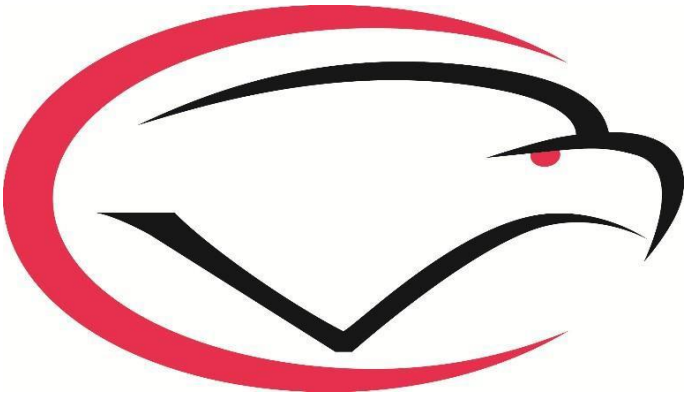
Secondary Curriculum Maps



Cumberland Valley School District

Soaring to Greatness, Committed to Excellence

8th Grade Common Core Math

		2.1 Numbers & Operations	2.2 Algebraic Concepts	2.3 Geometry	2.4 Measurement, Data
Unit	**Time Line**	**Priority Standards**	**Priority Standards**	**Priority Standards**	**Priority Standards**
1 - The Number System and Properties of Exponents	4 weeks	CC.2.1.8.E.1	CC.2.2.8.B.1		
2 - Congruence	5 weeks			CC.2.3.8.A.2 CC.2.3.8.A.3	
3 - Similarity	5 weeks			CC.2.3.8.A.2 CC.2.3.8.A.3	
4 - Linear Equations	8 weeks		CC.2.2.8.B.2 CC.2.2.8.B.3		
5 - Functions from Geometry	3 weeks		CC.2.2.8.C.1	CC.2.3.8.A.1	
6 - Linear Functions	4 weeks		CC.2.2.8.C.2		CC.2.4.8.B.1 CC.2.4.8.B.2
7 - Irrational Numbers Using Geometry	7 weeks	CC.2.1.8.E.1 CC.2.1.8.E.4			

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.8.B.3 Analyze and solve linear equations and pairs of simultaneous linear equations.
Taught in Unit(s)
Unit 2
Explanation/Example of Standard
Write, solve, and/or graph linear equations using various methods.
Common Misconceptions
1. Only the letters x and y can be used for variables 2. Students think that you always need a variable = a constant as a solution 3. The variable is always on the left side of the equation 4. Equations are not always in the slope intercept form, y=mx+b 5. Students believe that all equations, including those with more than one variable, have a single solution

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we use univariate and bivariate data to analyze relationships and make predictions?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.2 Linear Equations	**A1.1.2.1.1**	Write, solve, and/or apply a linear equation (including problem situations).
	A1.1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
	A1.1.2.1.3	Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
	A1.1.2.2.1	Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.
	A1.1.2.2.2	Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.

Concepts (what students need to know)	Skills (what students must be able to do)
Linear Equations	Interpret solutions to a linear equation and systems of two linear equations.

	Analyze, model and solve linear equations. Analyze and solve pairs of simultaneous equations.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations.
Taught in Unit(s)
Unit 1
Explanation/Example of Standard
Interpret and/or use linear functions and their equations, graphs, or tables.
Common Misconceptions
1. Only the letters x and y can be used for variables 2. Students think that you always need a variable = a constant as a solution 3. The variable is always on the left side of the equation 4. Equations are not always in the slope intercept form, y=mx+b 5. Students believe that all equations, including those with more than one variable, have a single solution 6. Students often confuse a recursive rule with an explicit formula for a function. For example, after identifying that a linear function shows an increase of 2 in the values of the output for every change of 1 in the input, some students will represent the equation as y = x + 2 instead of realizing that this means y = 2x + b. 7. When making axes for a graph, some students may not use equal intervals to create the scale. Some students may infer a cause and effect between independent and dependent variables, but this is often not the case. 8. When input values are not increasing consecutive integers (e.g., when the input values are decreasing, when some integers are skipped, or when some input values are not integers), some students have more difficulty identifying the pattern and calculating the slope 9**.** Students may mistakenly think their lines of best fit for the same set of data will be exactly the same. Because students are informally drawing lines of best fit, the lines will vary slightly.

Big Idea(s)	Essential Question(s)
There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Patterns exhibit relationships that can be extended, described, and generalized. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data.	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How are relationships represented mathematically? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze mathematical situations?

Assessments
See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.2.1 Functions	**A1.2.1.1.1**	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
	A1.2.1.1.2	Determine whether a relation is a function, given a set of points or a graph.
	A1.2.1.1.3	Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).

