PLC Question #1: What do we want all students to know and be able to do?

Unit 1: Relations and Functions	Unit 2: Linear Equations, Inequalities, and Systems	Unit 3: Quadratic Functions
Priority Standard(s) • M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • M.F.IF.C7b (F2Y) Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	**Priority Standard(s)** • M.A.CED.A.3 (F2Y) Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. • M.F.IF.B.6 Calculate and interpret the average rate of change of a linear or nonlinear function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	**Priority Standard(s)** • M.A.CED.A.1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. • M.F.IF.C.8a (F2Y) . Use an efficient process to rewrite f(x) = ax2+bx+c as f(x) = a(x-h)2 +k or f(x)=a(x-p)(x-q) to determine the characteristics of the function and interpret these in terms of a context.
Supporting Standard(s) • M.F.IF.B.5 Relate the domain of a function to its graph and find an appropriate domain (discrete or continuous) in the context of the given problem. • M.F.IF.C.7c (F2Y) Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. • M.F.IF.C.9 (F2Y) Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). • M.A.CED.A.3 (F2Y) Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. • M.F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) using transformations for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.	**Supporting Standard(s)** • M.A.CED.A.1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. • M.A.CED.A.2 (F2Y) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • M.A.REI.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.	**Supporting Standard(s)** • M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • M.F.IF.B.6 Calculate and interpret the average rate of change of a linear or nonlinear function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. • M.A.CED.A.2 (F2Y) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • M.N.CN.A.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form a + bi with a and b real. Understand why complex numbers exist. • M.N.CN.A.2 (+) Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. • M.N.CN.A.7 Solve quadratic equations with real coefficients that have complex solutions. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. • M.N.CN.A.8 (+) Extend polynomial identities to the complex numbers. For example, rewrite x2+ 4 as (x + 2i)(x - 2i). • M.A.SSE.A.1b (F2Y) Interpret complicated expressions by viewing one or more of their parts as a single entity. • M.A.CED.A.3 (F2Y) Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. • M.A.REI.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.

Learning Outcomes		Learning Outcomes		Learning Outcomes	
Students need to know (prior skills/knowledge)	**DOK Level**	**Students need to know (prior skills/knowledge)**	**DOK Level**	**Students need to know (prior skills/knowledge)**	**DOK Level**
• M.8.F.A.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a numerically valued function is the set of ordered pairs consisting of an input and the corresponding output. Function notation is not required in Grade 8. • M.F.IF.A.1 (F2Y) Understand that a function from one set, discrete or continuous, (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range.		• M.8.EE.C.8 Analyze and solve pairs of simultaneous linear equations. • M.A.REI.C.5 (F2Y) Justify that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. • M.A.REI.C.6 (F2Y) Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. • M.A.REI.C.7 (F2Y) Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. • M.A.REI.D 12 (F2Y) Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.		• M.A.REI.B.4 (F2Y) Solve quadratic equations by inspection (e.g., for x 2 = 49), taking square roots, completing the square, the quadratic formula, factoring, and graphing as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b. • M.F.IF.C.7a (F2Y) . Graph linear and quadratic functions and show intercepts, maxima, and minima; and exponential functions, showing intercepts and end behavior.	
Students will learn (new content & skills)	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**
• Students will determine the continuity of functions and whether functions are one-to-one and/or onto. • Students will determine the linearity, intercepts, and symmetry of functions. • Students will identify extrema and end behavior of functions. • Students will sketch graphs of functions and compare two functions represented in different ways. • Students will graph linear functions and inequalities in two variables. • Students will write and graph piecewise-defined, step, and absolute value functions. • Students will identify and use transformations of functions.		• Students will solve linear equations and inequalities in one variable. • Students will solve equations and inequalities involving absolute value algebraically. • Students will write linear equations in standard, slope-intercept, and point-slope forms. • Students will solve systems of equations by graphing. • Students will solve systems of equations by using substitution or elimination. • Students will solve systems of inequalities in two variables. • Students will use linear programming to find maximum and minimum values of a function. • Students will solve systems of equations in three variables. • Students will solve equations and inequalities involving absolute value by graphing.		• Students will graph quadratic functions. • Students will solve quadratic equations by graphing. • Students will perform operations under pure imaginary and complex numbers. • Students will solve quadratic equations by factoring. • Students will simplify quadratic expressions by using the Square Root Property and completing the square. • Students will use the Quadratic Formula and discriminant to solve quadratic equations and determine the number of real roots. • Students will graph and solve quadratic inequalities. • Students will solve systems of linear and quadratic equations.	
Students will do (I can statements)	**DOK Level**	**Students will do (I can statements)**	**DOK Level**	**Students will do (I can statements)**	**DOK Level**
• I can determine whether functions are one-to-one		• I can solve linear equations by applying the		• I can graph quadratic functions by making a table	

