PRESCOTT UNIFIED SCHOOL DISTRICT
District Instructional Guide
Date Revised 7/19/2018

Grade Level: 9-12	Subject: Algebra 1	Time: 1st Semester/2nd Semester	Core Text: Algebra 1, Mathematics Vision Project

Time	Unit/Topic	Standards	Assessments
1st Semester	1-Sequences	**A1.N-RN.B.3** Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. (sometime in module 1) **A1.N-Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context. **A1.A-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret expressions by viewing one or more of their parts as a single entity. **A1.A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **A1.F-LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **A1.F-LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.	Formative/Summative Unit Assessments

		A1.F-LE.B.5 Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context. **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).	
	2-Linear and Exponential Functions	**A1.F-IF.A.3** Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **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). **A1.F-LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another **A1.F-LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs. **A1.F-LE.A.3** Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. **A1.F-LE.B.5** Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context. **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.	Formative/Summative Unit Assessments

		A2.N-RN.A.2 Rewrite expressions involving radicals and rational exponents using the properties **A1.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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.F-IF.C.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square of a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **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-REI.D.10** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve, which could be a line. **A1.S-ID.B.6** Represent data on two quantitative variables on a scatter plot, and describe how the quantities are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Focus on linear models. b. Informally assess the fit of a function by plotting and analyzing residuals **A1.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. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **A.SSE.6** **A1.A-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret expressions by viewing one or more of their parts	

		as a single entity. **A1.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **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. **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)	
	3-Features of Functions	**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. **A1.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). Focus on cases where f(x) and/or g(x) are linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **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). **A1.F-IF.A.1**. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).	Formative/Summative Unit Assessments

		A1.F-IF.A.2. Evaluate a function for inputs in the domain, and interpret statements that use function notation in terms of a context. **A1.F-IF.A.3**. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. **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 negative; relative maximums and minimums. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.F-IF.B.5**. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. **A1.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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step).	
	4-Equations and Inequalities	**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. 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.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. **A1.N-Q.A.2**. Define appropriate quantities for the purpose of descriptive modeling. Include problem-solving opportunities utilizing real-world context.	Formative/Summative Unit Assessments

		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.	
	5-Systems of 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.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. **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. **A1.A-REI.D.12**. Graph the solutions to a linear inequality in two variables as a half-plane, excluding the boundary in the case of a strict inequality, and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. **A1.A-REI.C.5**. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. **A1.A-REI.C.6**. Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. Include problem solving opportunities utilizing real-world context. **P.A-REI.C.8**. Represent a system of linear equations as a single matrix equation in a vector variable. (Honors only)	Formative/Summative Unit Assessments

2nd Semester	6- Quadratic 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. (discussed in 6.2) **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. **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. b. Combine function types using arithmetic operations and function composition. **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-SSE.A.1** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret expressions by viewing one or more of their parts as a single entity. **A1.F-LE.A.1** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **A1.F-LE.A.2** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or input/output pairs.	Formative/Summative Unit Assessments

		A1.F-LE.A.3 Observe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. **A1.F-LE.B.5** Interpret the parameters in a linear or exponential function with integer exponents utilizing real world context. **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) **A1.F-IF.C.9** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.A-SSE.A.2** Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns. (Mod 6)	
	7-Structures of Expressions	**A1.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 and cubic polynomials in which linear and quadratic factors are available. (discussed in 7.1) **A1.A-REI.B.4** Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – k) 2 = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic (7.3) **A1.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. Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). **A1.F-IF.C.8**. Write a function defined by an expression in different but	Formative/Summative Unit Assessments

		equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square of a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **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). **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.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. **A1.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. a. Factor a quadratic expression to reveal the zeros of the function it defines. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **A1.A-REI.B.4**. Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – k) 2 = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic equations that have real roots. Include cases that recognize when a quadratic equation has no real solutions.	

		A2.A-REI.C.7. Solve a system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line y = -3x and the circle x2 + y2 = 3.	
	8-More Functions. More Features	**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-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.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-BF.B.4** Find inverse functions. 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. b. Understand that if a function contains a point (a,b), then the graph of the inverse relation of the function contains the point (b,a). c. Interpret the meaning of and relationship between a function and its inverse utilizing real-world context.	Formative/Summative Unit Assessments
	9-Modeling Data	**A1.S-ID.C.9** Distinguish between correlation and causation. (related too but need to add 9.3, 9.5 pg.441) **A1.S-CP.A.1** Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events. (need to add to Mod 9) **A1.S-CP.A.2** Use the Multiplication Rule for independent events to understand	Formative/Summative Unit Assessments

		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. (need to add to Mod 9) **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. (9.1) **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.3** Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of outliers if present. **A1.S-ID.B.5** Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data, including joint, marginal, and conditional relative frequencies. Recognize possible associations and trends in the data. **A1.S-ID.C.7** Interpret the slope as a rate of change and the constant term of a linear model in the context of the data. **A1.S-ID.C.8** Compute and interpret the correlation coefficient of a linear relationship.	

Missing State Standards:
A1.S-ID.C.9 Distinguish between correlation and causation. (9.3, 9.5) **A1.S-CP.A.1** Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events. (Mod 9) **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. (Mod 9) **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. (9.1) **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) (mod 2 and 6)
A1.F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). Focus on linear, quadratic, exponential and piecewise-defined functions (limited to absolute value and step). (mod 2 and 6)
A1.N-RN.B.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational. (sometime in module 1)
A1.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context. (in everything!)
A1.A-REI.B.4 Solve quadratic equations in one variable. a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x – k) 2 = q that has the same solutions. Derive the quadratic formula from this form. b. Solve quadratic equations by inspection (e.g., x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Focus on solutions for quadratic (7.3)
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. (discussed in 6.2)
A1.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 and cubic polynomials in which linear and quadratic factors are available. (discussed in 7.1)
A1.A-SSE.A.2 Use structure to identify ways to rewrite numerical and polynomial expressions. Focus on polynomial multiplication and factoring patterns. (Mod 6)

Mathematical Practices (MP)

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.