Concepts (what students need to know)	**Skills** (what students must be able to do)
Linear Equations	Analyze and describe linear relationships between two variables, using slope. Analyze, model and solve linear equations.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.8.B.1Apply concepts of radicals and integer exponents to generate equivalent expressions.
Taught in Unit(s)
Unit 5
Explanation/Example of Standard
Use exponents, roots, and/or absolute values to solve problems.
Common Misconceptions
1. A few irrational numbers are given special names (pi), and much attention is given to sqrt (2). Because we name so few irrational numbers, students sometimes conclude that irrational numbers are unusual and rare. Some students are surprised that the decimal representation of pi does not repeat. Some students believe that if only we keep looking at digits farther and farther to the right, eventually a pattern will emerge. 2. Students may make the relationship that in scientific notation, when a number contains one nonzero digit and a positive exponent, that the number of zeros equals the exponent. This pattern may incorrectly be applied to scientific notation values with negative values or with more than one nonzero digit. Students may mix up the product of powers property and the power of a power property.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities.	• How do you use exponents, roots, and/or absolute value to simplify expressions?

Assessments
See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.1. Operations with Real Numbers and Expressions	**A1.1.1.3.1**	Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note. Exponents should be integers from -10 to 10.

Concepts (what students need to know)	Skills (what students must be able to do)
Rational Numbers and Irrational Numbers	Distinguish between rational and irrational numbers using their properties.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
Taught in Unit(s)
Unit 2
Explanation/Example of Standard
Write, solve, and/or graph linear equations using various methods. Write, solve, and/or graph systems of linear equations using various methods. Write, solve, and/or graph linear inequalities using various methods. Write, solve, and/or graph systems of linear inequalities using various methods.
Common Misconceptions
1. Most mistakes that students make are careless rather than conceptual. 2. Students may believe that the graph of a relationship is simply a line or curve "connecting the dots," without recognizing that the graph represents all solutions to the equation. 3. Students may also believe that graphing linear and other functions is an isolated skill, not realizing that multiple graphs can be drawn to solve equations involving those functions. 4. Additionally, students may believe that two-variable inequalities have no application in the real world. 5. Students may believe that it is reasonable to input any x-value into a function, so they will need to examine multiple situations in which there are various limitations to the domains. 6. Students may also believe that the slope of a linear function is merely a number used to sketch the graph of the line. In reality, slopes have real-world meaning, and the idea of a rate of change is fundamental to understanding major concepts from algebra to calculus. 7. Additionally, students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise, rather than serving a purpose of allowing different features of the function to be exhibited. 8. Students may believe that the best (or only) way to generalize a table of data is by using a recursive formula. 9. Students naturally tend to look "down" a table to find the pattern but need to realize that finding the 100th term requires knowing the 99th term unless an explicit formula is developed. 10. Students may also believe that arithmetic and geometric sequences are the same. Students may believe that all functions have a first common difference and need to explore to realize that, for example, a quadratic function will have equal second common differences in a table. 11. Students will often combine terms that are not like terms. For example, $2 + 3x = 5x$ or $3x + 2y = 5xy$. 12. Students sometimes forget the coefficient of 1 when adding like terms. For example, $x + 2x + 3x = 5x$. 13. Students will change the degree of the variable when adding/subtracting like terms. For example: $3x + 4x = 7x^2$. 14. Students will forget to distribute to all terms when multiplying. For example, $6(2x + 1) = 12x + 1$. 15. Students may not follow the Order of Operations when simplifying expressions. For example, when $x = 3$ may be incorrectly evaluated as . Another common mistake occurs

when the distributive property should be used prior to adding/subtracting. For example, $2 + 3(x - 1)$ incorrectly becomes $5(x - 1) = 5x - 5$.

16. Students fail to use the property of exponents correctly when using the distributive property. For example, $3x(2x - 1) = 6x - 3x = 3x$.
17. Students fail to understand the structure of expressions. For example, they will write 4x when $x = 3$ is 43. In addition, students commonly misevaluate rather than .
18. Students routinely see . A method that may clear up the misconception is to use the proper terminology "the opposite of 3 squared is negative 9" and "the square of negative 3 is positive 9."
19. Students will incorrectly translate expressions that contain a difference of terms. For example, 8 less than 5 times a number is often incorrectly translated as $8 - 5n$.
20. Additionally, they believe that the labels and scales on a graph are not important and can be assumed by a reader, and that it is always necessary to use the entire graph of a number line when solving a problem as its model.
21. Students may believe that solving an equation such as involves subtracting 3x from every term, instead of combining like-terms then solving.
22. Some students may believe that for equations containing fractions only on one side, it requires "clearing fractions" (the use of multiplication) only on that side of the equation.
23. Students may confuse the rule of changing a sign of an inequality when multiplying or dividing by a negative number with changing the sign of an inequality when one or two sides of the inequality become negative, for example $3x > -15$ equals $x < -5$.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended, described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data.	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.2 Linear Equations **A1.1.3** Linear Inequalities	**A1.1.2.1.1**	Write, solve, and/or apply a linear equation (including problem situations).
	A1.1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
	A1.1.2.1.3	Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
	A1.1.2.2.1	Write and/or solve a system of linear equations (including problem situations) using graphing,

		substitution, and/or elimination. Note: Limit systems to two linear equations.
	A1.1.2.2.2	Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.
	A1.1.3.1.1	Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
	A1.1.3.1.2	Identify or graph the solution set to a linear inequality on a number line.
	A1.1.3.1.3	Interpret solutions to problems in the context of the problem situation.
	A1.1.3.2.1	Write and/or solve a system of linear inequalities using graphing. Note: Limit systems to two linear inequalities.
	A1.1.3.2.2	Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear inequalities.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Interpret solutions to linear equations and inequalities. Interpret solutions to linear systems of equations and inequalities.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
Taught in Unit(s)
Unit 1
Explanation/Example of Standard
Use estimation strategies in problem-solving situations. Write, solve, and/or graph linear equations using various methods. Write, solve, and/or graph linear inequalities using various methods.
Common Misconceptions