and/or onto by examining the graphs of functions.
- I can write the domain and range of functions by using set-builder and interval notation.
- I can identify linear and nonlinear functions by examining equations and graphs.
- I can identify and interpret intercepts of functions by examining graphs or tables
- I can identify whether graphs of functions possess line or point symmetry and determine whether functions are even, odd, or neither by analyzing graphs.
- I can identify extrema of functions by examining their graphs.
- I can identify end behavior of functions by examining their graphs.
- I can sketch graphs of functions by using key features.
- I can graph linear functions by using a table, intercepts, or the slope and intercept.
- I can graph linear inequalities in two variables by using the related equations.
- I can write and graph piecewise-defined functions by analyzing intervals of the domain.
- I can write and graph step functions by analyzing intervals of the domain.
- I can graph and analyze absolute value functions.
- I can identify the effect on the graphs of functions by replacing $f(x)$ with $f(x) + k$ and $f(x - h)$ for positive and negative values.
- I can identify the effect on the graphs of functions by replacing $f(x)$ with $af(x)$ and $f(ax)$ for positive and negative values.
- I can identify the effect on the graphs of functions by replacing $f(x)$ with $af(x-h)+k$ and will use transformations to write equations of graphs.

properties of equality.
- I can solve linear equations by examining graphs of the related functions.
- I can solve linear inequalities by applying the properties of inequality.
- I can write and solve absolute value equations by constructing two cases for the equation, then graph the solutions on a number line.
- I can write and solve absolute value inequalities by constructing compound inequalities, and then graph the solutions on a number line.
- I can write linear equations in standard form and identify values of $A, B,$ and C by using the properties of equality.
- I can create linear equations in slope-intercept form by rewriting given equations and by using the coordinates of two points.
- I can create linear equations in point-slope form by using two points on the line or the slope and a point on the line.
- I can solve systems of linear equations by identifying the intersections of their graphs.
- I can solve systems of equations by using the substitution method to find the value of each variable.
- I can solve systems of equations by using elimination method to find the value of each variable.
- I can solve systems of linear inequalities in two variables by using the related equations.
- I can find maximum and minimum values of a function over a region by using its vertices.
- I can solve real-world optimization problems by graphing systems of inequalities and using the vertices of the feasible region to maximize or minimize constraints.
- I can solve systems of equations in three variables by using algebraic methods.
- I can solve absolute value equations by examining graphs of related functions.
- I can solve absolute value inequalities by examining graphs of related functions.

of values.
- I can solve quadratic equations by graphing.
- I can perform operations with pure imaginary numbers.
- I can perform operations with complex numbers.
- I can solve quadratic equations by factoring.
- I can solve quadratic equations by factoring special products.
- I can solve quadratic equations by using the Square Root Property.
- I can complete the square in quadratic expressions to solve quadratic equations.
- I can complete the square in a quadratic function to interpret key features of its graph.
- I can solve quadratic equations by using the Quadratic Formula.
- I can determine the number and type of roots of a quadratic equation by using the discriminant.
- I can graph quadratic inequalities in two variables by using the related equations.
- I can solve quadratic inequalities in two variables by graphing.
- I can solve systems of linear and quadratic equations.
- I can solve systems of two quadratic equations.

