8th Grade Math
Year At A Glance

FIRST SEMESTER		SECOND SEMESTER			
Unit 1 **Equations**	**Unit 2** **Linear Functions & Data Analysis**	**Unit 3** **Systems of Equations**	**Unit 4** **Exponential Expressions**	**Unit 5** **Geometry**	**Unit 6** **Symmetry & Transformations**
8 weeks	7 weeks	4 weeks	4 weeks	5 weeks	4 Weeks
Basic Skills Review: ● Simplifying Expressions ● Distributive Property ● Like Terms ● Order of Operations ● Writing Expressions ● Graphing Coordinates **Solving Equations** ● One Step Equations ● Two Step Equations ● Multi-step Equations ● Multi-Step Equations with Variables on Both Sides ● Multi-Step Equations Special Cases	**Linear Functions** ● Define functions ● Compare functions- key characteristics (Domain, range, input, output) ● Determine and interpret Rate of Change (Slope) and Initial Value (Y-int) from a table, graph, verbal description, equation, and two points ● Identify functions for a value ● Write linear equations ● Graph linear equations ● Interpret/Compare and Contrast linear models in Tables, Graphs, Verbal Description, and Equations **Scatterplots** ● Correlation ● Line of Best Fit ● Frequency Tables	**Systems of Equations** ● Solving systems by graphing ● Solving systems by substitution ● Types of Solutions (one, infinite, none) ● Writing systems in context ● Converting equations from standard to slope-intercept form.	**Linear v. Nonlinear** ● Identify and sketch graphs exhibiting linear, non-linear, increasing, and decreasing characteristics **Exponent Rules** ● Multiplication ● Division ● Zero ● Negative ● Power of a power **Scientific Notation** ● Converting numbers between Scientific Notation and Standard Form ● Multiplication & Division of numbers in Sci. Notation	**Number Categories** ● Rational numbers→ decimal/fraction forms ● Comparing numbers in various forms **Square Roots & Cube Roots** ● Identifying Perfect Squares & Cubes ● Evaluating square & cube roots ● Estimating sq roots **Volume/Surface Area formulas** ● Cylinders ● Cones ● Spheres **Pythagorean Theorem** ● Using the formula ● Applying in context ● Application to distance on coordinate grid ● Converse of Pythagorean Theorem	**Transformations** ● Perform and Describe Rigid Transformations ✓ Translations ✓ Reflections ✓ Rotations ● Use corresponding parts to verify congruence ● Perform and Describe Dilations ● Similarity vs. Congruence **Angle Theorems with Parallel Lines/Transversal** ● Corresponding Angles ● Alternate Exterior Angles ● Alternate Interior Angles ● Same-Side/Consecutive Interior Angles **Triangle Sum Theorem & Exterior Angle Theorem** ● **Using theorems to find missing angles**

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 6

Unit 1	Equations	Grade Level	8th	Approx length	8 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.

Learning Indicators of Power Standards

Students will know…	And be able to…
• 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 • Vocab: Term, variable, coefficient, rational, linear, and solution	• Evaluate expressions using the distributive property, combining like terms, and order of operations • Solve one-step equations • 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

Additional Arkansas State Standards

None

Unit 2	Linear Functions & Data Analysis	Grade Level	8th	Approx Length	7 Weeks

CPSD Power Standards with Student Learning Objectives

8.EE.B.6 • Using a non-vertical or non-horizontal line, show why the slope *m* is the same between any two points. • 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*

Student-Friendly Objectives:

- I can identify slope and *y*-intercept in an equation.
- I can graph lines using slope and *y*-intercept.
- I can write an equation of a line from the graph.
- I can simplify slopes of a line between any two points.

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

Student-Friendly Objectives:

- I can determine when a relation is a function or not a function.
- I can identify the domain and range from a given relation.
- I can identify independent and dependent variables.
- I can generate outputs given certain inputs for a function role.

8.F.A.2 Compare properties (e.g., *y*-intercept/initial value, slope/rate of change) of two functions each represented in a different way (e.g., algebraically, graphically, numerically in tables, or by verbal descriptions) For example: Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change

Student-Friendly Objectives:

- I can find the slope and *y*-intercept of a line from a graph.
- I can find the slope and *y*-intercept of a line from a table.
- I can find the slope and *y*-intercept of a line from an algebraic expression.
- I can find the slope and *y*-intercept of a line from a verbal description.
- I can compare functions in different forms and determine which one has the greatest rate of change and initial value.

8.F.B.4 Construct a function to model a linear relationship between two quantities: • Determine the rate of change and initial value of the function from: • a verbal description of a relationship • two (x, y) values • a table • a graph • Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Student-Friendly Objectives:

- I can compare the slope and *y*-intercept of a line from a graph, table, equation, and verbal description.
- I can write a linear function to model the relationship between two quantities.

