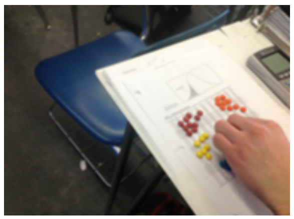
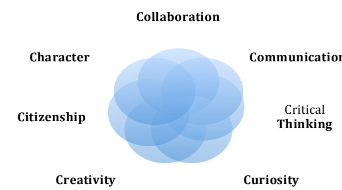
Content Area: Mathematics	Course: PreCalculus	Grade Level: 11-12



R14 The Seven Cs of Learning



Unit Titles	Length of Unit
• *Prerequisite Review*	2-3 weeks
• *Functions*	4-5 weeks
• *Operations on Functions*	3-4 weeks
• *Polynomials*	2-3 weeks
• *Rational Functions*	2-3 weeks
• *Exponential and Logarithmic Functions*	4-5 weeks
• *Trigonometric Functions*	3-4 weeks
• *Graphing Trigonometric Functions*	3-4 weeks
• *Trigonometric Identities*	2-3 weeks
• *Applications involving Right Triangles*	4-5 weeks

Strands	Course Level Expectations
Number and Quantity	• Know there is a complex number i such that $i2 = -1$, and every complex number has the form $a + bi$ with a and b real. • Use the relation $i2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. • Solve quadratic equations with real coefficients that have complex solutions. • (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.
Algebra	• Interpret expressions that represent a quantity in terms of its context.* • Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* • 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. • 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. • 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*. • Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. • Solve quadratic equations in one variable. • 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. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*
Functions	• Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.

	• Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. • 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. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.* • Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.** • Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* • Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. • Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum*. • Write a function that describes a relationship between two quantities.* • Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ 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. • Find inverse functions. • (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. • Distinguish between situations that can be modeled with linear functions and with exponential functions. • Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). • Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. • For exponential models, express as a logarithm the solution to $abct = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.

	• Interpret the parameters in a linear or exponential function in terms of a context. • Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • 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. • Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for x, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number. • Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. • Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.* • Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. • 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.* • Prove the Pythagorean identity $\sin2(\theta) + \cos2(\theta) = 1$ 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. • (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.
Geometry	• Explain and use the relationship between the sine and cosine of complementary angles. • Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.* • Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. • Prove the Laws of Sines and Cosines and use them to solve problems. • Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).
Statistics/ Probability	• Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. • Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Unit Title	*Prerequisite Review*	**Length of Unit**	2-3 weeks

Inquiry Questions **(Engaging & Debatable)**	• What are the different ways that linear functions may be represented? • What is the significance of a linear function's slope and y-intercept? How may linear functions model real world situations? • Why are there different methods of solving equations and when is it appropriate to use each method? • How can right triangle trigonometry be used to model and solve problems?
Standards	**Seeing Structure in Expressions:** A-SSE 3, **Creating Expressions:** A-CED 1, **Reasoning with Equations & Inequalities** A-REI 3, A-REI 4, A-REI 11,
Unit Strands & Concepts	• Writing Linear Equations • Modeling with Linear Equations • Solving Various Types of Equations • Right Triangle Trigonometry • Solving Right Triangles
Key Vocabulary	Linear Equation, Slope, Y-intercept, Rational Equation, Quadratic Equation, Factoring, Quadratic Formula, Sine, Cosine, Tangent, Reference Angle, Leg, Hypotenuse

Unit Title	*Prerequisite Review*	**Length of Unit**	2-3 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• Linear functions may be represented by equations, graphs, tables and words. The graph of a function is often a useful way of visualizing the relationship the function models. • In real-world applications, the y-intercept is the starting point and the slope is the rate of change. • The form of the equation determines which solution method (graphing or algebraic) is most efficient or appropriate. • Right triangle trigonometry has applications in the real world.	• Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. • Create equations in one variable and use them to solve problems. • Solve linear equations including equations with coefficients represented by letters. • Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. • Solve rational equations. • Factor a quadratic expression to reveal the zeros of the function it defines. • Solve quadratic equations by inspection (e.g., for *x*2 = 49), taking square roots, completing the square, the quadratic formula and factoring, 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*. • Calculate side lengths or angle measures in a right triangle use trigonometric ratios.

