Algebra 2		
Unit	**Priority Standards**	**Supporting Standards**
Unit 1 Linear/ Absolute Value/ Inequalities	N/A	CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
		CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
		CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
		CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
		CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
Unit 2 Systems of Equations and Matrices	CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.	CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
		CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
Unit 3 Factoring	N/A	N/A
Unit 4 Quadratics	CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.	CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
	CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.	CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
	CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.	
Unit 5 Polynomials	CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.	CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
	CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.	CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.

		CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
		CC.2.2.HS.D.5 Use polynomial identities to solve problems.
		CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
		CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
Unit 6 Rationals	CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.	CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
Unit 7 Exponentials/ Logarithms/ Inverses	CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
	CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.	CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.
	CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.	
	CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.	
Unit 8 Counting and Probability	CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.	CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.
Unit 9 Sequences and Series		CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic 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
• Solve systems of equations algebraically, graphically, and using matrices. • Solve equations and interpret their graphs
Common Misconceptions
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. Students will often combine terms that are not like terms. For example, $2 + 3x = 5x$ or $3x + 2y = 5xy$. Students may believe that it is reasonable to input any x-value into a function Students may believe that the process of rewriting equations into various forms is simply an algebra symbol manipulation exercise.

Big Idea(s)	Essential Question(s)
Solving Systems of Equations algebraically, graphically, and with matrices Simplify matrices using addition, subtraction, and multiplication Solve for the inverse of a matrix Use matrices to solve equations	How does representing functions graphically help solve a system of equations? What is the difference between Substitution and Elimination method? What does the solution represent? What are the different methods for operations with matrices? How do you use matrices to solve Systems of Equations? How do you determine where to shade an inequality? What does the solution represent?

Assessments
See unit map for specific unit common assessments

Concepts (what students need to know)	Skills (what students must be able to do)
Substitution Elimination Graphing Adding and Subtracting Matrices Multiplying Matrices Matrix Inverse Using Matrices to solve System of Equations	Solve equation for a variable using algebra I skills Graphs lines, parabolas, absolute values Add/Subtract/Multiply Organize data into a matrix Graphing lines, parabolas, and absolute values

How to graph linear and non linear inequalities	

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.
Taught in Unit(s)
Unit 4 Unit 5
Explanation/Example of Standard
• Perform arithmetic operations with complex numbers • Use complex numbers in polynomial identities and equations • Solve Quadratics that have imaginary solutions • Write imaginary numbers in complex number form • Understand what complex number answers from a quadratic mean to its graphical representation Use properties of rational and irrational numbers.
Common Misconceptions
1. **Students will confuse irrational numbers with non-real or complex numbers.** 2. **Students may misinterpret the imaginary unit *i* as -1.** 3. **Students may confuse powers of *i*, such as i^2 and i^4.** 4. **Some properties of radicals that are true for real numbers are not true for complex numbers. In particular, for positive real numbers *a* and *b:* and but,** 5. **In the cases of quadratic equations, when the use of quadratic formula is not critical, students sometime ignore the negative solutions.** 6. **Students may believe that the use of algebraic expressions is merely the abstract manipulation of symbols.** 7. **Students commonly confuse the properties of exponents. For example, students will often simplify $(x^2)^3 = x^5$ instead of x^6.** 8. **tudents may confuse the zeros, roots, and x-intercepts are synonymous.** 9. **Students with only procedural understanding of fractions are likely to "cancel" terms (rather than factors of) in the numerator and denominator of a fraction.** 10. **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.** 11. **Students may also confuse irrational numbers and complex numbers, and therefore mix their properties.** 12. **By using false extensions of properties of rational numbers, some students may assume that the sum of any two irrational numbers is also irrational.**

13. **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.**
14. **Students may struggle simplifying radicals that contain negative numbers**

Big Idea(s)	**Essential Question(s)**
The square root of a negative number is an imaginary number. Complex numbers can be added, subtracted, multiplied or divided. The product of complex conjugates is a real number. A complex number has a real part and an imaginary part. Solutions to the quadratic formula can be complex Complex solutions when solving for x-intercepts mean the graph does not intersect the x-axis	What happens when you take the square root of a negative number? What does an complex solution mean to the graph of a quadratic?

