Pre-AP Algebra I
Year At A Glance

Pre-AP Algebra I Year-at-a-Glance					
FIRST SEMESTER			SECOND SEMESTER		
Unit 1 Functions & Linear	**Unit 2 Systems of Linear Equations & Inequalities**	**Unit 3 Exponential**	**Unit 4 Polynomial Operations & Factoring**	**Unit 5 Quadratics**	**Unit 6 Data & Radicals**
11 weeks	4 weeks	4 weeks	5 weeks	7 weeks	5 weeks
Functions ● Types ● Domain/Range ● Determination ● Evaluating ● Function Notation ● Interpret Statements Linear - Solving Equations ● Two-Step, Distribute, Combine Like Terms, Variables on both Sides ● Proportions ● Absolute Value ● Zeros from Table/Graph ● Formulas ● Literal Equations Linear - Solving Inequalities ● Write Simple Ineq. ● Solving Simple Ineq. ● Writing Compound Ineq. ● Solving Compound Ineq. ● Abs. Value	Systems of Linear Equations ● Test a solution ● Solving ○ Graphing ○ Substitution ○ Elimination ● Modeling Systems of Linear Inequalities ● Test a solution ● Solve by Graphing ● Modeling	Exponent Rules ● Zero/Negative ● Multiplying ● Dividing Exponential - Writing ● Geometric Sequences ● Two points ● Tables ● Graphs ● Statements Exponential - Graphing ● Standard ● Key Features Exponential - Modeling ● Growth ● Decay ● Compound Interest	Polynomial Operations ● Add ● Subtract ● Multiply ○ Monomials ○ Binomials ○ Trinomials ○ Special Cases Polynomial Factoring ● GCF ● Higher Order ● Quadratic Trinomials ● Special Cases	Quadratic - Solving ● Zero-Product Rule ● Factoring ● Square Roots ● Zeros ● Completing the Square ● Quadratic Formula Quadratic - Graphing ● Standard ● Vertex ● Key Features ● Transformations Quadratic - Writing ● Standard ● Vertex ● Context ● Tables ● Graphs Systems of Linear & Nonlinear Equations ● Graphing	Radicals ● Simplify ● Add ● Subtract ● Multiply ● Divide ● Rationalize the Denominator Data ● Scatter Plots ● Trendlines ● Histograms ● Box & Whisker ● Central Tendencies

<u>Linear - Creating Equations</u> ● Slope ● Slope-Intercept ● Point-Slope ● Standard <u>Linear - Graphing</u> ● Slope-Intercept ● Point-Slope ● Standard ● Interval ● Piecewise				● Algebraically ● Modeling	

BLUE - Power Standard

BLACK - Additional Skills

RED - Closing the Achievement Gap

Green - Familiarity Only

Unit 1

Unit 2

Unit 3

Unit 4

Unit 5

Unit 1	Functions & Linear	Grade Level	Pre-AP Algebra I	Approx length	11 Weeks

CPSD Power Standards with Student Learning Objectives

HSF.IF.A.1.14 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 • Understand that 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* • Understand that the graph of *f* is the graph of the equation *y = f(x)*

Student-Friendly Objectives:

- I can determine if a relation is a function by looking at a set of ordered pairs, a table, a mapping, or a graph.
- I can relate the definition of a function to the use of the vertical line test.
- I can identify domain and range from graphs, mappings, sets of ordered pairs, or tables

HSF.IF.A.2.14 In terms of a real-world context: • Use function notation • Evaluate functions for inputs in their domains • Interpret statements that use function notation

Student-Friendly Objectives:

- I can use function notation.
- I can find *f(x)* if given *x*.
- I can explain the elements of function notation when it represents a real world context.

HSA.REI.B.3.11 Solve linear equations, inequalities and absolute value equations in one variable, including equations with coefficients represented by letters

Student-Friendly Objectives:

- I can determine when it is appropriate to reverse an inequality symbol.
- I can solve an equation, inequality, and absolute value equation.
- I can solve an equation with many variables.
- I can represent my solution(s) graphically and using set notation when appropriate.
- I can check my solutions.