Domain-specific Vocabulary

- Domain
- Codomain
- Range
- One-to-one function

Domain-specific Vocabulary

- Equation
- Solution
- Root
- Zero

Domain-specific Vocabulary

- Quadratic function
- Axis of symmetry
- Vertex
- Maximum

- Onto function
- Continuous function
- Discontinuous function
- Discrete function
- Algebraic notation
- Set-builder notation
- Interval notation
- Linear function
- Linear equation
- Nonlinear function
- Parabola
- X - intercept
- Y - intercept
- Symmetry
- Line symmetry
- Line of symmetry
- Point symmetry
- Point of symmetry
- Even functions
- Odd functions
- Extrema
- Maximum
- Minimum
- Relative maximum
- Relative minimum
- End behavior
- Linear inequality
- Boundary
- Closed half-plane
- Open half-plane
- Constraint
- Piecewise - defined function
- Step function
- Greatest integer function
- Absolute value function
- Parent function
- Family of graphs
- Constant function
- Identity function
- Transformations
- Dilation
- Reflection
- Line of reflection

- Inequality
- Absolute Value
- Extraneous solution
- Empty Set
- System of equations
- Consistent
- Inconsistent
- Independent
- Dependent
- Substitution
- Elimination
- System of inequalities
- Feasible region
- Bounded
- Unbounded
- Linear Programming
- Optimization
- Ordered triple

- Minimum
- Rate of change
- Average rate of change
- Quadratic equation
- Standard form of a quadratic equation
- Imaginary unit i
- Pure imaginary number
- Complex number
- Complex conjugates
- Rationalizing the denominator
- Factored form
- Difference of squares
- Perfect square trinomials
- Completing the square
- Vertex form
- Projectile motion problems
- Discriminant
- Quadratic inequality
- Quadratic relations

Building:	**RCHS**	Course:	**Algebra 2**	Grade:	**9-12**	Tier:	**3**	RSD Curriculum

PLC Question #1: What do we want all students to know and be able to do?

Unit 4: Polynomials and Polynomial Functions	Unit 5: Polynomial Equations	Unit 6: Inverse and Radical Functions
Priority Standard(s) ● M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. ● M.A.APR.C.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.	**Priority Standard(s)** ● M.A.CED.A.1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. ● M.A.APR.A.3 Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. ● M.N.CN.C.9 (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.	**Priority Standard(s)** ● M.A.SSE.A.2 (F2Y) Use the structure of an expression to identify ways to rewrite it. ● M.F.IF.C.7b (F2Y) Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. ● M.F.BF.A.1b Combine standard function types using arithmetic operations.
Supporting Standard(s) ● M.F.IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. ● M.A.APR.D.6 Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. ● M.A.APR.C.5 (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.	**Supporting Standard(s)** ● M.A.REI.D.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. ● M.A.APR.C.4 Prove polynomial identities and use them to describe numerical relationships. ● M.A.APR.B.2 Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x). ● M.F.IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.	**Supporting Standard(s)** ● M.F.IF.B.5 Relate the domain of a function to its graph and find an appropriate domain (discrete or continuous) in the context of the given problem. ● M.A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. ● M.F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) using transformations for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

Learning Outcomes		Learning Outcomes		Learning Outcomes	
Students need to know (prior skills/knowledge)	**DOK Level**	**Students need to know (prior skills/knowledge)**	**DOK Level**	**Students need to know (prior skills/knowledge)**	**DOK Level**
● M.F.IF.7a (F2Y) Graph linear and quadratic functions and show intercepts, maxima, and minima; and exponential functions, showing intercepts and end behavior. ● M.F.IF.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.		● M.A.APR.C.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. ● M.F.IF.C.7c Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.		● M.8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	
Students will learn (new content & skills)	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**
● Students will analyze polynomial functions by examining key features and graphing.		● Students will solve polynomial equations by graphing.		● Students will simplify and graph operations on functions, and determine compositions of	

