics, maximum error of estimate, negatively skewed distribution, normal distribution, null hypothesis H_0, observational study, parameter, positively skewed distribution, probability distribution, random variable, standard normal distribution, statistic, statistical inference, survey, symmetric distribution, theoretical probability distribution, z-value, compound event, dependent event, independent event, conditional probability, probability tree,

	A2.S-IC.A.2 Explain whether a specified model is consistent with results from a given data-generating process.			
Chapter 12 **Trigonometric Functions** **Lesson 12-1 Trigonometric Functions in Right Triangles** **Lesson 12-2 Angles and Angle Measure** **Lesson 12-3 Trigonometric Functions of General Angles** **Lesson 12-4 Law of Sines** **Lesson 12-5 Law of Cosines** **Lesson 12-6 Circular and Periodic Functions**	**F-TF.A.1** Understand radian measure of an angle as the length of the arc on any circle subtended by the angle, measured in units of the circle's radius. **F-TF.A.2** Explain how the unit circle in the coordinate plane enables the extension of sine and cosine functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. **A2.F-IF.C.7** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A2.F-TF.B.5** Create and interpret sine, cosine and tangent functions that model periodic phenomena with specified amplitude, frequency, and midline. **F-BF.B.3** Identify the effect on the graph of replacing *f(x)* by *f(x) + k*, *kf(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	I can: -explore trigonometric functions, first in acute angles in standard form, and also for points on the unit circle -derive and use the Law of Sines and Law of Cosines as applications of trigonometric functions -develop inverse for the sine, cosine and tangent functions - use trigonometric functions to explore amplitude and period -investigate phase shifts and vertical shifts in the graphs of trigonometric functions	• Find values of trigonometric functions for acute angles. • Use trigonometric functions to find side lengths and angle measures of right triangles. • Draw and find angles in standard position. • Convert between degree measures and radian measures. • Find values of trigonometric functions for general angles. • Find values of trigonometric functions by using reference angles. • Find the area of a triangle using two sides and an included angle. • Use the Law of Sines to solve triangles. • Use the Law of Cosines to solve triangles. • Choose methods to solve triangles. • Find values of trigonometric functions based on unit circle.	ambiguous case, amplitude, angle of depression, angle of elevation, Arccosine function, Arcsine function, Arctangent function, central angle, circular function, cosecant, cosine, cotangent, coterminal angles, cycle, frequency, initial side, Law of Cosines, Law of Sines, midline, period, periodic function, phase shift, principal values, quadrantal angle, radian, reference angle, secant, sine, solving a triangle, standard position, tangent, terminal side, trigonometric function, trigonometric ratio, trigonometry, unit circle, vertical shift

Lesson 12-7 Graphing Trigonometric Functions **Lesson 12-8 Translations of Trigonometric Graphs** **Lesson 12-9 Inverse Trigonometric Functions**	even and odd functions from their graphs and algebraic expressions for them. Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **A.1.A.CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		• Use the properties of periodic functions to evaluate trigonometric functions. • Describe and graph the sine, cosine, and tangent functions. • Describe and graph other trigonometric functions. • Graph horizontal translations of trigonometric graphs and find phase shifts. • Graph vertical translations of trigonometric graphs. • Find values of inverse trigonometric functions. • Solve equations by using inverse trigonometric functions.	
Chapter 13 **Trigonometric Identities and Equations** **Lesson 13-1 Trigonometric Identities** **Lesson 13-2 Verifying Trigonometric Identities**	**F.TF.C.8** Use 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.	I can: -learn how to verify and use trigonometric identities -prove trigonometric identities	• Use trigonometric identities to find trigonometric values. • Use trigonometric identities to simplify expressions. • Verify trigonometric identities by transforming one side of an equation into the form of the other side. • Verify trigonometric identities by transforming each side of the equation into the same form.	Co-function identity, negative angle identity, Pythagorean identity, quotient identity, reciprocal identity, trigonometric equation, trigonometric identity

Lesson 13-3 Sum and Differences of Angles Identities **Lesson 13-4** **Double-Angle And Half-Angle Identities** **Lesson 13-5** **Solving Trigonometric Equations**				