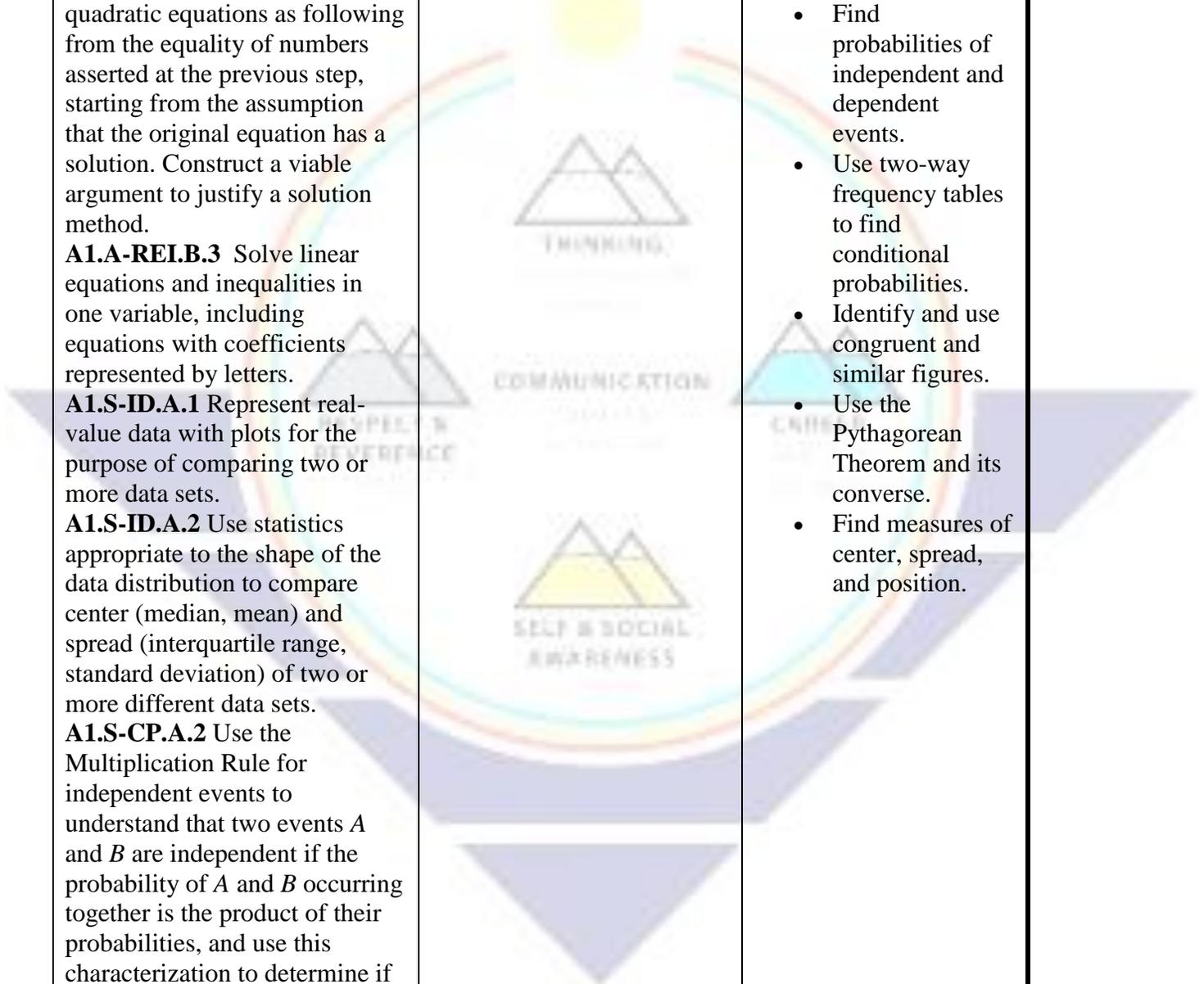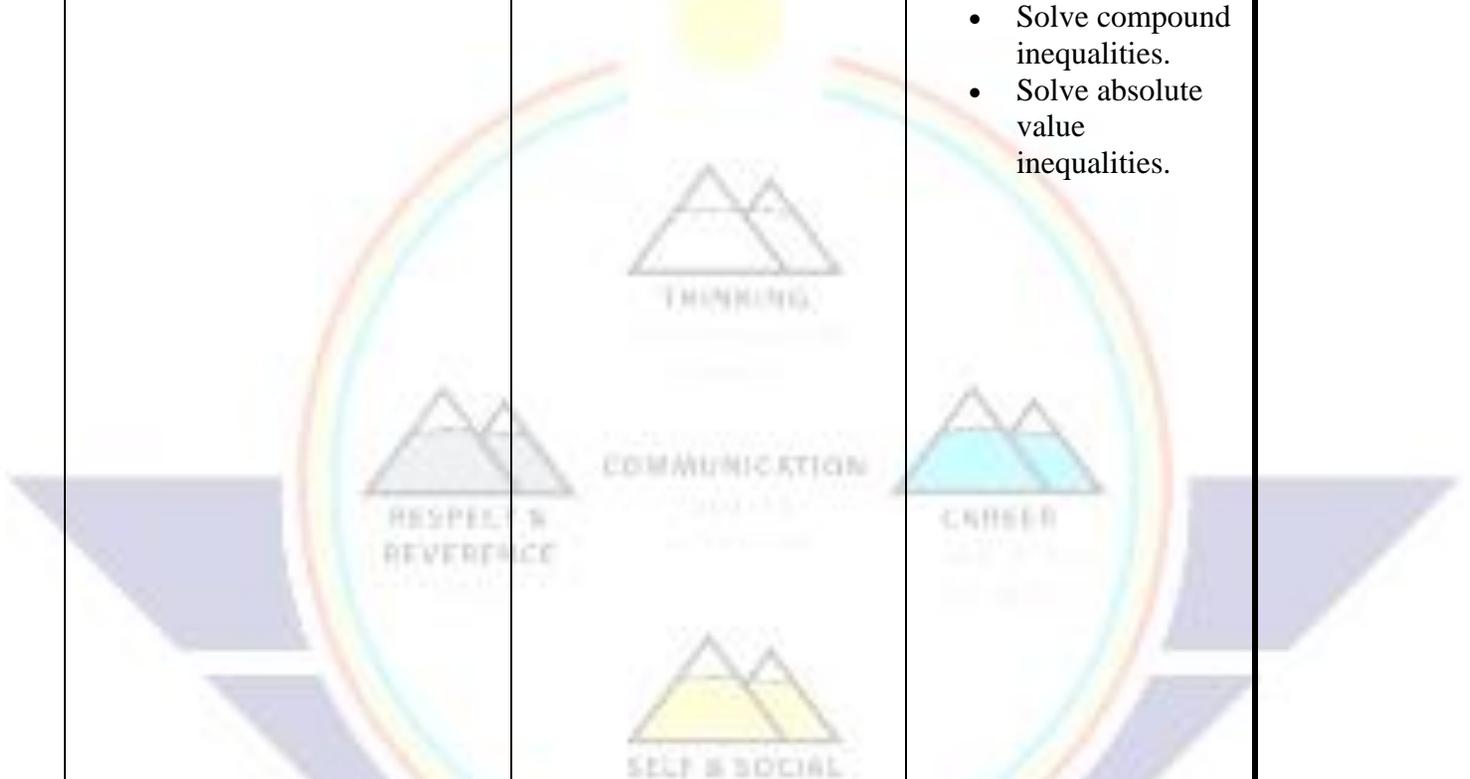# Ganado