Assessments:	• Formative Review Assessment • Formative Assessments (Equations, right triangles, etc.)
Teacher Resources:	Textbook Resources R14 Implementation Guide

Unit Title	*Functions*	**Length of Unit**	4-5 weeks

Inquiry Questions **(Engaging & Debatable)**	• What is a function and what are the different ways they can be represented? • What are domain and range? • How are functions used in the real world? • How can I use the graph of an equation to better understand the function? • What are the key characteristics of a graph and why are they important? • Why is it important to understand the basic characteristics of the library of common functions (tool kit)?
Standards	**Interpreting Functions:** F-IF 1, F-IF 2, F-IF 4, F-IF 5, F-IF 7, F-IF 9, IF.B.4, **Interpreting Functions:** HSF.IF.B.6, HSF.IF.C.7, **Building Functions:** F-BF 1, F-BF 3, S-ID 6
Unit Strands & Concepts	• What is a Function? • Function Notation and Evaluation of Functions • Domain of a Function • Piecewise Functions • Transformations of Functions • Modeling with Functions
Key Vocabulary	Function, Input, Output, Independent Variable, Dependent Variable, Domain, Range, f(x), Vertical Line Test, Piecewise Function, Parent Function, Transformation, Vertical Shift, Horizontal Shift, Vertical Stretch, Vertical Reflection, Horizontal Reflection

Unit Title	*Functions*	Length of Unit	4-5 weeks

Critical Content: My students will Know…	Key Skills: My students will be able to (Do)…
• A function is a specific type of relation in which each element in the domain is paired with a unique element of the range. Functions can be represented verbally, numerically, graphically, and algebraically. • The terms domain, input and independent can be used interchangeably. • The terms range, output and dependent variable can be used interchangeably. • An independent variable is the controlling factor of the function. • The dependent variable changes based on the value of the independent variable. • Functions can model many important phenomena • Every function creates a unique graph. Graphs are used to illustrate solutions and solve problems. • Key characteristics such as zeros, extrema, increasing, decreasing, symmetry, and end behavior are important because they describe the behavior of the outputs. • Having an understanding of the basic characteristics of a variety of functions facilitates the solving of complex problems.	• Determine if a relationship is a function. • Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. • 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. • Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. • Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Graph linear and quadratic functions and show intercepts, maxima, and minima. • Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. • Write a function that describes a relationship between two quantities. • Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative) and find the value of k given the graphs.

Assessments:	• Formative Assessment • Summative Assessment
Teacher Resources:	• Textbook Resources • R14 Implementation Guide

Unit Title	*Operations on Functions*	**Length of Unit**	3-4 weeks

Inquiry Questions **(Engaging & Debatable)**	• What are the different ways functions can be combined? • How does composing functions affect the domain? • What is the relationship between a function and its inverse?
Standards	**Building Functions:** F-BF 1, F-BF 4
Unit Strands & Concepts	• One-to-one Functions • Inverse Functions • Evaluating Inverse Functions • Graphs of Inverse Functions • Verifying Inverse Functions • Adding, Subtracting, Multiplying, and Composition of Functions
Key Vocabulary	One-to-one, Inverse, Domain, Restricted Domain, Composition, interchanges, Functions, Non-Invertible, graphically, composition

Unit Title	*Operations on Functions*	Length of Unit	3-4 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• Arithmetic operations (addition, subtraction, multiplication, composition) can be performed on functions. • When composing functions the restrictions on the domain of each original function must be considered in determining the domain of the composite function. • Every function has an inverse and that inverse is not necessarily a function, which is graphically represented by its reflection over the y = x line. • An inverse relation interchanges the domain and range of the original function, and therefore "undoes" the original function.	• Combine standard function types using arithmetic operations. • Compose functions. • Find inverse functions. • Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. • Verify by composition that one function is the inverse of another. • Read values of an inverse function from a graph or a table, given that the function has an inverse. • Produce an invertible function from a non-invertible function by restricting the domain.