Assessments
See unit map for specific unit common assessments

Concepts (what students need to know)	**Skills** (what students must be able to do)
How to use the quadratic formula. How to simplify square roots.	Students must be able to factor, use the quadratic formula, or complete the square to find complex solutions.

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
Taught in Unit(s)
Unit 4 Unit 5
Explanation/Example of Standard
• Understand the relationship between zeros and factors of polynomials • Perform arithmetic operations on polynomials • Use polynomial identities to solve problems • Identify (recognize) the parts and structure of rational, radical, and polynomial expressions • Write expressions in equivalent forms to solve problems
Common Misconceptions
1. Students may confuse the zeros, roots, and x-intercepts are synonymous. 2. Students with only procedural understanding of fractions are likely to "cancel" terms (rather than factors of) in the numerator and denominator of a fraction. 3. Students frequently attempt to "solve" expressions. Many students add "= 0" to an expression they are asked to simplify. 4. Students commonly confuse the properties of exponents. For example, students will often simplify $(x^2)^3 = x^5$ instead of x^6. 5. Some students may believe that factoring and completing the square are isolated techniques within a unit of quadratic equations. 6. Students may confuse the difference between the minimum and maximum of a graph and where to locate the point on the graph. 7. Students sometimes forget the coefficient of 1 when adding like terms. For example, . 8. Students will change the degree of the variable when adding/subtracting like terms. 9. Students commonly misevaluate $-3^2 = 9$ rather than $-3^2 = -9$. Students routinely see -3^2 as the same as $(-3)^2 = 9$

Big Idea(s)	Essential Question(s)
The zeros of quadratic functions are equivalent to the x-intercepts of the graph of the function or the solutions of the quadratic equation. The zeros can be used to begin graphing a quadratic. The zeros can be found by graphing, factoring, completing the square or the quadratic formula. The degree of a polynomial equation is the greatest degree among its monomial terms.	How can quadratics be shifted? How can you graph quadratics that are shifted? What are the characteristics of a polynomial equation? What is the relationship between a factored polynomial function and its graph? What effect do special roots of a polynomial function have on its graph? What is synthetic division and how is it used?

The end behavior describes the graph at the far left and at the far right. If the zeros of a function are known, a polynomial can be written to satisfy the zeros. Solutions to polynomials can be found by a combination of graphing, theorems and factoring techniques. The algebraic form of a polynomial function gives information about its graph. A polynomial of degree n has n linear factors. (x-a) is linear factor if and only if a is a zero. The degree of a polynomial equation tells how many roots the equation has.	

Assessments	
See unit map for specific unit common assessments	
Concepts (what students need to know)	**Skills** (what students must be able to do)
zeros/ roots Graphing roots of a Quadratic Root multiplicity	Find the roots of a polynomial by factoring or the quadratic formula. Graph a single, double, triple root at the appropriate x value. Graph the appropriate direction of end behavior arrows Transform and translate polynomials on a coordinate axis Graph a quadratic by averaging the intercepts, or completing the square

CVSD Math Curriculum Map ~ Grade

CV Priority Standard/PA Academic 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 4 Unit 5 Unit 7
Explanation/Example of Standard
• Analyze functions using different representations • Construct and compare linear, quadratic, and exponential models and solve problems • Represent and solve equations and inequalities graphically • Write expressions in equivalent forms to solve problems
Common Misconceptions
1. 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. 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 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. 6. 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. 7. 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. 8. Students may believe that it is reasonable to input any *x*-value into a function. 9. 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. 10. Students may believe that each family of functions (e.g., quadratic, square root, etc.) is independent of the others. 11. Students often confuse the shift of a function with the stretch of a function. 12. Students may also believe that *even* and *odd* functions refer to the exponent of the variable 13. 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 Ideas	Essential Question(s)
Identify the effect that graph shifts have on a function. Graph exponential and logarithmic functions.	What is polynomial division and how is it used? What is the process to expand binomials using the binomial theorem? What are the characteristics of a polynomial equation? What is the relationship between a factored polynomial function and its graph? What effect do special roots of a polynomial function have on its graph? How is a rational expression graphed? How do you graph exponential functions? How do you graph logarithmic functions? What are some similarities and differences between a graph of a function and the graph of its inverse? How do you know if two functions are inverses of one another?