8.F.B.5 • Describe the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear) • Sketch a graph that exhibits the features of a function that has been described verbally

Student-Friendly Objectives:

- I can determine if a function is linear or nonlinear.
- I can determine if a function is increasing or decreasing.
- I can compare the graphs, tables, and equations of linear and nonlinear functions.
- I can graph a function from a verbal description.
- I can describe the behavior of one variable given another the behavior of the other variable.

Learning Indicators of Power Standards

Students will know…

- Coordinate System
  - Horizontal and vertical axis (*x* and *y* axis)
  - Origin
  - Quadrant
  - Coordinate plane
- Slope
  - Rate of Change
  - Slope is rise/run and $\Delta y/\Delta x$
  - Different types of slope (positive, negative, zero, and undefined)
- Slope intercept form ($y = mx+b$)
  - *y*-intercept
- Independent and dependent variables
  - Vocab: Inputs, outputs, function, linear, independent, dependent, domain, range, rate of change, initial value, vertical line test, and ordered pair
- The definition of a function
- Compare the properties of functions expressed different ways :
  - Vocab: Inputs, outputs, function, linear, independent, dependent, domain, range, rate of change (slope), initial value (*y*-intercept)

And be able to…

- Identify slope and *y*-intercept in an equation
- Graph lines using slope and *y*-intercept
- Write an equation of a line from a graph
- Simplify slopes (fractions) to show correlation between rise over run between any 2 points on a line
- Identify when a relation is a function or not a function
- List the domain and range of a given relation
- Identify the independent and dependent variables
- Generate outputs given a certain input
- Find the slope and *y*-intercept from a graph, table, algebraic expression, and verbal description
- Determine which function has a greater rate of change and higher initial value
- Compare the properties of functions expressed in different ways
- Determine rate of change and initial value from an equation, graph, table, two points, and verbal description
- Interpret rate of change and initial value from an equation, graph, table, two points, and verbal description
- Write a linear function

• Relationship between the equation, graph, table, and description • Vocab: Inputs, outputs, function, linear, independent, dependent, domain, range, rate of change (slope), initial value (y intercept), • Slope intercept form ($y = mx+b$) • Slope is rise/run and $\Delta y/\Delta x$ • Different types of slope (positive, negative, zero, and undefined) • Y-intercept • Independent and dependent variables • Equation of a line from a graph, table, algebraic expression, and verbal description	

Additional Arkansas State Standards

- 8.EE.B5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. • Compare two different proportional relationships represented in different ways (graphs, tables, equations) For example: Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
- 8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities • Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association
- 8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables • For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line For example: Identify weak, strong, or no correlation.
- 8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercepts For example: In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
- 8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table • Construct and interpret a two-way table on two categorical variables collected from the same subjects • Use relative frequencies calculated for rows or columns to describe possible association between the two variables

Unit 3	Systems of Equations	Grade Level	8th	Approx Length	4 weeks

CPSD Power Standards with Student Learning Objectives

8.EE.C.8.A 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

Student-Friendly Objectives:

- I can find the solution of a system of equations by graphing.
- I can find the solution of a system of equations by substitution.
- I can identify the type of solution that exists (one, infinite, or no solution).

Learning Indicators of Power Standards

Students will know…	And be able to…

• 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
	• Transform equations into slope intercept form
	• Graph 2 lines based on the following potential solutions:
	  ○ One solution (intersection)
	  ○ No solution (parallel)
	  ○ Infinite solutions (same/coinciding)
	• Use substitution to solve a system of equations

Additional Arkansas State Standards

None

Unit 4	Exponential Expressions	Grade Level	8th	Approx Length	4 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

8.F.B.5 • Describe the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear) • Sketch a graph that exhibits the features of a function that has been described verbally

Student-Friendly Objectives:

- I can determine if a function is linear or nonlinear.
- I can determine if a function is increasing or decreasing.
- I can compare the graphs, tables, and equations of linear and nonlinear functions.
- I can graph a function from a verbal description.
- I can describe the behavior of one variable given another the behavior of the other variable.

Learning Indicators of Power Standards

Students will know…

- Vocabulary related to exponents (coefficient, base, and exponent/power).
- The exponent rules in order to simplify exponential expressions:
  - Product (Add)
  - Quotient (Subtract)
  - Power to a Power (Multiply)
  - Negative exponents (Reciprocal)
  - Zero power (always = 1)

And be able to…

- Use the exponent rules in order to simplify exponential expressions
  - Product (Add)
  - Quotient (Subtract)
  - Power to a Power (Multiply)
  - Negative exponents (Reciprocal)
  - Zero power (always = 1)
- Write expressions in 3 main forms:
  - Standard

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x^2 is not the same as 2x is not the same as $x/2$

Vocab: Inputs, outputs, function, independent, dependent, domain, range, rate of change (slope), initial value (y intercept), increasing, decreasing, linear, and non-linear

Negative slope causes a decrease while positive slope causes an increase and zero slope stays constant or horizontal