Unified School District #20
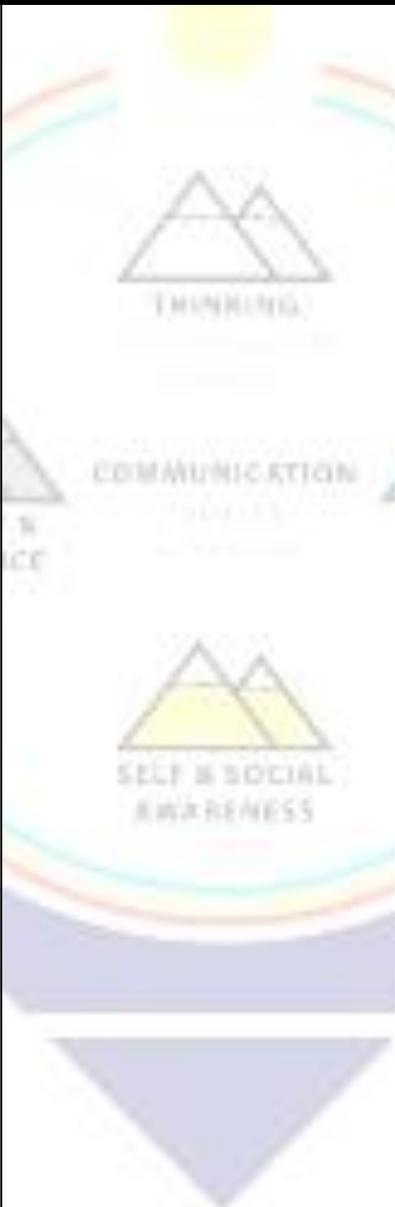# (Algebra II)