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended, described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities.	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.1 Operations with Real Numbers and Expressions **A1.1.2** Linear Equations **A1.1.3** Linear Inequalities	**A1.1.1.4.1**	Use estimation to solve problems.
	A1.1.2.1.1	Write, solve, and/or apply a linear equation (including problem situations).
	A1.1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
	A1.1.2.1.3	Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
	A1.1.2.2.1	Write and/or solve a system of linear equations (including problem situations) using graphing, substitution, and/or elimination. Note: Limit systems to two linear equations.
	A1.1.2.2.2	Interpret solutions to problems in the context of the problem situation. Note: Limit systems to two linear equations.
	A1.1.3.1.1	Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
	A1.1.3.1.2	Identify or graph the solution set to a linear inequality on a number line.
	A1.1.3.1.3	Interpret solutions to problems in the context of the problem situation. Note: Limit to linear inequalities.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Estimation strategies Linear equations Linear inequalities	Use estimation strategies to solve problems. Write, solve, and graph linear equations using various methods. Write, solve, and graph linear inequalities using various methods.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
Taught in Unit(s)
Unit 1
Explanation/Example of Standard
Write, solve, and/or graph linear equations using various methods. Write, solve, and/or graph linear inequalities using various methods.
Common Misconceptions

1. Students may believe that the use of algebraic expressions is merely the abstract manipulation of symbols.
2. Students will often combine terms that are not like terms. For example, $2 + 3x = 5x$ or $3x + 2y = 5xy$.
3. Students sometimes forget the coefficient of 1 when adding like terms. For example, x + 2x + 3x = 5x.
4. Students will forget to distribute to all terms when multiplying. For example, $6(2x + 1) = 12x + 1$.
5. Students may not follow the Order of Operations when simplifying expressions. For example, when $x = 3$ may be incorrectly evaluated as . Another common mistake occurs when the distributive property should be used prior to adding/subtracting. For example, $2 + 3(x - 1)$ incorrectly becomes $5(x - 1) = 5x - 5$.
6. Students fail to use the property of exponents correctly when using the distributive property. For example, $3x(2x - 1) = 6x - 3x = 3x$.
7. Students fail to understand the structure of expressions. For example, they will write 4x when $x = 3$ is 43. It is "4 times 3."
8. Students routinely see $-3^2 = (-3)^2$. A method that may clear up the misconception is to use the proper terminology "the opposite of 3 squared is negative 9" and "the square of negative 3 is positive 9."
9. Students will incorrectly translate expressions that contain a difference of terms. For example, 8 less than 5 times a number is often incorrectly translated as $8 - 5n$.
10. Additionally, they believe that the labels and scales on a graph are not important and can be assumed by a reader, and that it is always necessary to use the entire graph of a number line when solving a problem as its model.
11. Students do not know when to include the "or equal to" bar when translating the graph of an inequality.
12. Students may believe that solving an equation such as involves subtracting 3x from every term, instead of combining like-terms then solving.
13. Some students may believe that for equations containing fractions only on one side, it requires "clearing fractions" (the use of multiplication) only on that side of the equation.
14. Students may confuse the rule of changing a sign of an inequality when multiplying or dividing by a negative number with changing the sign of an inequality when one or two sides of the inequality become negative, for example $3x > -15$ equals $x < -5$.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended,	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems?