Assessments:	• Formative Assessment • Summative Assessment
Teacher Resources:	R14 Implementation Guide

Unit Title	*Polynomials*	**Length of Unit**	2-3 weeks

Inquiry Questions **(Engaging & Debatable)**	● 1. How do the characteristics of a quadratic equation affect its graphical representation? ● 2. How are quadratic functions used to model situations that occur in the real world? ● 3. What are the key characteristics of a graph of a polynomial and why are they important? ● 4. Why are there different methods of determining zeros and when is it appropriate to use each method?
Standards	N-CN 1, N-CN 2, N-CN 7, N-CN 9, **Seeing Structure in Expressions:** A-SSE 1, A-SSE 3, A-APR 1, A-APR 3, A-REI 4, **Interpreting Functions:** F-IF 7, F-IF 8, F-IF 9,
Unit Strands & Concepts	• Types of Polynomials • Forms of a Quadratic • End Behavior of Polynomials • Zeros of Polynomials • Long Division of Polynomials • Synthetic Division • Graphs of Polynomials • Modeling with Polynomials
Key Vocabulary	Polynomial, Constant, Linear, Quadratic, Cubic, Quartic, End Behavior, Zero, Root, Long Division, Synthetic Division

Unit Title	*Polynomials*	Length of Unit	2-3 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The quadratic equation represents the graph of a parabola. The characteristics of a quadratic equation determine the size and direction of the parabola. • Quadratic functions model real-world data that is parabolic in nature. • Key characteristics such as continuity, zeros, multiplicity of zeros, and end behavior are important because they describe the behavior of the outputs. These characteristics can be used to sketch a graph of the polynomial. • Multiple methods (factoring, long division, synthetic division, graphing) are necessary because certain methods will only work for specific polynomials.	• Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. • Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions and derive the quadratic formula from this form. • Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. • Know the Fundamental Theorem of Algebra and show that it is true for quadratic polynomials. • Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. • 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. • Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. • Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. • Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

Assessments:	• Formative Assessments • Summative Assessment
Teacher Resources:	Textbook Resources R14 Implementation Guide

Unit Title	*Rational Functions*	Length of Unit	2-3 weeks

Inquiry Questions **(Engaging & Debatable)**	● 1. Why do asymptotes or holes occur in the graphs of rational functions? ● 2. Why is it important to find as much information as possible about the graph of the function from its equation?
Standards	**Interpreting Functions:** F-IF 7, F-IF 9,
Unit Strands & Concepts	• Intercepts of a Rational Equation • Asymptotes of a Rational Equation • Hole of a Rational Equation • End Behavior of a Rational Equation
Key Vocabulary	Rational Equation, Hyperbola, X-Intercept, Y-Intercept, Vertical Asymptote, Hole, End Behavior, Horizontal Asymptote

Unit Title	*Rational Functions*	**Length of Unit**	2-3 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The domain restrictions and the end behavior define the asymptotes in the graph. • Holes occur when the numerator and denominator have a common linear factor. • The asymptotes, intercepts, and domain are used to create the graph of the rational function.	• Determine analytically where a rational equation has intercepts. • Determine analytically where a rational equation has holes. • Determine analytically where a rational equation has vertical asymptotes. • Determine analytically the end behavior and horizontal asymptotes of a rational function. • Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.

Assessments:	● Formative Assessment on finding asymptotes. ● Project – Students are randomly assigned a rational function. Students find all necessary information and graph the function. Projects will be assessed using department rubric.
Teacher Resources:	Textbook Resources R14 Implementation Guide

Unit Title	*Exponential and Logarithmic Functions*	Length of Unit	4-5 weeks

Inquiry Questions **(Engaging & Debatable)**	• How can exponential functions be used to model growth and decay? • How are the exponential and logarithmic functions related to each other? • How do transformations affect the graphs of exponential and logarithmic functions? • How are exponential and logarithmic functions used to model real-world problems? • What is the purpose of logarithms and how are the properties of logarithms used?
Standards	**Seeing Structure in Expressions:** A-SSE 3, **Interpreting Functions:** F-IF 7, F-IF 8, F-IF 9, **Building Functions:** F-BF 1, F-BF 5, **Linear, Quadratic, & Exponential Models:** F-LE 1, F-LE 2, F-LE 3, F-LE 4, F-LE 5, **Interpreting Categorical & Quantitative Data** S-ID 6
Unit Strands & Concepts	• Graphing Exponential Functions • Graphing Logarithmic Functions • Rewriting Exponential Expressions with Exponent Rules • Rewriting Logarithmic Expressions with Logarithmic Rules • Solving Exponential Equations • Solving Logarithmic Equations • Modeling Exponential Growth and Decay Problems
Key Vocabulary	Exponential Function, Logarithmic Function, Asymptote, Intercept, Exponent Rules, Logarithmic Rules, Exponential Growth, Exponential Decay, Growth/Decay Rate, Growth/Decay Factor, Continuous Growth