HSA.CED.A.2.9 Create equations in two or more variables to represent relationships between quantities • Graph equations, in two variables, on a coordinate plane

Student-Friendly Objectives:

- I can graph (a line, a parabola, & an exponential curve) given various information.
- I can write an equation from a verbal description, a table, or a graph.
- I can interpret slope in the context of a problem.
- I can calculate the common ratio of a data set and interpret its meaning.
- I can identify the y-intercept in linear, exponential, or quadratic functions and interpret its meaning.
- I can determine if a point is a solution to an equation.
- I can describe the relationship between the domain and range using the variables.

HSF.IF.C.7 Graph functions expressed algebraically and show key features of the graph, with and *without technology (limited to parent functions only)* • Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima

Student-Friendly Objectives:

- I can name the key features of a graph and equation.
- I can graph the seven parent functions by hand.
- I can state the end behaviors from an equation and/or a graph.
- I can sketch the graph of an equation using the key features

Learning Indicators of Power Standards

Students will know…

- The definition of domain and range
- The definition of independent and dependent variables
- The independent variable is the input and the dependent variable is the output
- If *x* is an element of its domain, then *f(x)* denotes the corresponding element of the range (*y*)
- The definition of function
- Various notations for domain and range
- The elements of function notation (i.e., if linear, then coefficient is a rate and constant term is often an initial value)
- The meaning of absolute value
- When (and why) the inequality symbol switches
- Which variable (among multiple letters) to isolate, i.e. $ax + b = 16$, solve for x in terms of a and b
- Solutions should be verified
- The formula for slope/rate of change
- Slope-intercept form of a linear equation

And be able to…

- Determine if a relation is a function when it's given as a set of ordered pairs, a table, a mapping, or a graph.
- Graph an equation written in function notation.
- Relate the vertical line test to the definition of a function.
- Identify the domain and range of a relation from graph (including piecewise graphs), mapping, set of ordered pairs, or a table.
- Write an equation using function notation.
- Evaluate functions.
- Interpret equations written in function notation (i.e. $C(n) = 2.79n$ means the cost of n gallons of gas is \$2.79 times the number gallons and \$2.79 is the price per gallon).
- Isolate the variable of an equation, inequality, and absolute value (including with coefficients represented with letters -- literal equations).
- Set up and solve two equations based on an absolute value equation.
- Represent a solution to a linear equation, inequality, or absolute value equation graphically or on a number line.

● All solutions to a two-variable equation are points on a graph ● Understand that a function can be represented graphically, algebraically, verbally, etc. ● Know what an initial value represents and its graphic representation ● Know how domain/range relate to the graph and its variables ● The key features of a graph ○ Intercepts ○ End behavior ○ Extrema ○ Increasing/decreasing intervals ○ Jump discontinuities in piecewise functions	● Represent the solution to an inequality using set notation. ● Solve for a specific variable in terms of the others. ● Determine if a data set is linear, exponential, or neither. ● Interpret slope or common ratio in the context of a graph, verbal description, or table. ● Graph functions (linear, exponential, and quadratic). ● Write a description of the relationship between the variables (verbal or equation). ● Determine whether an exponential function is exponential growth or exponential decay. ● Translate between the tabular, algebraic, graphical, and verbal representations of equations. ● Identify the type of function. ● Graph the parent functions for those listed above without technology. ● Graph a function using the key features. ● Identify the end behaviors from the equation and the graph.

Additional Arkansas State Standards

- HSF.IF.B.6 Calculate and interpret the average *rate of change* of a *function* (presented algebraically or as a table) over a specified interval* Estimate the *rate of change* from a graph*
- HSF.IF.B.4.15 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
- HSF.IF.B.5.15 Relate the domain of a function to its graph • Relate the domain of a function to the quantitative relationship it describes
- HSA.CED.A.1.9 Create equations and inequalities in one variable and use them to solve problems Note: Including but not limited to equations arising from: • Linear functions • Quadratic functions • Exponential functions • Absolute value functions
- HSA.CED.A.3.9 Represent and interpret constraints by equations or inequalities, and by systems of equations and/or inequalities • Interpret solutions as viable or nonviable options in a modeling and/or real-world context
- HSA.CED.A.4.9 Rearrange literal equations using the properties of equality

Unit 2	Solving Systems of Equations and Inequalities	Grade Level	Pre-AP Algebra I	Approx Length	4 weeks

CPSD Power Standards with Student Learning Objectives

HSA.REI.C.6.12 Solve systems of equations algebraically and graphically Limitation: i) Tasks have a real-world context. ii) Tasks have hallmarks of modeling as a mathematical practice (less defined tasks, more of the modeling cycle).