described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data.	• How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How can we use univariate and bivariate data to analyze relationships and make predictions?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.2 Linear Equations **A1.1.3** Linear Inequalities	**A1.1.2.1.1**	Write, solve, and/or apply a linear equation (including problem situations).
	A1.1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
	A1.1.2.1.3	Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
	A1.1.3.1.1	Write or solve compound inequalities and/or graph their solution sets on a number line (may include absolute value inequalities).
	A1.1.3.1.2	Identify or graph the solution set to a linear inequality on a number line.
	A1.1.3.1.3	Interpret solutions to problems in the context of the problem situation. Note: Limit to linear inequalities.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Simplify/factor expressions involving polynomials. Use polynomial identities. Perform arithmetic operations on polynomials. Apply and extend previous understandings of arithmetic to algebraic expressions. Write, solve, and/or graph linear equations and inequalities using various methods.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
Taught in Unit(s)
Unit 4
Explanation/Example of Standard
Simplify expressions involving polynomials.
Common Misconceptions
1. Students will change the degree of the variable when adding/subtracting like terms. 2. Students may not follow the Order of Operations when simplifying expressions. 3. Another common mistake occurs when the distributive property should be used prior to adding/subtracting. For example, $2 + 3(x - 1)$ incorrectly becomes $5(x - 1) = 5x - 5$. 4. Students fail to use the property of exponents correctly when using the distributive property. For example, $3x(2x - 1) = 6x - 3x = 3x$ 5. Students fail to understand the structure of expressions. For example, they will write $4x^2$ when $x = 3$ is 43^2. 6. In addition, students commonly misevaluate $-3^2 = 9$ rather than $-3^2 =$ –students routinely see -3^2 as the same as $(-3)^2 = 9$. 7. Students commonly confuse the properties of exponents, specifically the product of powers property with the power of a power property. For example, students will often simplify $(x^2)^3 = x^5$. 9. Students may not distribute the multiplication of polynomials correctly and only multiply like terms. For example, they will write $(x + 3)(x - 2) = x^2 - 6$ 13. Some students may think that rewriting equations into various forms (taking square roots, completing the square, using quadratic formula and factoring) are isolated techniques within a unit of quadratic equations.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended, described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How can mathematics support effective communication? • How is mathematics used to quantify, compare, represent, and model numbers?

make predictions based on the data. Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.	

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.1 Operations with Real Numbers and Expressions	**A1.1.1.5.1**	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.
	A1.1.1.5.2	Factor algebraic expressions, including differences of squares and trinomials. Note: Trinomials are limited to the form ax^2+bx+c where a is equal to 1 after factoring out all monomial factors.
	A1.1.1.5.3	Simplify/reduce a rational algebraic expression.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Simplify/factor expressions involving polynomials. Use polynomial identities. Perform arithmetic operations on polynomials. Apply and extend previous understandings of arithmetic to algebraic expressions. Write, solve, and/or graph linear equations and inequalities using various methods.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
Taught in Unit(s)
Unit 4
Explanation/Example of Standard
Simplify expressions involving polynomials.
Common Misconceptions
1. Students will change the degree of the variable when adding/subtracting like terms. 2. Students may not follow the Order of Operations when simplifying expressions. 3. Another common mistake occurs when the distributive property should be used prior to adding/subtracting. For example, $2 + 3(x - 1)$ incorrectly becomes $5(x - 1) = 5x - 5$. 4. Students fail to use the property of exponents correctly when using the distributive property. For example, $3x(2x - 1) = 6x - 3x = 3x$ 5. Students fail to understand the structure of expressions. For example, they will write $4x^2$ when $x = 3$ is 43^2. 6. In addition, students commonly misevaluate –32 = 9 rather than –32 = –students routinely see -3^2 as the same as $(-3)^2 = 9$. 7. Students frequently attempt to "solve" expressions. Many students add "= 0" to an expression they are asked to simplify. Students need to understand the difference between an equation and an expression. 8. Students commonly confuse the properties of exponents, specifically the product of powers property with the power of a power property. For example, students will often simplify $(x^2)^3 = x^5$. 9. Students may not distribute the multiplication of polynomials correctly and only multiply like terms. For example, they will write $(x + 3)(x - 2) = x^2 - 6$ 10. Some students may think that rewriting equations into various forms (taking square roots, completing the square, using quadratic formula and factoring) are isolated techniques within a unit of quadratic equations.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended, described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How can mathematics support effective communication? • How is mathematics used to quantify, compare, represent, and model numbers?

real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.	

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.1 Operations with Real Numbers and Expressions	**A1.1.1.5.1**	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.
	A1.1.1.5.2	Factor algebraic expressions, including differences of squares and trinomials. Note: Trinomials are limited to the form ax^2+bx+c where a is equal to 1 after factoring out all monomial factors.
	A1.1.1.5.3	Simplify/reduce a rational algebraic expression.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Simplify/factor expressions involving polynomials. Use polynomial identities. Perform arithmetic operations on polynomials. Apply and extend previous understandings of arithmetic to algebraic expressions. Write, solve, and/or graph linear equations and inequalities using various methods.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.D.1Interpret the structure of expressions to represent a quantity in terms of its context.
Taught in Unit(s)
Unit 4
Explanation/Example of Standard
Simplify expressions involving polynomials.
Common Misconceptions
1. Students will change the degree of the variable when adding/subtracting like terms. 2. 2. Students may not follow the Order of Operations when simplifying expressions. 3. Another common mistake occurs when the distributive property should be used prior to adding/subtracting. For example, $2 + 3(x - 1)$ incorrectly becomes $5(x - 1) = 5x - 5$. 4. Students fail to use the property of exponents correctly when using the distributive property. For example, $3x(2x - 1) = 6x - 3x = 3x$ 5. Students fail to understand the structure of expressions. For example, they will write $4x^2$ when $x = 3$ is 43. 6. In addition, students commonly misevaluate $-3^2 = 9$ rather than $-3^2 = -$students routinely see $(-3)^2$ as the same as $(-3)^2 = 9$. 7. Students frequently attempt to "solve" expressions. Many students add "= 0" to an expression they are asked to simplify. Students need to understand the difference between an equation and an expression. 8. Students commonly confuse the properties of exponents, specifically the product of powers property with the power of a power property. For example, students will often simplify $(x^2)^3 = x^5$. 9. Some students may believe that factoring and completing the square are isolated techniques within a unit of quadratic equations. 10. Students may not distribute the multiplication of polynomials correctly and only multiply like terms. For example, they will write $(x + 3)(x - 2) = x^2 - 6$ 13. Students may confuse the rule of changing a sign of an inequality when multiplying or dividing by a negative number with changing the sign of an inequality when one or two sides of the inequality become negative (for ex., $3x > -15$ or $x < -5$). 14. Some students may think that rewriting equations into various forms (taking square roots, completing the square, using quadratic formula and factoring) are isolated techniques within a unit of quadratic equations. 15. Additionally, students may believe that two-variable inequalities have no application in the real world.