Unit Title	*Exponential and Logarithmic Functions*	Length of Unit	4-5 weeks

Critical Content: My students will **Know…**	**Key Skills:** My students will be able to **(Do)…**
• Exponential functions model situations which grow or decline at a constant percent rate. • Exponential and logarithmic equations are inverses of one another. • The same transformations that apply to the graphs of common functions can be applied to the graphs of exponential and logarithmic functions. • Many phenomena such as population growth, cooling and heating systems, compound and continuous interest, and the Richter scale are modeled by exponential and logarithmic functions. • Logarithms can be used to solve equations for which no other algebraic method exists. • Properties of logarithms are used to rewrite logarithmic expressions into a different form to aid in solving equations.	• Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. • Use the properties of exponents to transform expressions for exponential functions. • Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. • Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. • Use the properties of exponents to interpret expressions for exponential functions. • Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. • Distinguish between situations that can be modeled with linear functions and with exponential functions. • Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. • Construct exponential functions given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). • Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. • For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e and evaluate the logarithm using technology. • Interpret the parameters in a linear or exponential function in terms of a context.

Assessments:	● Formative Assessments (School Wide Rubric ● Summative Assessment
Teacher Resources:	R14 Implementation Guide

Unit Title	*Trigonometric Functions*	Length of Unit	3-4 weeks

Inquiry Questions **(Engaging & Debatable)**	• Why are the unit circle and radian measure necessary? • How is the unit circle utilized in determining the values of the trigonometric functions? • Why are reference angles necessary?
Standards	**Trigonometric Functions:** F-TF 1, F-TF 2, F-TF 3, F-TF 4, **Similarity, Right Triangles, & Trigonometry:** G-SRT 7
Unit Strands & Concepts	• Converting from Radians to Degrees and Vice Versa • Complements and Supplements of Angles • Six Trigonometric Functions • Evaluating Trigonometric Functions • Modeling with Trigonometry
Key Vocabulary	Radian, Degree, Coterminal Angles, Complement, Supplement, Sine, Cosine, Tangent, Secant, Cosecant, Cotangent, Reference Angle

Unit Title	*Trigonometric Functions*	**Length of Unit**	3-4 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The unit circle relates the radian measure to the degree measure of an angle. Degree measure gives only a bearing while radian measure also incorporates distance. • The unit circle enables one to evaluate the sine, cosine, and tangent functions by relating the x and y coordinates to the trigonometric ratios. • Reference angles are acute angles that allow us to evaluate trigonometric functions of any angle.	• Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle. • 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. • Use special triangles to determine geometrically the values of sine, cosine, tangent for $\pi/3$, $\pi/4$ and $\pi/6$, and use the unit circle to express the values of sine, cosine, and tangent for $\pi - x$, $\pi + x$, and $2\pi - x$ in terms of their values for x, where x is any real number. • Explain and use the relationship between the sine and cosine of complementary angles. • Evaluate Trigonometric Functions. • Solve real world problems involving modeling of situations with right triangles.

Assessments:	• Formative Assessment on Radians, Degrees and Unit Circles • Summative Assessment
Teacher Resources:	• Textbook Resources • R14 Implementation Guide

Unit Title	*Graphing Trigonometric Functions*	**Length of Unit**	3-4 weeks

Inquiry Questions **(Engaging & Debatable)**	• What are the unique characteristics of the graphs of trigonometric functions? • What is the relationship between sine and cosine functions and their graphs? • How do trigonometric functions model authentic situations? • Why is it important to restrict the domain of a trigonometric function when determining its inverse? • Why are inverse trigonometric functions needed?
Standards	**Interpreting Functions:** F-IF 9, **Building Functions:** F-BF 1, **Trigonometric Functions:** F-TF 5, F-TF 6, F-TF 7
Unit Strands & Concepts	• Graphing Trigonometric Functions • Writing Equations of Trigonometric Functions from Graphs • Evaluating Inverse Trigonometric Expressions • Modeling with Trigonometric Functions
Key Vocabulary	Sine, Cosine, Tangent, Secant, Cosecant, Cotangent, Sinusoidal, Inverse Trigonometric Function