PACING Guide SY 2018-2019

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/ Glencoe Algebra 2 (2014) and Online ALEKS learning program integration	**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	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.	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

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	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. 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.		• 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.	

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Chapter 1

Equations and Inequalities | **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 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. | I can:
-use properties of real numbers to evaluate expressions and formulas.

-classify real numbers.

-use the properties of equality to solve equations.

-solve absolute value equations.

-solve inequalities, compound inequalities, and absolute value inequalities. | • 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 properties of equality.
• Evaluate expressions involving absolute values.
• Solve absolute equations.
• Solve one-step inequalities.
• Solve multi-step inequalities. | 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 operations, rational numbers, real numbers, set-builder notation, solution, union, variables, whole numbers |

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			• Solve compound inequalities. • Solve absolute value inequalities.	
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 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	I can: -identify the mathematical domains and ranges of functions and determine reasonable domain and range values for continuous and discrete situations. -identify and sketch graphs of parent functions, including linear functions	• Analyze relations and functions. • Use equations of relations and functions. • Identify linear relations and functions. • Write linear equations in standard form.	absolute value function, bivariate data, continuous relation, correlation coefficient, 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,

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	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	$(f(x)=x)$ 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.	• 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.	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

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	(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-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.		• Graph absolute value inequalities.	

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	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**	**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	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	• 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	bounded, break-even point, consistent, dependent, elimination method, feasible region, inconsistent, independent, optimize, ordered triple, substitution method, unbounded

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	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.	to systems of equations for given contexts.	system of inequalities.	
Chapter 4

Quadratic Functions and Relations | **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. | 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.

-use complex numbers to describe the solutions of quadratic equations.

-determine a quadratic function from its zeros. | • 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 | 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 |
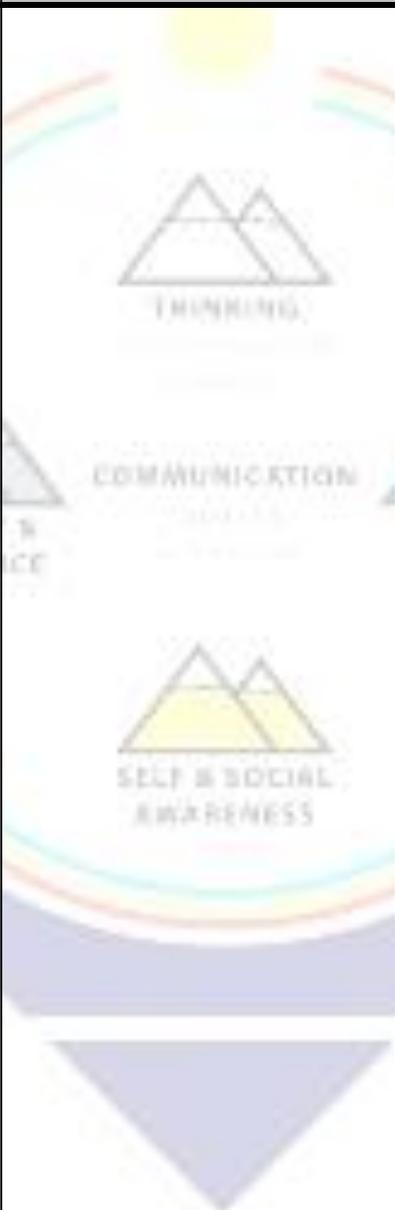
Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
	Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums. Focus on linear, 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.	-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 $y=a(x-h)^2 +k$ form of a function.	pure imaginary numbers. • Perform operations with complex numbers. • Solve quadratic equations by using the Square Root Property. • 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	