Big Idea(s)	Essential Question(s)
Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Patterns exhibit relationships that can be extended, described, and generalized. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques?

equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.	• How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How can mathematics support effective communication? • How is mathematics used to quantify, compare, represent, and model numbers?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.1 Operations with Real Numbers and Expressions	**A1.1.1.5.1**	Add, subtract, and/or multiply polynomial expressions (express answers in simplest form). Note: Nothing larger than a binomial multiplied by a trinomial.
	A1.1.1.5.2	Factor algebraic expressions, including differences of squares and trinomials. Note: Trinomials are limited to the form ax^2+bx+c where a is equal to 1 after factoring out all monomial factors.
	A1.1.1.5.3	Simplify/reduce a rational algebraic expression.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Simplify/factor expressions involving polynomials. Use polynomial identities. Perform arithmetic operations on polynomials. Apply and extend previous understandings of arithmetic to algebraic expressions. Write, solve, and/or graph linear equations and inequalities using various methods.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.6 Interpret functions in terms of the situation they model.
Taught in Unit(s)
Unit 2
Explanation/Example of Standard
Interpret and/or use linear functions and their equations, graphs, or tables. Analyze and/or interpret data on a scatter plot.
Common Misconceptions
1. Most mistakes that students make are careless rather than conceptual. 2. Students may believe that the graph of a relationship is simply a line or curve "connecting the dots," without recognizing that the graph represents all solutions to the equation. 3. Students may also believe that graphing linear and other functions is an isolated skill, not realizing that multiple graphs can be drawn to solve equations involving those functions. 4. Students may misinterpret dependent and independent variables in their application of real world situation. 5. Students may believe that it is reasonable to input any *x*-value into a function, so they will need to examine multiple situations in which there are various limitations to the domains. 6. Students may also believe that the slope of a linear function is merely a number used to sketch the graph of the line. In reality, slopes have real-world meaning, and the idea of a rate of change is fundamental to understanding major concepts from algebra to calculus. 7. Students naturally tend to look "down" a table to find the pattern but need to realize that finding the 100th term requires knowing the 99th term unless an explicit formula is developed. 8. Students may also believe that arithmetic and geometric sequences are the same. Students may believe that all functions have a first common difference and need to explore to realize that, for example, a quadratic function will have equal second common differences in a table. 9. Students may also believe that the end behavior of all functions depends on the situation and not the fact that exponential function values will eventually get larger than those of any other polynomial functions. 10. Students may believe that changing the slope of a linear function from "2" to "3" makes the graph steeper without realizing that there is a real-world context and reason for examining the slopes of lines. Similarly, an exponential function can appear to be abstract until applying it to a real-world situation.

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member	• How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear

of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Patterns exhibit relationships that can be extended, described, and generalized. Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions. Data can be modeled and used to make inferences.	equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How is mathematics used to quantify, compare, represent, and model numbers? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze mathematical situations? • How are relationships represented mathematically? • How can recognizing repetition or regularity assist in solving problems more efficiently? • How can patterns be used to describe relationships in mathematical situations? • How can data be organized and represented to provide insight into the relationship between quantities? • How does the type of data influence the choice of display? • How can probability and data analysis be used to make predictions? • How is mathematics used to quantify, compare, represent, and model numbers?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.2.1 Functions **A1.2.2.1** Coordinate Geometry	**A1.2.1.2.1**	Create, interpret, and/or use the equation, graph, or table of a linear function.
	A1.2.1.2.2	Translate from one representation of a linear function to another (i.e., graph, table, and equation).
	A1.2.2.2.1	Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Categorical and Quantitative Data	Analyze a set of data for a pattern, and represent the pattern with an algebraic rule and/or a graph. Summarize, represent, and interpret single-variable data and two-variable data. Analyze and/or interpret data displays and/or use them to make predictions (circle graph, line graph, bar graph, box-and-whisker plot, stem-and-leaf plot, scatter plot).