Assessments
See unit map for specific unit common assessments

Concepts (what students need to know)	Skills (what students must be able to do)
multiplying/dividing polynomials graphing polynomials Horizontal asymptote Vertical asymptote Hole X intercept Y intercept exponential/logarithmic graphs	Transform and translate polynomials on a coordinate axis. Divide polynomials using synthetic division Divide polynomials using long division Graph both vertical and horizontal asymptotes Graph exponential/logarithmic functions, including their asymptotes

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic 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 4 Unit 7
Explanation/Example of Standard
Determine the effect a stretch factor has on a quadratic. Find the inverse of functions, both algebraically and graphically.
Common Misconceptions
Mistaking whether a stretch factor "a" makes a graph wider or skinnier. When creating a table of values for a quadratic, students sometimes make a mistake in finding the range value because not understanding order of operations. Students often multiply by the stretch factor before squaring a number. Students may believe that all functions have inverses that are also functions. Students when finding the inverse will do opposite sign/opposite operation without regard to order.

Big Idea(s)	Essential Question(s)
Stretching Quadratics Compressing Quadratics Graphing Quadratics Functions Inverses	How can quadratics be transformed? How can quadratics that are transformed or shifted be graphed? How do you find the inverse of a function?

Assessments
See unit map for specific unit common assessments

Concepts (what students need to know)	Skills (what students must be able to do)
Transforming Quadratics Shifting Quadratics Graphing Quadratics Functions Finding Inverses Graphing Inverses	Manipulate equations to transform quadractics. Graph quadratics that are transformed and or shifted. Find the inverse of a function (linear,quadratic, cubic, exponential, logarithmic) Graph a function and its inverse Determine if the inverse of a function is also a function and restrict the domain if necessary.

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
Taught in Unit(s)
Unit 6
Explanation/Example of Standard
• Perform operations on rational expressions (add, subtract, multiply and divide) • Understand how to solve rationals through cross multiplication and multiplying by a common denominator
Common Misconceptions
Students may forget to use parentheses when the numerator and/or denominator contain more than a single variable or constant. Students will not make sure all terms in the numerator of the second fraction are subtracted. Only common factors can be divided out. Students will divide out a common term. Students will try to cross multiply. This is Not the cross products property. When multiplying by a LCD, students do not always recognize the Distributive Property. Students may believe that the use of algebraic expressions is merely the abstract manipulation of symbols. Students may also believe that an expression cannot be factored because it does not fit into a form they recognize. Students will often combine terms that are not like terms. For example, $2 + 3x = 5x$ or $3x + 2y = 5xy$. Students sometimes forget the coefficient of 1 when adding like terms. For example, . Students will change the degree of the variable when adding/subtracting like terms. Students commonly misevaluate $-32 = 9$ rather than $-32 = -9$. Students routinely see -32 as the same as $(-3)2 = 9$. Students frequently attempt to "solve" expressions. Many students add "= 0" to an expression they are asked to simplify. Students commonly confuse the properties of exponents. For example, students will often simplify $(x2)3 = x5$ instead of $x6$. Students with only procedural understanding of fractions are likely to "cancel" terms (rather than factors of) in the numerator and denominator of a fraction.

Big Idea(s)	Essential Question(s)
The sign rules for adding and subtracting rational numbers are the same for adding and subtracting integers. Many of the techniques used to solve proportions are also used to solve rational equations. Rewrite simple rational expressions in different forms.	How are two rational expressions added together? How are two rational expressions subtracted together? How are two rational expressions multiplied together? How are rational expressions divided by each other? How is a complex fraction simplified?

	What technique is used to solve a rational expression?
Assessments	
See unit map for specific unit common assessments	
Concepts (what students need to know)	**Skills** (what students must be able to do)
adding rationals subtracting rationals multiplying rationals dividing rationals simplifying complex fractions into rationals solving rationals graphing asymptotes graphing holes	Add together multiple rationals Subtract together multiple rationals Multiply together rationals Divide together rationals Simplify a complex fraction by multiplying by a common denominator solve a rational equation Graph a horizontal and vertical asymptote Identify and graph holes

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
Taught in Unit(s)
Unit 7
Explanation/Example of Standard
Simplify expressions with rational exponents Solve problems that have rational exponents
Common Misconceptions
1. Most mistakes that students make are careless rather than conceptual. 2. Students often confuse rational exponents with negative exponents, for example when simplifying x^(½), students will say the answer is (1/(x^2)), or x^(-2) 3. Students often confuse the numerator and denominator of rational exponents, for example, when simplifying x^(3/2), students will say it equals cube root (x^2) rather than the square root(x^3) 4. When solving equations with rational exponents, students sometimes perform the same operation as already present in the problem, rather than undoing the current operation by performing the inverse operation. For example, when solving x ^ (½) = 2, students might take the square root of both sides, rather than square both sides.