• Students will analyze the graphs of polynomial functions by identifying key features. • Students will add, subtract, and multiply polynomials. • Students will divide polynomials by using long division and synthetic division. • Students will expand powers of binomials.		• Students will solve polynomial equations by factoring and by writing them in quadratic form. • Students will prove polynomial identities and use them to describe numerical relationships. • Students will evaluate and factor functions by using the Remainder and Factor Theorems. • Students will determine the number and types of roots of polynomial equations, find zeros, and use zeros to graph polynomial functions.		functions. • Students will graph and verify inverse functions. • Students will simplify expressions involving radicals and rational exponents. • Students will graph and analyze square and cube root functions. • Students will simplify and perform operations with radical expressions. • Students will solve radical equations algebraically and by graphing.	

Students will do (I can statements)	DOK Level	Students will do (I can statements)	DOK Level	Students will do (I can statements)	DOK Level
• I can graph and analyze power functions. • I can graph and analyze polynomial functions. • I can approximate zeros by graphing polynomial functions. • I can find the relative maxima and relative minima of polynomial functions. • I can add and subtract polynomials by combining like terms. • I can multiply polynomials by using the Distributive Property. • I can divide polynomials by using long division. • I can divide polynomials by using synthetic division. • I can expand powers of binomials by using Pascal's triangle and the Binomial Theorem.		• I can solve polynomial equations by examining graphs of the related functions and by graphing systems of equations. • I can solve polynomial equations by factoring. • I can solve polynomial equations by writing them in quadratic form and factoring. • I can prove polynomial identities and use them to describe the numerical relationships. • I can evaluate functions by using synthetic substitution. • I can determine factors of polynomials by using the Factor Theorem. • I can determine the numbers and types of roots of polynomial equations by using the Fundamental Theorem of Algebra. • I can find zeros of polynomial functions and graph polynomial functions by using zeros.		• I can find sums, differences, products, and quotients of functions. • I can find compositions of functions. • I can find inverses of relations. • I can verify that two relations are inverses by using compositions. • I can simplify expressions involving radicals and rational exponents by using the properties of exponents. • I can simplify expressions in exponential form or radical form. • I can graph and analyze square root functions. • I can graph and analyze cube root functions. • I can simplify radical expression by applying the properties of radicals. • I can add, subtract, and multiply radicals by using the Distributive Property and combining like terms. • I can divide and simplify radical expressions by rationalizing the denominator. • I can solve radical equations in one variable and identify extraneous solutions. • I can solve radical equations by examining graphs of related functions and graphing systems of equations.	

Domain-specific Vocabulary	Domain-specific Vocabulary	Domain-specific Vocabulary
• Power function • Leading coefficient • Degree • Monomial function • Polynomial in one variable • Standard form of a polynomial • Degree of a polynomial • Polynomial function • Quartic function	• Prime polynomial • Quadratic form • Identity • Polynomial identity • Synthetic substitution • Depressed polynomial • Multiplicity	• Compositions of functions • Inverse relations • Inverse functions • nth root • Index • Radicand • Principal root • Rational exponent • Radical function

- Quintic function
- Binomial
- Trinomial
- Closed
- FOIL method
- Synthetic division
- Pascal's triangle

- Square root function
- Cube root function
- Like radical expressions
- Conjugates
- Radical equation

PLC Question #1: What do we want all students to know and be able to do?

Unit 7: Exponential Functions	Unit 8: Logarithmic Functions	Unit 9: Rational Functions
Priority Standard(s) • M.A.CED.A.1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. • M.F.IF.A.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**Priority Standard(s)** • M.A.SSE.A.2 (F2Y) Use the structure of an expression to identify ways to rewrite it. • M.F.LE.A.4 For exponential models, express as a logarithm the solution to abcct = d where a, c, and d are numbers and the base b is 2,10, or e; evaluate the logarithm using technology.	**Priority Standard(s)** • M.A.APR.D.7 (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. • M.F.IF.B.5 (F2Y) Relate the domain of a function to its graph and find an appropriate domain (discrete or continuous) in the context of the given problem.
Supporting Standard(s) • M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • M.A.REI.D.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. • M.A.CED.A.2 (F2Y) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • M.F.IF.B.6 Calculate and interpret the average rate of change of a linear or nonlinear function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. • M.A.SSE.B.4 Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems.	**Supporting Standard(s)** • M.F.IF.A.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. • M.A.CED.A.1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. • M.A.REI.D.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.	**Supporting Standard(s)** • M.F.IF.B.5 Relate the domain of a function to its graph and find an appropriate domain (discrete or continuous) in the context of the given problem. • M.F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) using transformations for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. • M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • M.A.CED.A1 (F2Y) Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. • M.A.CED.2 (F2Y) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. • M.A.REI.A.2 Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. • M.A.REI.D.11 (F2Y) Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations.
Learning Outcomes	**Learning Outcomes**	**Learning Outcomes**