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Expanded
Exponential

Show how the exponent rules are developed
Determine if a function is linear or nonlinear
Determine if a graph is increasing or decreasing (positive and negative slope)
Sketch a graph given a verbal description
Describe the behavior of one variable given the behavior of another variable

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8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other For example: Estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger.
8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both standard form and scientific notation are used • Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading) • Interpret scientific notation that has been generated by technology
8.FA.3 Identify the unique characteristics of functions (e.g., linear, quadratic, and exponential) by comparing their graphs, equations, and input/output tables

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Unit 5	Geometry	Grade Level	8th	Approx Length	5 Weeks

CPSD Power Standards with Student Learning Objectives

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations: • Use square root symbols to represent solutions to equations of the form $x^2 = p$, where p is a positive rational number Evaluate square roots of small perfect squares. • Use cube root symbols to represent solutions to equations of the form $x^3 = p$, where p is a rational number. Evaluate square roots and cube roots of small perfect cubes

Student-Friendly Objectives:

- I can identify a rational number.
- I can identify an irrational number.
- I can estimate square and cube roots.
- I can evaluate a square and cube root.

8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions

Student-Friendly Objectives:

- I can use the Pythagorean Theorem to find unknown side lengths.
- I can use the Pythagorean Theorem to solve real world distance problems.
- I can use the Pythagorean Theorem to determine if a triangle can be classified as a right triangle

Learning Indicators of Power Standards

Students will know…

- Students will know:
  - Rational numbers (Integer, whole, natural, repeating, terminating decimals)
  - Irrational numbers ($\pi,\ non-repeating,\ non\ terminating\ decimals$)
  - Square (all sides are the same)
  - Root of the square (side length)
  - Perfect square (all sides are whole numbers)
  - Cube (3D, volume, all sides are the same)
  - Root of a cube (side length)
  - Perfect cube
- x^2 is not the same as $2x$ is not the same as $x/2$ is not the same as $\sqrt{2}$

And be able to…

- Identify a number as rational or irrational
- Recognize a perfect square (1-225)
- Recognize a perfect cube (1-125)
- Use perfect squares or perfect cubes to estimate square roots
- Solve equations using square and cube roots
- Evaluate the square roots and cube roots of small perfect squares and cubes
- Find a missing side length of a right triangle using the Pythagorean Theorem
- Use Pythagorean Theorem to solve real world distance problems
- Use the Pythagorean Theorem to determine if a triangle can be classified as a right triangle

• The parts of a right triangle • Square roots can be rational/irrational • Pythagorean Theorem • Converse of the Pythagorean Theorem	
Additional Arkansas State Standards	
• 8.NS.A.1 Know that numbers that are not rational are called irrational: • Understand that every number has a decimal expansion For example: 2=2.00… • Write a fraction a/b as a repeating decimal • Write a repeating decimal as a fraction AR.Math.Content. • 8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π 2) For example: By truncating the decimal expansion of $\sqrt{}$2, show that $\sqrt{}$2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. • 8.GB.6 Model or explain an informal proof of the Pythagorean Theorem and its converse. • 8.GB.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. • 8.GC.9 Develop and know the formulas for the volumes and surface areas of cones, cylinders, and spheres and use them to solve real- world and mathematical problems	

Unit 6	Symmetry and Transformations	Grade Level	8th	Approx Length	4 Weeks

CPSD Power Standards with Student Learning Objectives

8.G.A.3 Given a two-dimensional figure on a coordinate plane, identify and describe the effect (rule or new coordinates) of a transformation (dilation, translation, rotation, and reflection): • Image to pre-image • Pre-image to image

Student-Friendly Objectives:

- I can flip a figure or point on the coordinate plane using reflection rules.
- I can turn a figure or point on the coordinate plane using rotation rules.
- I can slide a figure or point on the coordinate plane using translation rules.
- I can enlarge or shrink a figure on the coordinate plane using dilation rules.
- I can write the rules for a given flip, turn, slide, or dilation.

Learning Indicators of Power Standards

Students will know…

- Coordinate plane
- Transformation vocabulary:
  - image, preimage, prime marks
  - dilation, translation, rotation, and reflection

And be able to...

- Graph pre-image on a coordinate plane
- Use transformation rules to transform a pre-image into an image on a coordinate plane
- Write a rule to describe a given transformation

Additional Arkansas State Standards

- 8.GA.1 Verify experimentally the properties of rotations, reflections, and translations: • Lines are taken to lines, and line segments to line segments of the same length • Angles are taken to angles of the same measure • Parallel lines are taken to parallel lines
- 8.GA.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations • Given two congruent figures, describe a sequence that exhibits the congruence between them
- 8.GA.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations • Given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them
- 8.GA.5 Use informal arguments to establish facts about: • The angle sum and exterior angle of triangles For example: Arrange three copies of the same triangle so that the sum of the three angles appears to form a line. • The angles created when parallel lines are cut by a transversal For example: Give an argument in terms of translations about the angle relationships. • The angle-angle criterion for similarity of triangles