Big Idea(s)	Essential Question(s)
Rational exponents Solve problems with rational exponents	How are numbers and expressions with rational exponents simplified? How are exponents used to solve radical equations?
Assessments	
See unit map for specific unit common assessments	
Concepts (what students need to know)	**Skills** (what students must be able to do)
Fractional exponents can be written as roots. Roots can be written as fractional exponents.	Simplify numbers with fractional exponents Apply exponent rules to simplify expressions with exponents Solve radical equations using exponents

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
Taught in Unit(s)
Unit 7
Explanation/Example of Standard
Finding the inverse of a function, including exponential/logarithmic functions Using logarithms to solve exponential equations Using exponents to solve logarithmic equations
Common Misconceptions
1. Students may believe that all functions have inverses that are also functions. 2. 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. 3. Students may believe that in order to solve logarithmic equations, they divide by log, for example, to solve log (2x) = 3, they divide both sides by log (2). 4. Students may believe that in order to solve exponential equations, they divide by the base, for example, to solve 2^x = 3, they divide both sides by 2.

Big Idea(s)	Essential Question(s)
Finding inverses Using inverses to solve equations	How do you find the inverse of a function? How do you find the inverse of an exponential? How do you find the inverse of a logarithm? How do you solve exponential equations? How do you solve logarithmic equations?
Assessments	
See unit map for specific unit common assessments	
Concepts (what students need to know)	**Skills** (what students must be able to do)
Exponentials and logarithmic functions are inverses. Logarithmic functions are used to solve exponential equations and exponential functions are used to solve logarithmic equations.	Find the inverse of a function Solve exponential equations Solve logarithmic equations Create and/or solve equations (including exponential and logarithmic) both algebraically and graphically.

CVSD Math Curriculum Map ~ Algebra 2

CV Priority Standard/PA Academic Standard
CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.
Taught in Unit(s)
Unit 8
Explanation/Example of Standard
Building on probability concepts that began in the middle grades, students use the languages of set theory to expand their ability to compute and interpret theoretical and experimental probabilities for compound events, attending to mutually exclusive events, independent events, and conditional probability. Students will use probability concepts to draw conclusions and make informed decisions in a data rich world.
Common Misconceptions
1. **Students may believe that multiplying across branches of a tree diagram has nothing to do with conditional probability.** 2. **That independence of events and mutually exclusive events are the same thing.** 3. **That the probability of *A* or *B is* always the sum of the two events individually.** 4. **That the probability of *A* and *B* is the product of the two events individually, not realizing that one of the probabilities may be conditional.**

Big Idea(s)	Essential Question(s)
The probability, p, of an event is a number such that 0 is less than or equal to p which is less than or equal to 1. To find the probability of two events occurring together, it is necessary to determine whether the occurrence of one event affects the probability that the other event will occur. A conditional probability is the probability that one event occurs, given that another event has occurred. Probability models can be used to analyze situations and make fair decisions.	What is the difference between a combination and a permutation? What is the difference between experimental and theoretical probability? How can probability be used to make fair decisions and analyze decisions?

Assessments
See unit map for specific unit common assessments

Concepts (what students need to know)	Skills (what students must be able to do)
Fundamental Counting Principle Combination Permutation	To apply the Fundamental Counting Principle To count combinations

Factorial Odds Experimental Probability Theoretical Probability Sample Space Dependent Events Independent Events Mutually Exclusive Events Conditional Probability Tree Diagram Binomial Theorem	To count permutations To use factorials To find the probability of an event using theoretical and experimental methods. To find the probability of the event A and B To find the probability of the event A or B To find the probability of the event A given that event has occurred (conditional probability) Use tree diagrams to determine conditional probabilities To use the Binomial Theorem