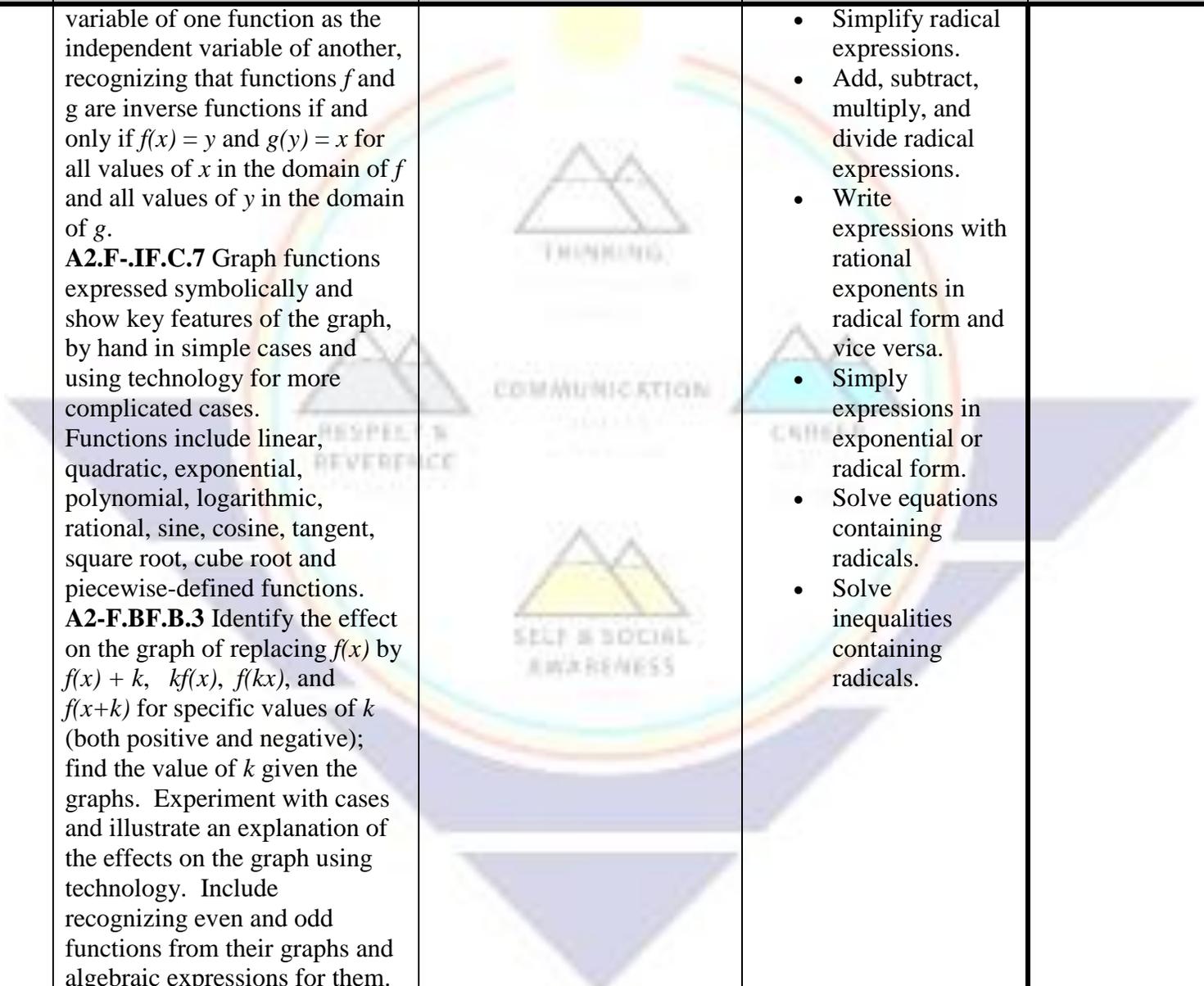| Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
	A2.A-REI.D.11 Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; 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.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.		form y=a(x-h)^2+k. - Graph quadratic inequalities in two variables. - Solve quadratic inequalities in one variable.	