Students need to know (prior skills/knowledge)	DOK Level	Students need to know (prior skills/knowledge)	DOK Level	Students need to know (prior skills/knowledge)	DOK Level

	DOK Level		DOK Level		DOK Level
● M.F.IF.A.7a (F2Y) Graph linear and quadratic functions and show intercepts, maxima, and minima; and exponential functions, showing intercepts and end behavior. ● M.F.IF.A.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.		● M.A.CED.A.2 (F2Y) Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ● M.F.IF.A.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.		● M.N.RN.A.1 (F2Y) Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents. ● M.N.RN.2 (F2Y) Rewrite expressions involving radicals and rational exponents using the properties of exponents.	
Students will learn (new content & skills)	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**
● Students will graph exponential growth and decay functions. ● Students will solve exponential equations and inequalities algebraically and by graphing. ● Students will analyze expressions and functions involving the natural base *e*. ● Students will generate geometric series and find their sums. ● Students will choose the best function type to model sets of data by using technology.		● Students will write and evaluate logarithms and graph logarithmic functions. ● Students will simplify logarithmic expression and solve logarithmic equations. ● Students will simplify logarithmic expression and solve exponential equations by using common logarithms. ● Students will simplify logarithmic expressions and solve exponential equations by using natural logarithms. ● Students will write exponential growth and decay equations and solve them by using logarithms.		● Students will multiply and divide rational expressions. ● Students will add and subtract rational expressions. ● Students will graph and analyze reciprocal functions. ● Students will graph and analyze rational functions. ● Students will recognize and solve direct, joint, inverse, and combined variation equations. ● Students will solve rational equations and inequalities algebraically and by graphing.	
Students will do (I can statements)	**DOK Level**	**Students will do (I can statements)**	**DOK Level**	**Students will do (I can statements)**	**DOK Level**
● I can graph exponential growth functions. ● I can graph exponential decay functions. ● I can solve exponential equations in one variable algebraically and by graphing. ● I can solve exponential inequalities in one variable algebraically. ● I can analyze expressions and functions involving the natural base *e*. ● I can generate geometric sequences by using the common ratio. ● I can find sums of geometric series. ● I can choose the best function type to model sets of data by using technology.		● I can write logarithmic expressions in exponential form and exponential expressions in logarithmic form. ● I can graph and analyze logarithmic functions. ● I can solve logarithmic equations using properties of equality. ● I can simplify and evaluate expressions by using the properties of logarithms. ● I can solve exponential equations by using common logarithms. ● I can evaluate logarithmic expressions by using the Change of Base formula. ● I can simplify expressions with natural logarithms. ● I can solve exponential equations by using natural logarithms. ● I can write exponential growth equations and inequalities and solve them by using logarithms. ● I can write exponential decay equations and solve them by using logarithms.		● I can simplify rational expressions. ● I can simplify rational expression by multiplying and dividing. ● I can simplify rational expressions by adding and subtracting. ● I can simplify complex fractions by using the least common denominator. ● I can graph reciprocal functions by examining properties and making tables of values. ● I can graph and write reciprocal functions by using transformations. ● I can graph and analyze rational functions with vertical and horizontal asymptotes. ● I can graph and analyze rational functions with oblique asymptotes. ● I can recognize and solve direct and joint variation equations. ● I can recognize and solve inverse and combined variation equations. ● I can solve rational equations in one variable algebraically. ● I can solve rational inequalities in one variable algebraically.	