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.5 Construct and compare linear, quadratic and/or exponential models to solve problems.
Taught in Unit(s)
Unit 1
Explanation/Example of Standard
Describe, compute, and/or use the rate of change (slope) of a line.
Common Misconceptions
1. Some students may believe that both terminating and repeating decimals are rational numbers, without considering nonrepeating and nonterminating decimals as irrational numbers. 2. Students may also confuse irrational numbers and complex numbers, and therefore mix their properties. 3. By using false extensions of properties of rational numbers, some students may assume that the sum of any two irrational numbers is also irrational. An example where two irrational numbers do end up summing to a irrational number is: (2 + 1263' type="#_x0000_t75">) + (5 - 1243' type="#_x0000_t75">) = 7 + 12 23' type="#_x0000_t75">
4. Students may believe that each family of functions (e.g., quadratic, square root, etc.) is independent of the others, so they may not recognize commonalities among all functions and their graphs. 5. Students may also believe that skills such as factoring a trinomial or completing the square are isolated within a unit on polynomials, and that they will come to understand the usefulness of these skills in the context of examining characteristics of functions. 6. Additionally, students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise, rather than serving a purpose of allowing different features of the function to be exhibited. 7. Students may also believe that even and odd functions refer to the exponent of the variable, rather than the sketch of the graph and the behavior of the functions 8. Students may also believe that the end behavior of all functions depends on the situation and not the fact that exponential function values will eventually get larger than those of any other polynomial functions**.** 9. Students may believe that equations of linear, quadratic and other functions are abstract and exist only "in a math book," without seeing the usefulness of these functions as modeling real-world phenomena. 10. Additionally, they believe that the labels and scales on a graph are not important and can be assumed by a reader, and that it is always necessary to use the entire graph of a number line when solving a problem as its model. 11. Students do not know when to include the "or equal to" bar when translating the graph of an inequality.

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us	• How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How is mathematics used to quantify, compare, represent, and model numbers? • How can expressions, equations, and inequalities be

make predictions based on the data. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Patterns exhibit relationships that can be extended, described, and generalized. Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions. Data can be modeled and used to make inferences.	used to quantify, solve, model, and/or analyze mathematical situations? • How are relationships represented mathematically? • How can recognizing repetition or regularity assist in solving problems more efficiently? • How can patterns be used to describe relationships in mathematical situations? • How can data be organized and represented to provide insight into the relationship between quantities? • How can probability and data analysis be used to make predictions?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.2.2 Coordinate Geometry	**A1.2.2.1.1**	Identify, describe, and/or use constant rates of change.
	A1.2.2.1.2	Apply the concept of linear rate of change (slope) to solve problems.
	A1.2.2.1.3	Write or identify a linear equation when given • the graph of a line, • two points on the line, or • the slope and a point on the line. Note: Linear equation may be in the point-slope, standard and/or slope-intercept form.
	A1.2.2.1.4	Determine the slope and/or y-intercept represented by a linear equation or graph.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percent's, square roots, exponents). Apply and extend the properties of exponents to solve problems with rational exponents.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
Taught in Unit(s)
Unit 6
Explanation/Example of Standard
Interpret and/or use linear functions and their equations, graphs, or tables.
Common Misconceptions
1. Students may believe that each family of functions (e.g., quadratic, square root, etc.) is independent of the others, so they may not recognize commonalities among all functions and their graphs. 2. Additionally, students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise, rather than serving a purpose of allowing different features of the function to be exhibited. 3. Students may believe that the graph of $y = (x - 4)^2$ is the graph of $y = x^2$ shifted 4 units to the left (due to the subtraction symbol). 4. Students often confuse the shift of a function with the stretch of a function. 5. Students may also believe that even and odd functions refer to the exponent of the variable, rather than the sketch of the graph and the behavior of the functions 6. Additionally, students may believe that all functions have inverses and need to see counter examples, as well as examples in which a non-invertible function can be made into an invertible function by restricting the domain. 7. Students may believe that all functions have a first common difference and need to explore to realize that, for example, a quadratic function will have equal second common differences in a table. 8. Students may also believe that the end behavior of all functions depends on the situation and not the fact that exponential function values will eventually get larger than those of any other polynomial functions.

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data Mathematical relationships among numbers can be represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Patterns exhibit relationships that can be extended,	• How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How is mathematics used to quantify, compare, represent, and model numbers? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze mathematical situations? • How can recognizing repetition or regularity assist in solving problems more efficiently? • How can data be organized and represented to provide insight into the relationship between quantities? • How does the type of data influence the choice of display? • How can probability and data analysis be used to make predictions?

described, and generalized. Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.	

Assessments		
See unit map for specific unit common assessments		
Assessment Anchor	**Eligible Content**	
A1.2.1 Functions	**A1.2.1.2.1**	Create, interpret, and/or use the equation, graph, or table of a linear function.
	A1.2.1.2.2	Translate from one representation of a linear function to another (i.e., graph, table, and equation).

