8th Grade Algebra I
2018-2019 Year At A Glance

Year-at-a-Glance			
FIRST SEMESTER		SECOND SEMESTER	
Unit 1	**Unit 2**	**Unit 3**	**Unit 4**
1st 9-weeks	2nd 9-weeks	3rd 9-weeks	4th 9- weeks
Linear - Solving Equations • Two-Step, Distribute, Combine Like Terms, Variables on both Sides • Proportions • Formulas • Solve for variable **Linear - Solving Inequalities** • Write Simple Inequalities • Solving Simple Inequalities • Writing Compound Inequalities • Solving Compound Inequalities **Linear - Creating Equations** • Slope-intercept • Point - slope • Two points • Contextual **Linear - Graphing Equations** • Slope- intercept • Point - slope • Standard • Contextual	**Systems of Equations** • Solving Graphing Substitution Elimination • Contextual **Systems of Linear Inequalities** • Solve by Graphing • Contextual **Functions** • Types • Domain/Range • Determination • Evaluating • Function Notation • Piecewise **Absolute Value** • Solve equations • Graphing • Solving inequalities **Exponential - Writing** • Geometric Sequences • Two points • Tables • Graphs • Statements	**Exponential Rules** • Zero/Negative • Multiplying • Dividing **Polynomials** • Classify • Standard form • Add • Subtract • Multiply Monomials Binomials Trinomials Special Cases **Factoring Polynomials** • GCF • Higher Order • Quadratic Trinomials • Special Cases **Solving Quadratics** • Zero-Product Rule • Square Roots • Completing the Square • Quadratic Formula • Graphing (zeroes)	**Quadratic - Graphing** • Standard • Vertex • Transformations **Quadratic - Writing** • Standard • Vertex • Context • Tables • Graphs **Data** • Histograms • Box & Whisker • Central Tendencies • Two-way frequency tables **Scatterplots** • Distinguish between correlation & causation • Line of best fit (linear regression) **Radicals** • Simplify • Add • Subtract • Multiply • Divide • Rationalize Denominator

	Exponential - Graphing • Standard • Key Features **Exponential - contextual** • Growth • Decay		

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	Linear Equations - Solving, Graphing, and Creating	Grade Level	Gr 8 Algebra I	Approx length	9 weeks

CPSD Power Standards with Student Learning Objectives

8.EE.C.7 Solve linear equations in one variable: • Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions Note: Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form *x = a, a = a, or a = b* results (where a and b are different numbers) • Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms Note: Students should solve equations with variables on both sides.

Student-Friendly Objectives:

- I can use the distributive property.
- I can combine like terms.
- I can use order of operations properly.
- I can solve a one-step equation.
- I can solve a two-step equation.
- I can solve a multi-step equation.
- I can solve an equation with a variable on both sides.
- I can solve an equation with rational coefficients.
- I can solve an equation and check my solution by using substitution.
- I can determine when an equation has infinite or no solution.

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.

8.EE.B.6 Using a non-vertical or non-horizontal line, show why the slope *m* is the same • Write the equation *y= mx + b* for a line through the origin • Be able to write the equation *y = mx + b* for a line intercepting the vertical axis at *b*

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.

Learning Indicators of Power Standards

Students will know…

- Distributive property and combining like terms
  - Order of operations
  - Strategies for solving equations
    - One-step, two-step, multi-step, and with variables on both sides
  - When an equation has one, infinite, or no solutions
  - Vocabulary: Term, variable, coefficient, rational, linear, and solution
- 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
- 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

And be able to…

- Evaluate expressions using the distributive property, combining like terms, and order of operations
- Solve two-step equations
- Solve multi-step equations
- Solve equations with variables on both sides
- Solve equations with rational coefficients
- Solve equations with infinite or no solution
- Check the solution by substitution
- Isolate the variable of an equation, inequality, and absolute value (including with coefficients represented with letters -- literal equations)
- Represent a solution to a linear equation, inequality, or absolute value equation graphically or on a number line
- 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
- Write a description of the relationship between the variables (verbal or equation)
- Translate between the tabular, algebraic, graphical, and verbal representations of equations

Additional Arkansas State Standards

HSN.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.

HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems

HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling (i.e., use units appropriate to the problem being solved)

HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context - Interpret parts of an expression using the appropriate vocabulary, such as terms, factors and coefficients. Interpret complicated expressions by viewing one or more of their parts as a single entity.

HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it

HSA.APR.D.7 Add, subtract, multiply, and divide by nonzero rational expressions.

HSA.CED.A.3 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 Rearrange literal equations using the properties of equality

HSA.REI.A.1 Assuming that equations have a solution, construct a solution and justify the reasoning used.
HSA.REI.A.2 Solve simple and radical equations in one variable, and give examples showing how extraneous solutions may arise.

HSA.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

HSA.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 $f(x)=g(x)$

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

HSF.IF.B.6 Calculate and interpret the average rate of change of a function over a specified interval. Estimate the rate of change from a graph

HSF.BF.B.3 Experiment with multiple transformations and illustrate an explanation of the effects on the graph with or without technology

HSS.ID.C.7 Interpret the slope (rate of change) and interpret the intercept (constant term) of a linear model in the context of the data

Unit 2	Systems of Equations Functions - Absolute Value and Exponential	Grade Level	Gr 8 Algebra I	Approx Length	9 weeks

CPSD Power Standards with Student Learning Objectives

8.EE.C.8. Analyze and solve pairs of simultaneous linear equations: • Find solutions to a system of two linear equations in two variables so they correspond to points of intersection of their graphs.