Domain-specific Vocabulary

- Exponential function
- Exponential growth
- Asymptote
- Growth factor
- Exponential decay
- Decay factor
- Exponential equation
- Compound interest
- Exponential inequality
- e
- Sequence
- Term of a sequence
- Finite sequence
- Geometric sequence
- Common ratio
- Explicit formula
- Recursive formula
- Geometric means
- Series
- Geometric series
- Sigma notation
- Regression function
- Coefficient of determination

Domain-specific Vocabulary

- Logarithm
- Logarithm function
- Logarithmic equation
- Common logarithms
- Natural base
- Exponential function
- Natural logarithm

Domain-specific Vocabulary

- Rational expression
- Complex fraction
- Reciprocal function
- Vertical asymptote
- Horizontal asymptote
- Hyperbola
- Excluded values
- Rational function
- Oblique function
- Point discontinuity
- Direct variation
- Constant of variation
- Joint variation
- Inverse variation
- Combined variation
- Rational equation
- Rational inequality

PLC Question #1: What do we want all students to know and be able to do?

Unit 10: Inferential Statistics (Proposed Unit)	Unit 11: Trigonometric Functions (Proposed Unit)	Unit 12: Trigonometric Identities and Equations (Proposed Unit)
Priority Standard(s) • M.SP.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. • M.SP.IC.B.6 Evaluate reports based on data.	**Priority Standard(s)** • M.F.TF.A.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. • M.F.IF.C.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**Priority Standard(s)** • M.F.TF.C.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle. • M.F.TF.C.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
Supporting Standard(s) • M.SP.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population. • M.SP.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. • M.SP.IC.A.2 Decide if a specified model is consistent with results from a given data-generating process (e.g., using simulation). • M.SP.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. • M.SP.ID.A.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use statistical packages, calculators, spreadsheets, and tables to estimate areas under the normal curve.	**Supporting Standard(s)** • M.F.TF.A.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • M.F.TF.A.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number. • M.F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. • M.F.IF.B.4 (F2Y) For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. • M.F.BF.B.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) using transformations for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. • M.F.TF.B.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.	**Supporting Standard(s)** • M.F.TF.A.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. • M.F.TF.A.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosine, and tangent for π–x, π+x, and 2π–x in terms of their values for x, where x is any real number.
Learning Outcomes	**Learning Outcomes**	**Learning Outcomes**

Students need to know (prior skills/knowledge)	DOK Level	Students need to know (prior skills/knowledge)	DOK Level	Students need to know (prior skills/knowledge)	DOK Level
• M.SP.ID.A.1 (F2Y) Represent data with plots on the real number line (dot plots, histograms, and box plots). • M.SP.ID.A.2 (F2Y) Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile		• M.8.G.B.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. • M.8.G.B.8 Apply the Pythagorean Theorem to find the distance between two points in a		• M.F.IF.C.7e (F2Y) Graph logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. • M.F.TF.A.2 Explain how the unit circle in the coordinate plane enables the extension of	