Student-Friendly Objectives:

- I can solve a system of equations by substitution, elimination or graphing.
- I can determine if a point is a solution.
- I can write a system of equations for a real-world situation.
- I can solve and interpret the solution of a system of equations in a real-world context.

Learning Indicators of Power Standards

Students will know...	And be able to...
● The definition of a systems of equations ● That a solution to a system of equations is the point(s) that makes both equations true ● Whether a system of equations has one solution, no solutions, or infinite solutions	● Determine whether a point is the solution to a system of equations. ● Solve a system of equations algebraically using substitution or elimination. ● Use graphs to solve a system of equations. ● Create, solve, and interpret the solution of a system of equations from context.

Additional Arkansas State Standards

- HSA.REI.D.12 Solve linear inequalities and systems of linear inequalities in two variables by graphing

Unit 3	Exponential	Grade Level	Pre-AP Algebra I	Approx Length	4 weeks

CPSD Power Standards with Student Learning Objectives

HSA.CED.A.2.9 Create equations in two or more variables to represent relationships between quantities • Graph equations, in two variables, on a coordinate plane

Student-Friendly Objectives:

- I can graph (a line, a parabola, & an exponential curve) given various information.
- I can write an equation from a verbal description, a table, or a graph.
- I can calculate the common ratio of a data set and interpret its meaning.
- I can identify the y-intercept in linear, exponential, or quadratic functions and interpret its meaning.
- I can determine if a point is a solution to an equation.
- I can describe the relationship between the domain and range using the variables.

HSF.IF.B.5.15 Relate the domain of a function to its graph • Relate the domain of a function to the quantitative relationship it describes For example: If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Student-Friendly Objectives:

- I can describe the domain given a real-world problem.
- I can determine if the domain is appropriate for the real-world problem.
- I can identify the domain of linear, quadratic, and exponential functions.

HSF.IF.C.7.16 Graph functions expressed algebraically and show key features of the graph, with and *without technology (limited to parent functions only)* • Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima • Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions • Graph exponential functions, showing intercepts and end behavior

Student-Friendly Objectives:

- I can name the key features of a graph and equation.
- I can graph the seven parent functions by hand.
- I can state the end behaviors from an equation and/or a graph.
- I can sketch the graph of an equation using the key features.

Learning Indicators of Power Standards	
Students will know… ● All solutions to a two-variable equation are points on a graph ● Understand that a function can be represented graphically, algebraically, verbally, etc. ● Know what an initial value represents and its graphic representation ● Know how domain/range relate to the graph and its variables ● The relationship between the domain and independent variable ● The appropriate domain could be the set or any subset of the real number system ● The key features of a graph ○ Intercepts ○ End behavior ○ Extrema ○ Increasing/decreasing intervals ○ Jump discontinuities in piecewise functions	And be able to… ● Solve for a specific variable in terms of the others. ● Determine if a data set is linear, exponential, or neither. ● Interpret slope or common ratio in the context of a graph, verbal description, or table. ● Graph functions (linear, exponential, and quadratic). ● Write a description of the relationship between the variables (verbal or equation). ● Determine whether an exponential function is exponential growth or exponential decay. ● Translate between the tabular, algebraic, graphical, and verbal representations of equations. ● Identify the domain given the graph. ● Identify the domain given a problem in context. ● Analyze the appropriateness of the identified domain. ● Identify the domain of linear, quadratic, and exponential function both with and without a context. ● Relate the domain of a function to the relationship it's describing (i.e. If $C(n) = 2.79n$ gives the cost of n gallons of gas, *then an appropriate domain would be real numbers between 0 and the max the tank would hold*). ● Identify the type of function. ● Graph the parent functions for those listed above without technology. ● Graph a function using the key features. ● Identify the end behaviors from the equation and the graph.
Additional Arkansas State Standards	
● None	