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	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,			

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	and interpret solutions as viable or non-viable options in a modeling context.			
Spring Semester Chapter 5 **Polynomials and Polynomial Functions**	**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 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	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. -determine the reasonable domains and range values for continuous situations.	• 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 polynomial functions. • Graph polynomial functions and locate their zeroes. • Find relative maxima and	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, synthetic division, synthetic substitution, turning points

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	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, quadratic, rational, and exponential functions.		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	

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	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		a polynomial function.	

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	polynomials for which factors are not provided **A2.A-APR.C.4** Prove polynomial identities and use them to describe numerical relationships.			
Chapter 6 **Inverses and Radical Functions and Relations**	**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	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.	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

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	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, 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.		• 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.	

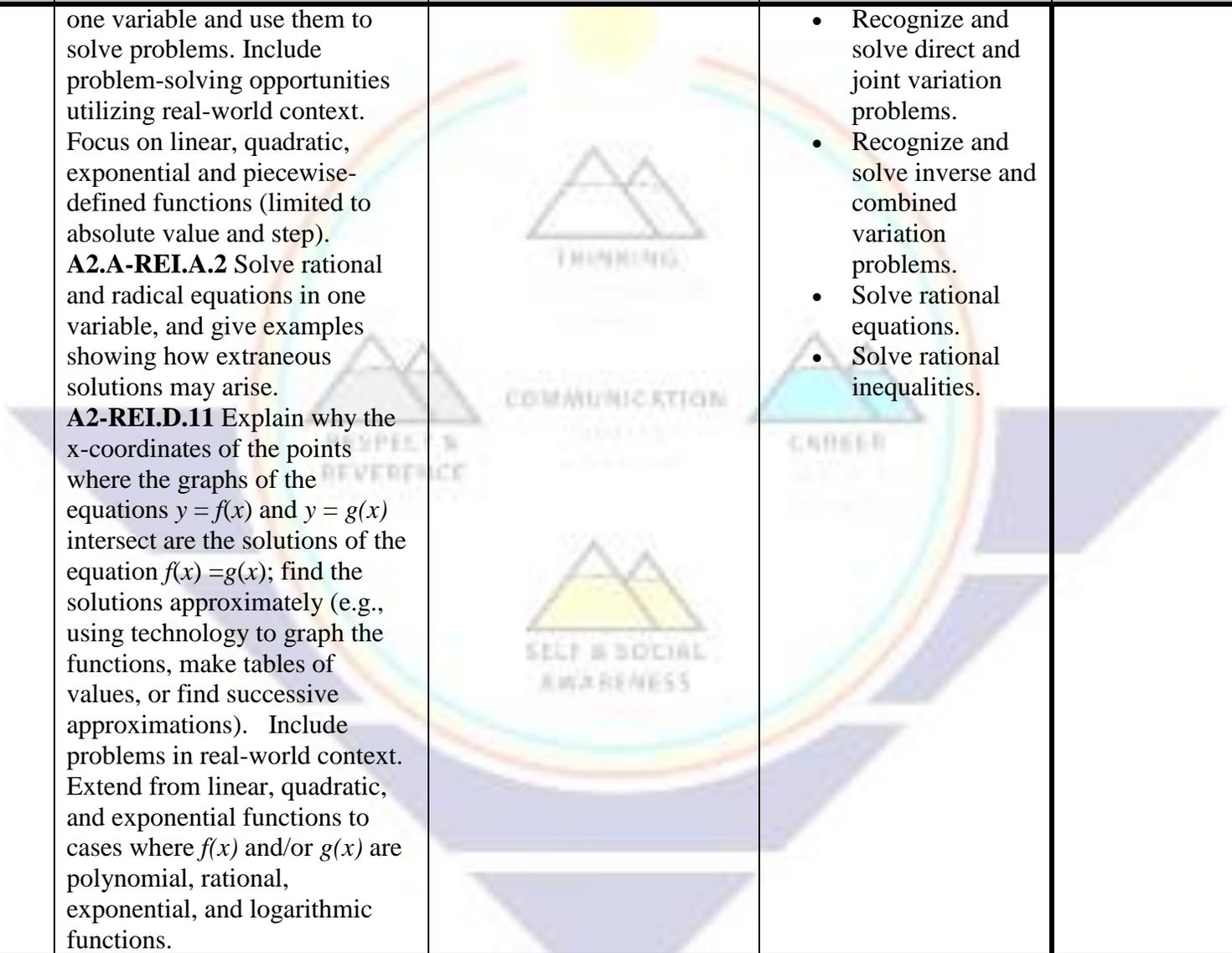| Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
	Functions include linear, quadratic, exponential, polynomial, logarithmic, rational, sine, cosine, tangent, square root, cube root and piecewise-defined functions. **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,			