range, standard deviation) of two or more different data sets. ● M.SP.ID.A.3 (F2Y) Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).		coordinate system. ● M.G.SRT.C.8 (F2Y) Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.		trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. ● M.F.TF.B.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.	
Students will learn (new content & skills)	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**	**Students will learn (new content & skills)**	**DOK Level**
● Students will classify and identify bias in surveys and studies. ● Students will collect, analyze, and use data to compare theoretical and experimental probabilities. ● Students will use statistics to summarize, represent, and compare sets of data. ● Students will use statistics and normal distribution to analyze data. ● Students will sample data to make inferences about populations.		● Students will draw angles in standard position and convert between degrees and radian measures of angles. ● Students will find the values of trigonometric functions by using general angles and reference angles. ● Students will find trigonometric values by using the unit circle and the properties of periodic functions. ● Students will graph and analyze sine and cosine functions. ● Students will graph and analyze tangent and reciprocal trigonometric functions. ● Students will graph and translations of trigonometric functions. ● Students will find the values of angle measures		● Students will find trigonometric values and simplify trigonometric expressions by using trigonometric identities. ● Students will verify trigonometric identities by transforming equations. ● Students will find trigonometric values and verify identities by using the sum and difference identities. ● Students will find values of sine and cosine by using double-angle and half-angle identities. ● Students will solve equations and determine extraneous solutions by using trigonometric identities.	
Students will do (I can statements)	**DOK Level**	**Students will do (I can statements)**	**DOK Level**	**Students will do (I can statements)**	**DOK Level**
● I can classify sampling methods and identify bias in samples and survey questions. ● I can distinguish among sample surveys, experiments, and observational studies. ● I can compare theoretical and experimental probabilities. ● I can determine whether models are consistent with results from simulations of real-life situations. ● I can describe distributions by finding their mean and standard deviation. ● I can classify variables and analyze probability distributions to determine expected outcomes. ● I can analyze normally distributed variables by using the Empirical Rule. ● I can analyze standardized data and distributions by using z - scores. ● I can use sample data to infer a population mean by using confidence intervals. ● I can use sample data to infer population proportions by using confidence intervals.		● I can draw angles in standard position and identify coterminal angles. ● I can convert between degree measures and radian measures and find arc lengths by using central angles. ● I can find values of trigonometric functions for acute angles by comparing side lengths of right triangles. ● I can find values of trigonometric functions of general angles by using a point on the terminal side of the angle. ● I can find values of trigonometric functions by using reference angles. ● I can find values of trigonometric functions given a point on a unit circle or the measure of a special angle. ● I can find values of trigonometric functions that model periodic events. ● I can graph and analyze sine and cosine functions and identify the periods, midlines, and amplitudes.		● I can use trigonometric identities to find unknown trigonometric values. ● I can simplify trigonometric expression by using trigonometric identities. ● I can verify trigonometric identities by transforming one side of an equation into the form of the other side. ● I can find values of sine and cosine by using sum and difference identities. ● I can verify trigonometric identities by using sum and difference identities. ● I can find values of sine and cosine by using double-angle identities. ● I can find values of sine and cosine by using half-angle identities. ● I can solve equations by using trigonometric identities.	

| | | • I can model period real-world situations with sine and cosine functions.
• I can graph and analyze tangent functions and identify the periods and midlines.
• I can graph and analyze reciprocal trigonometric functions and identify the periods and midlines.
• I can graph horizontal translations of trigonometric functions.
• I can graph vertical translations of trigonometric functions.
• I can find values of angle measures by using inverse trigonometric functions. | | |

Domain-specific Vocabulary

- Parameter
- Statistic
- Population
- Bias
- Survey
- Experiment
- Observational study
- Theoretical probability
- Experimental probability
- Probability model
- Simulation
- Descriptive statistics
- Distribution
- Symmetric distribution
- Outlier
- Variance
- Standard deviation
- Probability distribution
- Discrete random variable
- Continuous random variable
- Outcome
- Sample space
- Normal distribution
- z - value
- Standard normal distribution
- Inferential statistics
- Sampling error
- Standard error of the mean
- Confidence interval
- Maximum error of the estimate
- Population proportion

Domain-specific Vocabulary

- Standard position
- Initial side
- Terminal side
- Coterminal angles
- Radian
- Central angle of a circle
- Trigonometry
- Trigonometric ratio
- Trigonometric function
- Sine
- Cosine
- Tangent
- Cosecant
- Secant
- Cotangent
- Quadrantal angle
- Reference angle
- Unit circle
- Circular function
- Periodic function
- Cycle
- Period
- Oscillation
- Midline
- Amplitude
- Sinusoidal function
- Frequency
- Reciprocal trigonometric functions
- Phase shift
- Vertical shift
- Inverse trigonometric functions
- Principal values

Domain-specific Vocabulary

- Trigonometric identity
- Pythagorean identities
- Cofunction identities
- Trigonometric equation