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percent's, square roots, exponents). Apply and extend the properties of exponents to solve problems with rational exponents.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
Taught in Unit(s)
Unit 6
Explanation/Example of Standard
Write, solve, and/or graph linear equations using various methods. Analyze and/or use patterns or relations. Interpret and/or use linear functions and their equations, graphs, or tables. Describe, compute, and/or use the rate of change (slope) of a line.
Common Misconceptions
1. Students may believe that each family of functions (e.g., quadratic, square root, etc.) is independent of the others, so they may not recognize commonalities among all functions and their graphs. 2. Students may also believe that skills such as factoring a trinomial or completing the square are isolated within a unit on polynomials, and that they will come to understand the usefulness of these skills in the context of examining characteristics of functions. 3. Additionally, students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise, rather than serving a purpose of allowing different features of the function to be exhibited. 4. Students may also believe that even and odd functions refer to the exponent of the variable, rather than the sketch of the graph and the behavior of the functions 5. Students may believe that all functions have a first common difference and need to explore to realize that, for example, a quadratic function will have equal second common differences in a table. 12. Students may also believe that the end behavior of all functions depends on the situation and not the fact that exponential function values will eventually get larger than those of any other polynomial functions.

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real world situations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Degree and direction of linear association between two variables is measurable. Mathematical relationships among numbers can be	• How do you decide which functional representation to choose when modeling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraic properties and processes to solve problems? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How is mathematics used to quantify, compare, represent, and model numbers? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze

represented, compared, and communicated. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations.	mathematical situations? • How are relationships represented mathematically? • How can recognizing repetition or regularity assist in solving problems more efficiently? • How can probability and data analysis be used to make predictions?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.1.2 Linear Equations **A1.2.1** Functions **A1.2.2** Coordinate Geometry	**A1.1.2.1.1**	Write, solve, and/or apply a linear equation (including problem situations).
	A1.2.1.2	Use and/or identify an algebraic property to justify any step in an equation-solving process. Note: Linear equations only.
	A.1.1.2.1.3	Interpret solutions to problems in the context of the problem situation. Note: Linear equations only.
	A1.2.1.1.1	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
	A1.2.1.1.2	Determine whether a relation is a function, given a set of points or a graph.
	A1.2.1.1.3	Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table)/
	A1.2.1.2.1	Create, interpret, and/or use the equation, graph, or table of a linear function.
	A1.2.1.2.2	Translate from one representation of a linear function to another (i.e., graph, table, and equation).
	A1.2.2.1.1	Identify, describe, and/or use constant rates of change.
	A1.2.2.1.2	Apply the concept of linear rate of change (slope) to solve problems.
	A1.2.2.1.3	Write or identify a linear equation when given • the graph of the line, • two points on the line, or • the slope and a point on the line. Note: Linear equation may be in point-slope, standard, and/or slope-intercept form.
	A1.2.2.1.4	Determine the slope and/or y-intercept represented by a linear equation or graph.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Equations and Inequalities	Represent and/or use numbers in equivalent forms (integers, fractions, decimals, percent's, square roots, exponents). Apply and extend the properties of exponents to solve problems with rational exponents.

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
Taught in Unit(s)
Unit 6
Explanation/Example of Standard
Analyze and/or use patterns or relations. Interpret and/or use linear functions and their equations, graphs, or tables. Describe, compute, and/or use the rate of change (slope) of a line.
Common Misconceptions
1. Most mistakes that students make are careless rather than conceptual. 2. Students may believe that the graph of a relationship is simply a line or curve "connecting the dots," without recognizing that the graph represents all solutions to the equation. 3. Students may also believe that graphing linear and other functions is an isolated skill, not realizing that multiple graphs can be drawn to solve equations involving those functions. 4. Students may misinterpret dependent and independent variables in their application of real world situation. 5. Students may also believe that the notation *f(x)* means to multiply some value *f* times another value *x*. The notation alone can be confusing and needs careful development. 6. Students may also believe that the slope of a linear function is merely a number used to sketch the graph of the line. In reality, slopes have real-world meaning, and the idea of a rate of change is fundamental to understanding major concepts from algebra to calculus. 7. Additionally, students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise, rather than serving a purpose of allowing different features of the function to be exhibited. 8. Students may believe that the best (or only) way to generalize a table of data is by using a recursive formula. 9. Students naturally tend to look "down" a table to find the pattern but need to realize that finding the 100th term requires knowing the 99th term unless an explicit formula is developed. 10. Students may also believe that the end behavior of all functions depends on the situation and not the fact that exponential function values will eventually get larger than those of any other polynomial functions. 11. Students may believe that changing the slope of a linear function from "2" to "3" makes the graph steeper without realizing that there is a real-world context and reason for examining the slopes of lines. Similarly, an exponential function can appear to be abstract until applying it to a real-world situation. 12. Students may believe that each family of functions (e.g., quadratic, square root, etc.) is independent of the others, so they may not recognize commonalities among all functions and their graphs. 13. Students may believe that equations of linear, quadratic and other functions are abstract and exist only "in a math book," without seeing the usefulness of these functions as modeling real-world phenomena. **14.** Additionally, they believe that the labels and scales on a graph are not important and can be assumed by a reader, and that it is always necessary to use the entire graph of a

number line when solving a problem as its model.