Unit Title	*Graphing Trigonometric Functions*	Length of Unit	3-4 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• Trigonometric functions are periodic, have restrictions with their domain or range, and have inverses that are not functions. • The graph of a sine function can easily be converted into a cosine function (and vice versa) by a horizontal shift (phase shift). • Trigonometric functions model data or situations that are periodic in nature. • The domain of a trigonometric function is restricted in order to create a function that is one-to-one so that the inverse is also a function. • Inverse trigonometric functions allow us to algebraically solve trigonometric equations.	• Graph Trigonometric Functions • Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline. • Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. • Evaluate Inverse Functions • 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.

Assessments:	• Formative Assessments (Inverse Trigonometric Functions, Sinusoidal Inverse Trigonometric Functions, and Graphing Sine and Cosine • Performance Based Assessment – Students will complete a series of open-ended questions focused on collecting data which is trigonometric in nature and finding an equation to model the data. Students will be assessed using a department rubric.
Teacher Resources:	Textbook Resources R14 Implementation Guide

Unit Title	*Trigonometric Identities*	Length of Unit	2-3 weeks

Inquiry Questions **(Engaging & Debatable)**	• 1. What is the difference between solving an equation and verifying a trigonometric identity? • 2. How do you decide which strategies to use when verifying a trigonometric identity? • 3. How are trigonometric identities used in the process of solving trig equations?
Unit Strands & Standards	**Trigonometric Functions:** F-TF 8, F-TF 9,
Concepts	Pythagorean Identity Proving Trigonometric Identities Solving Trigonometric Equations Trigonometric Formulas
Vocabulary	Sine, Cosine, Tangent, Secant, Cosecant, Cotangent, Sum Formula, Difference Formula, Double Angle Formula, Half Angle Formulas

Unit Title	*Trigonometric Identities*	**Length of Unit**	2-3 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• Solving an equation gives the value of the variable. Verifying a trigonometric identity requires proving that the identity holds true for all values of the variable for which it is defined. • Multiple strategies can be used to verify identities however some will be more efficient than others. • Using identities to replace an expression with an equivalent expression allows us to solve trigonometric equations that otherwise could not be solved algebraically.	• Prove the Pythagorean identity sin2(θ) + cos2(θ) = 1 and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle. • Prove equivalence through the use of Trigonometric Identities • Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. • Solve equations with Trigonometric Functions

Assessments:	• Formative Assessment on solving Trigonometric Equations and Trigonometric Identities • Summative Assessment
Teacher Resources:	Textbook Resources R14 Implementation Guide

Unit Title	*Applications involving Right Triangles*	**Length of Unit**	4-5 weeks

Inquiry Questions **(Engaging & Debatable)**	• How are trigonometric ratios used in solving real-world problems? • How do you determine whether the law of sines or law of cosines is most appropriate for solving a particular problem? • Is it possible to solve for the area of a triangle if the altitude is not known?
Standards	**Similarity, Right Triangles, & Trigonometry:** G-SRT 7, G-SRT 8, G-SRT 9, G-SRT 10, G-SRT 11
Unit Strands & Concepts	• Law of Sines • Law of Cosines • Solving Triangles • Area of a Triangle using Trigonometry • Modeling with the Law of Sines/Cosines
Key Vocabulary	Law of Sines, Law of Cosines, Opposite Side, Opposite Angle, Ambiguous Case

Unit Title	*Applications involving Right Triangles*	**Length of Unit**	4-5 weeks

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• In situations that can be modeled with right triangles, trigonometric ratios are used to find missing lengths or angles. • In a non-right triangle the given information determines which law is most appropriate to solve a problem. • Specific information must be known in order to solve for the area of a triangle.	• Explain and use the relationship between the sine and cosine of complementary angles. • Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. • Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. • Prove the Laws of Sines and Cosines and use them to solve problems. • Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Assessments:	● Formative Assessment on Solving Trigonometric Equations and the Law of Sine ● Performance Based Assessment - Students will use right triangles or law of sin/cos to solve real world problems. Projects will be scored using department rubric.
Teacher Resources:	Textbook Resources R14 Implementation Guide