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	exponential, and logarithmic functions.			
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, 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 | I can: -analyze a situation modeled by an exponential function, formulate an equation or inequality , and solve the problem - 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 | • Graph exponential growth and decay functions. • Solve exponential equations. • Solve exponential inequalities. • Evaluate logarithmic expressions. • Graph logarithmic functions. • Solve logarithmic equations. • Solve logarithmic inequalities. • Simplify and evaluate expressions using the properties of logarithms. • Solve logarithmic equations using | asymptote, change of base formula, common logarithm, compound interest, decay factor, exponential decay, exponential function, exponential 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 |

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	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 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		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	

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	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		problems involving logistic growth.	

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	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).			

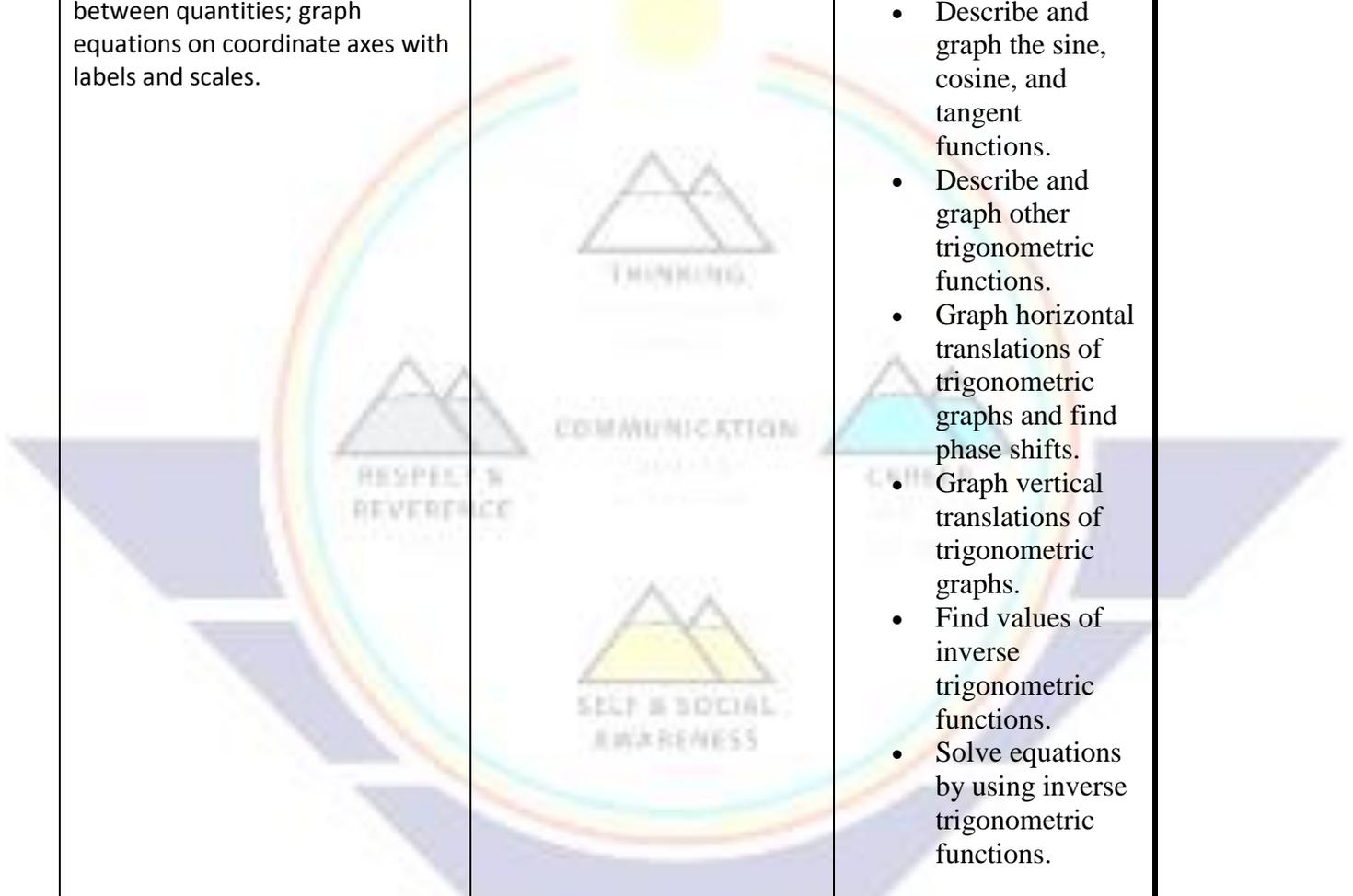| Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Chapter 8 **Rational Functions and Relations**	**A1.A-CED.A.2** Create equations in two or more variables to represent relationships between quantities; graph equations 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	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.	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