Unit 4	Polynomial Operations	Grade Level	Pre-AP Algebra I	Approx Length	4 weeks

CPSD Power Standards with Student Learning Objectives

SA.APR.A.1.5 Add, subtract, and multiply polynomials • Understand that polynomials, like the integers, are closed under addition, subtraction, and multiplication Note: If p and q are polynomials p + q, p – q, and pq are also polynomials

Student-Friendly Objectives:

- I can write a polynomial in descending order.
- I can classify polynomials based on its terms and degree.
- I can add and subtract polynomials.
- I can multiply polynomials.
- I can explain why polynomials are closed under addition, subtraction, and multiplication.

Learning Indicators of Power Standards

Students will know…	And be able to…
• The definition of a polynomial • Like terms can be added or subtracted • Polynomials are closed under addition, subtraction, and multiplication	• Write a polynomial in descending order. • Classify a polynomial based on its terms and degree. • Add, subtract, and multiply polynomials. • Explain why polynomials are closed under addition, subtraction, and multiplication.

Additional Arkansas State Standards

- None

Unit 5	Quadratics	Grade Level	Pre-AP Algebra I	Approx Length	6 weeks

CPSD Power Standards with Student Learning Objectives

HSA.APR.B.3.6 Identify zeros of polynomials **(linear, quadratic only**) when suitable factorizations are available • Use the zeros to construct a rough graph of the function defined by the polynomial

Student-Friendly Objectives:

- I can find the zeros of a quadratic given its factored form.
- I can determine if the vertex of a quadratic is the maximum or minimum value of the function.
- I can identify the zeros from a graph/equation.
- I can use the zeros and the vertex (min/max) to make a rough sketch of a graph.

HSA.CED.A.2.9 Create equations in two or more variables to represent relationships between quantities • Graph equations, in two variables, on a coordinate plane

Student-Friendly Objectives:

- I can graph (a line, a parabola, & an exponential curve) given various information.
- I can write an equation from a verbal description, a table, or a graph.
- can identify the y-intercept in linear, exponential, or quadratic functions and interpret its meaning.
- I can determine if a point is a solution to an equation.
- I can describe the relationship between the domain and range using the variables.

HSA.REI.B.4.11 Solve quadratic equations in one variable • Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Introduce this with a leading coefficient of 1 in Algebra I. • Solve quadratic equations (as appropriate to the initial form of the equation) by: • Inspection of a graph • Taking square roots • Completing the square • Using the quadratic formula • Factoring • Limitation: i) Tasks do not require students to write solutions for quadratic equations that have roots with nonzero imaginary parts. However, tasks can require the student to recognize cases in which a quadratic equation has no real solutions. Note: Solving a quadratic equation by factoring relies on the connection between zeros and factors of polynomials

Student-Friendly Objectives:

- I can solve a quadratic equation
  - By completing the square
  - Using the quadratic formula
  - By factoring (including using difference of squares)

    - By inspecting the graph or table
    - By taking the square root.
- I can determine the easiest method of solving a quadratic equation (depending on its given form).

HSF.IF.B.5.15 Relate the domain of a function to its graph • Relate the domain of a function to the quantitative relationship it describes For example: If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.

Student-Friendly Objectives:

- I can describe the domain given a real-world problem.
- I can determine if the domain is appropriate for the real-world problem.
- I can identify the domain of linear, quadratic, and exponential functions.

HSF.IF.C.7.16 Graph functions expressed algebraically and show key features of the graph, with and *without technology (limited to parent functions only)* • Graph linear and quadratic functions and, when applicable, show intercepts, maxima, and minima

Student-Friendly Objectives:

- I can name the key features of a graph and equation.
- I can graph the seven parent functions by hand.
- I can state the end behaviors from an equation and/or a graph.
- I can sketch the graph of an equation using the key features.