Big Idea(s)	Essential Question(s)
Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations. There are some mathematical relationships that are always true and these relationships are used as the rules of arithmetic and algebra and are useful for writing equivalent forms of expressions and solving equations and inequalities. Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations. Bivariate data can be modeled with mathematical functions that approximate the data well and help us make predictions based on the data. Mathematical relationships among numbers can be represented, compared, and communicated. Patterns exhibit relationships that can be extended, described, and generalized. Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions. Data can be modeled and used to make inferences.	• How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you decide which functional representation to choose when modeling a real world situation, and how would you explain your solution to the problem? • How can we use univariate and bivariate data to analyze relationships and make predictions? • How can expressions, equations, and inequalities be used to quantify, solve, model, and/or analyze mathematical situations? • How can patterns be used to describe relationships in mathematical situations? • How can recognizing repetition or regularity assist in solving problems more efficiently? • How can data be organized and represented to provide insight into the relationship between quantities?

Assessments

See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.2.1 Functions	**A1.2.1.1.1**	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
	A1.2.1.1.2	Determine whether a relation is a function, given a set of points or a graph.
	A1.2.1.1.3	Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table)/
	A1.2.1.2.1	Create, interpret, and/or use the equation, graph, or table of a linear function.
	A1.2.1.2.2	Translate from one representation of a linear function to another (i.e., graph, table, and equation).

Concepts (what students need to know)	Skills (what students must be able to do)
Categorical and Quantitative Data	Analyze a set of data for a pattern, and represent the pattern with an algebraic rule and/or a graph. Summarize, represent, and interpret single-

	variable data and two-variable data. Analyze and/or interpret data displays and/or use them to make predictions (circle graph, line graph, bar graph, box-and-whisker plot, stem-and-leaf plot, scatter plot).

CVSD Math Curriculum Map ~ Algebra

PA Core Standard
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
Taught in Unit(s)
Unit 2
Explanation/Example of Standard
Analyze and/or use patterns or relations. Describe, compute, and/or use the rate of change (slope) of a line.
Common Misconceptions
1. Most mistakes that students make are careless rather than conceptual. 2. Students may misinterpret dependent and independent variables in their application of real world situation. 3. Students may believe that all relationships having an input and an output are functions, and therefore, misuse the function terminology. 4. Students may also believe that the notation *f(x)* means to multiply some value *f* times another value *x*. The notation alone can be confusing and needs careful development. 5. Students may believe that it is reasonable to input any *x*-value into a function, so they will need to examine multiple situations in which there are various limitations to the domains. 6. Students may also believe that the slope of a linear function is merely a number used to sketch the graph of the line. In reality, slopes have real-world meaning, and the idea of a rate of change is fundamental to understanding major concepts from algebra to calculus. 7. Students naturally tend to look "down" a table to find the pattern but need to realize that finding the 100th term requires knowing the 99th term unless an explicit formula is developed. 8. Students may believe that changing the slope of a linear function from "2" to "3" makes the graph steeper without realizing that there is a real-world context and reason for examining the slopes of lines. Similarly, an exponential function can appear to be abstract until applying it to a real-world situation.

Big Idea(s)	Essential Question(s)
Patterns exhibit relationships that can extended, described and generalized. Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms. Mathematical relationships can be represented as expressions, equations, and inequalities in mathematical situations. Mathematical relationships can be represented, compared, and communicated. Relations and functions are mathematical relationships that can be represented and analyzed using words, tables, graphs, and equations	• How do you decide which functional representation to choose when modelling a real world situation, and how would you explain your solution to the problem? • How do you write, solve, graph, and interpret linear equations and inequalities to model relationships between quantities? • How do you write, solve, and interpret systems of two linear equations and inequalities using graphing and algebraic techniques? • How can we show that algebraic properties and processes are extensions of arithmetic properties and processes, and how can we use algebraicproperties and processes to solveproblems? • How is mathematics used to quantify, compare, represent, and model numbers?

Assessments
See unit map for specific unit common assessments

Assessment Anchor	Eligible Content	
A1.2.1 Functions **A1.2.2** Coordinate Geometry	**A1.2.1.1.1**	Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically.
	A1.2.1.1.2	Determine whether a relation is a function, given a set of points or a graph.
	A1.2.1.1.3	Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table).
	A1.2.2.1.1	Identify, describe, and/or use constant rates of change.
	A1.2.2.1.2	Apply the concept of linear rate of change (slope) to solve problems.
	A1.2.2.1.3	Write or identify a linear equation when given • the graph of the line, • two points on the line, or • the slope and a point on the line. Note: Linear equation may be in point-slope, standard, and/or slope-intercept form.
	A1.2.2.1.4	Determine the slope and/or y-intercept represented by a linear equation or graph.

Concepts (what students need to know)	**Skills** (what students must be able to do)
Categorical and Quantitative Data	Analyze a set of data for a pattern, and represent the pattern with an algebraic rule and/or a graph.