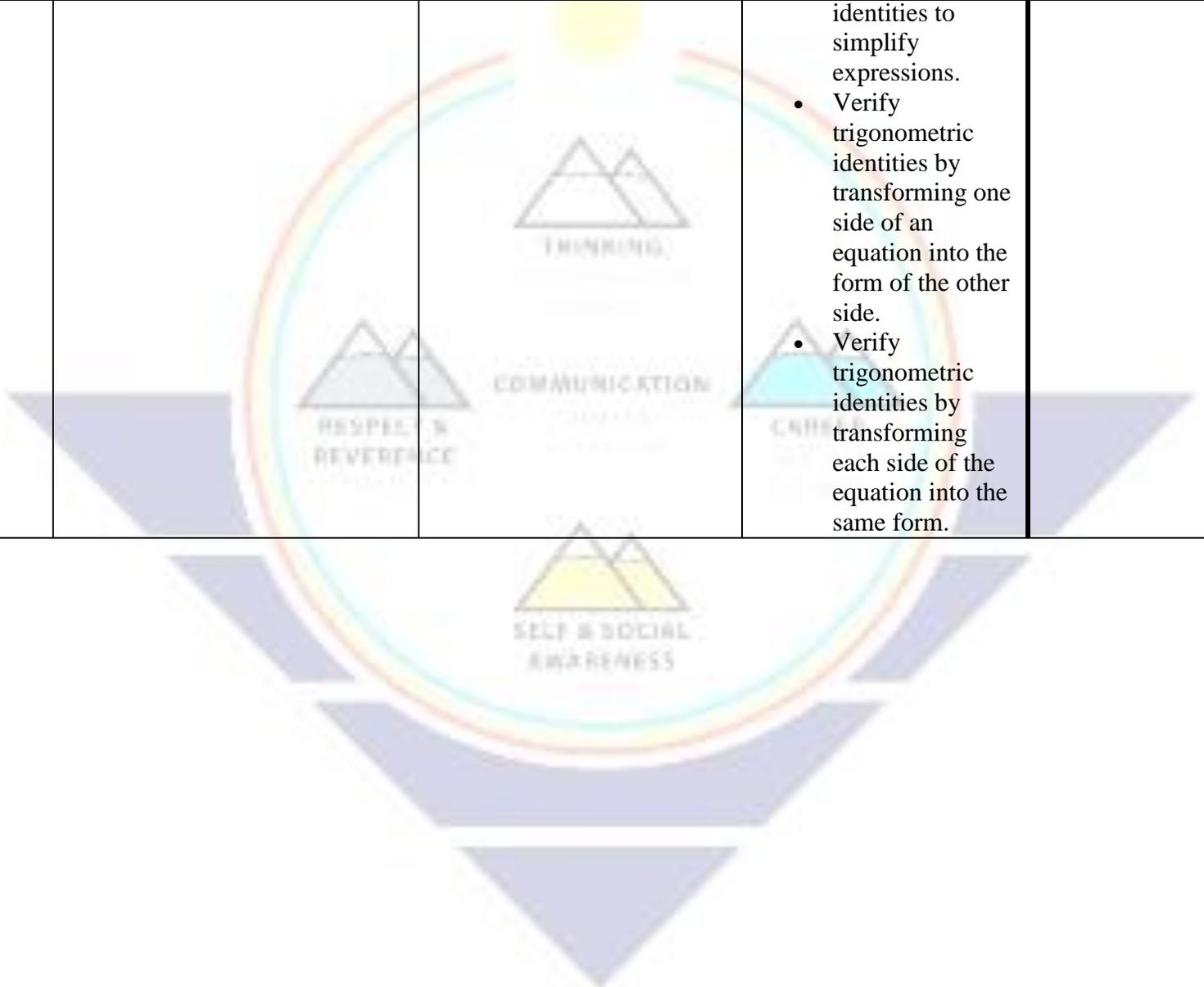| Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
	one variable and use them to solve problems. Include problem-solving opportunities utilizing real-world context. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A2.A-REI.A.2** Solve rational and radical equations in one variable, and 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.		• Recognize and solve direct and joint variation problems. • Recognize and solve inverse and combined variation problems. • Solve rational equations. • Solve rational inequalities.	
Chapter 10	**A2.F-.IF.B.4** For a function that models a relationship between two quantities, interpret key	I can: -relate arithmetic sequences to linear functions and	• Relate arithmetic sequences to linear functions.	arithmetic means, arithmetic sequence, arithmetic series, common

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Sequences and Series	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. **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.*	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 Theorem to expand powers of binomials -use mathematical inductions to prove statements	• 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..	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, recursive sequence, sequence, series, sigma notation, term

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	A1.A-SSE.A.1.b Interpret expressions by viewing one or more of their parts as a single entity.			
Chapter 11 **Probability and Statistics**	**A2.S-IC.B.3** Recognize the purposes of and differences between designed experiments, sample surveys and observational studies. **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.	I can: -use a measure of central tendency to represent a set of data 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	• Classify study types. • Design statistical studies. • Use the shapes of distributions to select 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	alternative hypothesis H_a, bias, binomial distribution, confidence interval, continuous 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

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			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.	
Chapter 12 **Trigonometric 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	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	• 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.	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

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	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 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	-investigate phase shifts and vertical shifts in the graphs of trigonometric functions	• 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. • Use the properties of periodic functions to evaluate trigonometric functions.	side, trigonometric function, trigonometric ratio, trigonometry, unit circle, vertical shift

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	between quantities; graph equations on coordinate axes with labels and scales.		• 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**	**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	cofunction identity, negative angle identity, Pythagorean identity, quotient identity, reciprocal identity, trigonometric equation, trigonometric identity

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			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.	