HSA.REI.C.6. 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

8.F.A.1 • Understand that a function is a rule that assigns to each input exactly one output • The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. Note: An informal discussion of function notation is needed; however, student assessment is not required

HSF.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 • 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 generate outputs given certain inputs for a function role.
- 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 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.

HSF.IF.B.5 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.

HSA.REI.B.3 Solve linear equations, inequalities and **absolute value** equations in one variable, including equations with coefficients represented by letters

Student-Friendly Objectives:

- I can solve an equation, inequality, and absolute value equation.
- I can represent my solution(s) graphically and using set notation when appropriate.
- I can check my solutions.

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
- 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 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 a systems of equations
- Transform equations from standard form to slope intercept form
- Graph lines using slope intercept form
- Systems of equations have 3 types of solutions (one, no solution, or infinite)
- The coordinates of a solution to a system of equations will satisfy both equations
- All solutions to a two-variable equation are points on a graph
- The definition of function
- 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

And be able to…

- Determine whether a point is the solution to a system of equations
- Graph 2 lines based on the following potential solutions:
  - One solution (intersection)
  - No solution (parallel)
  - Infinite solutions (same/coinciding)
- Solve a system of equations algebraically using substitution or elimination
- Create, solve, and interpret the solution of a system of equations from context
- 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

● If *x* is an element of its domain, then *f(x)* denotes the corresponding element of the range (*y*) ● Various notations for domain and range ● Understand that a function can be represented graphically, algebraically, verbally, etc. ● What an initial value represents and its graphic representation ● 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 ● The meaning of absolute value	● Identify the domain and range of a relation from graph (including piecewise graphs), mapping, set of ordered pairs, or a table ● 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)* = 2.79*n* 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 ● 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
Additional Arkansas State Standards	
HSA.REI.D.12 Solve linear inequalities and systems of linear inequalities in two variables by graphing HSA.REI.C.5 Solve systems of equations in two variables using substitution and elimination. Understand that the solution to a system of equations will be the same when using substitution and elimination. HSA.REI.C.7 Solve systems of equations consisting of linear equations and nonlinear equations in two variables algebraically and graphically.	

HSA.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

HSA.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 by: Using technology to graph the functions, Making tables of values, finding successive approximations. Include cases (but not limited to) where f(x) and/or g(x) are linear, polynomial, absolute value, exponential (introduction in Alg 1)

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

HSF.IF.C.9 Compare properties of two functions each represented in a different way(algebraically, graphically, numerically in tables, or by verbal descriptions)
HSF.BF.A.1 Write a function that describes a relationship between two quantities. From a context, determine an explicit expression, a recursive process, or steps for calculation

HSF.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 (k, a constant both positive and negative). Find the value of k given the graphs of transformed functions. Experiment with multiple transformations and illustrate an explanation of the effects on the graph with or without technology.

HSF.LE.A.1 Distinguish between situations that can be modeled with linear functions and with exponential functions

- Show that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals
- Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another

HSF.LE.A.2 Construct linear and exponential equations, including arithmetic and geometric sequences, given a graph, a description of a relationship, two input-output pairs (include reading these from a table.

HSF.LE.A.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly

HSF.LE.B.5 In terms of context, interpret the parameters (rates of growth or decay, domain and range restrictions where applicable) in a function.

Unit 3	Exponent rules, polynomials, factoring and solving quadratics	Grade Level	Gr 8 Algebra I	Approx Length	9 weeks

CPSD Power Standards with Student Learning Objectives

8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions using product, quotient, power to a power, or expanded form

Student-Friendly Objectives:

- I can identify a coefficient, base, and exponent/power in an expression.
- I can write expressions in standard form.
- I can write expressions in expanded form.
- I can write expressions in exponential form.
- I can simplify expressions by using exponent rules.
- I can show how the exponent rules are developed

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

- 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.

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).

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.

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 • 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 • 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)	• 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 • 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 • 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)

Additional Arkansas State Standards

HSA.APR.D.7 Add, subtract, multiply, and divide by nonzero rational expressions. Understand that rational expressions, like the integers are closed under addition, subtraction, and multiplication

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

HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context

- Interpret parts of an expression using appropriate vocabulary, such as terms, factors, and coefficients
- Interpret complicated expressions by viewing one or more of their parts as a single entity

HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it

HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of 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

  Standard form: $ax^2 + bx + c$

  Factored form: $a(x - r_1)(x - r_2)$

  Vertex form: $a(x - h)^2 + k$

HSF.IF.C.8 Write expressions for functions in different by equivalent forms to reveal key features of the function. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values (vertex), and symmetry of the graph, and interpret these in terms of context.

HSA.APR.C.4 Prove polynomial identities and use them to describe numerical relationships.

HSA.REI.A.2 Solve simple and radical equations in one variable, and give examples showing how extraneous solutions may arise.

HSF.LE.B.5 In terms of context, interpret the parameters (rates of growth or decay, domain and range restrictions where applicable) in a function.

Unit 4	Graphing quadratics, Data, and Radicals	Grade Level	Gr 8 Algebra I	Approx Length	9 weeks

CPSD Power Standards with Student Learning Objectives

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
- 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.

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…

- The key features of a graph
  - Intercepts
  - End behavior
  - Extrema
  - Increasing/decreasing intervals
- 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

And be able to…

- 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
- 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
HSF.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 (k, a constant both positive and negative). Find the value of k given the graphs of transformed functions. Experiment with multiple transformations and illustrate an explanation of the effects on the graph with or without technology. HSN.RN.B.4 Simplify radical expressions, perform operations with radical expressions, and rationalize denominators and/or numberators HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it 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