Learning Indicators of Power Standards	
Students will know... ● Zeros are the x-intercepts and are also referred to as solutions and/or roots ● The impact of the Zero Product Property ● The vertex of a quadratic will be the maximum or minimum of the function ● The leading coefficient determines the direction of opening ● All solutions to a two-variable equation are points on a graph ● Understand that a function can be represented graphically, algebraically, verbally, etc. ● Know what an initial value represents and its graphic representation ● Know how domain/range relate to the graph and its variables	And be able to... ● Use the Zero Product Property to find the zeros of quadratic given its factored form. ● Determine if the vertex of a quadratic is a minimum or maximum. ● Determine zeros of a function from a given graph. ● Use the zeros and the vertex (min/max) to make a rough sketch of a graph given the equation of the function. ● Solve for a specific variable in terms of the others. ● Determine if a data set is linear, exponential, or neither. ● Interpret slope or common ratio in the context of a graph, verbal description, or table. ● Graph functions (linear, exponential, and quadratic).

● Solutions of quadratic equations are the x-intercepts of the graph and the zeros on the table
● The quadratic formula
● Not all quadratics are factorable
● The process of completing the square (how the new "*c*" coefficient is formed)
● The key features of a graph
  ○ Intercepts
  ○ End behavior
  ○ Extrema
  ○ Increasing/decreasing intervals
	● Write a description of the relationship between the variables (verbal or equation).
	● Locate solutions of quadratic equations on a graph or table, if real solutions exist.
	● Solve a quadratic equation by factoring (including using difference squares).
	● Complete the square algebraically (associate meaning of new "*c*" coefficient).
	● Convert a quadratic equation from standard form to vertex form.
	● Solve a quadratic equation by completing the square.
	● Solve a quadratic equation by taking the square root.
	● Recognize an unfactorable quadratic equation, and use another appropriate method to solve.
	● Solve a quadratic equation by graphing (use technology for irrational roots).
	● Identify the domain given the graph.
	● Identify the domain given a problem in context.
	● Analyze the appropriateness of the identified domain.
	● Identify the domain of linear, quadratic, and exponential function both with and without a context.
	● Identify the type of function.
	● Graph the parent functions for those listed above without technology.
	● Graph a function using the key features.

Additional Arkansas State Standards

- HSA.SSE.B.3 Choose and produce an equivalent form of an *expression* to reveal and explain properties of the quantity represented by the *expression**
  - Factor a quadratic expression to reveal the *zeros* of the function it defines
  - Complete the square in a quadratic expression to reveal the *maximum* or *minimum* value of the function it defines
- HSA.REI.C.7 Solve *systems of equations* consisting of linear equations and nonlinear equations in two variables algebraically and graphically

Unit 6	Data/Radical Expressions	Grade Level	Pre-AP Algebra I	Approx Length	5 Weeks

CPSD Power Standards with Student Learning Objectives

HSS.ID.B.6.22 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related • Fit a function to the data; use functions fitted to data to solve problems in the context of the data Note: The focus of Algebra I should be on **linear and exponential models**

Student-Friendly Objectives:

- I can define the independent and dependent variables for a given situation.
- I can sketch a scatter plot using data.
- I can find an equation (function) that best fits the data.
- I can determine the practical domain and range for the line of best fit.
- I can use the line of best fit to solve problems.

Learning Indicators of Power Standards

Students will know…	And be able to…
• a scatter plot is a graphical representation of two variables • a scatter plot could represent different functions including linear and exponential • the definition of regression model	• Define independent and dependent variables in context. • Construct a scatter plot. • Describe how one variable should affect another. • Find an equation that best fits the scatter plot data from a graph and table, determine the practical domain and range of the equation, and use it to solve problems in the context of the data.

Additional Arkansas State Standards

- HSN.RN.B.4 Simplify radical expressions, perform operations with radical expressions, and rationalize denominators and/or numberators
- HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots)
- HSS.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
- HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers)
- HSS.ID.B.5 Summarize categorical data for two categories in a two-way frequency table. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.
- HSS.ID.C.8 Compute (using technology) and interpret the correlation coefficient of a linear fit
- HSS.ID.C.9 Distinguish between correlation and causation