Pre-Calculus & Trigonometry Scope and Sequence

Domain	Quarter 1	Quarter 2	Quarter 3	Quarter 4
	46 Days	**42 Days**	**46 Days**	**47 Days**
	Content	Content	Content	Content
INTERPRETING FUNCTIONS **F.IF Understand the concept of a function, and use function notation.** **TRIGONOMETRIC FUNCTIONS F.TF BUILDING FUNCTIONS F.BF** **EXPRESSING GEOMETRIC PROPERTIES WITH EQUATIONS G.GPE** **ARITHMETIC WITH POLYNOMIALS AND RATIONAL EXPRESSIONS A.APR**	**F.BF.3** 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. **F.BF. 4.** Find inverse functions. a. 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. For example, f(x) =2 x3 or f(x) = (x+1)/(x–1) for x ≠ 1. b. (+) Verify by composition that one function is the inverse of another. c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the	**F.TF.3** (+) 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 π–x, π+x, and 2π–x in terms of their values for x, where x is any real number. **F.TF.4** (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **F.TF.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ **F.TF.6** (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. **F.TF.7** (+) Use inverse functions to solve	**A.APR.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.1 **A.SSE.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. For example, calculate mortgage payments.★ **N.VM.1.** (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., v, |v|, ||v||, v).	**G.GPE.1**. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation. **G.GPE.2**. Derive the equation of a parabola given a focus and directrix. **G.GPE.3** (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. **F.IF.6.** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★ Instantaneous rates of change (derivatives) are beyond the scope of the Common Work with estimating area under a curve is considered college

SEEING STRUCTURE IN EXPRESSIONS A.SSE **VECTOR AND MATRIX QUANTITIES N.VM** **THE COMPLEX NUMBER SYSTEM N.CN**	domain. 5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **F.BF.5** (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents. **F.LE.4** 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 **G.SRT.9** (+) 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. **G.SRT.10** (+) Prove the Laws of Sines and Cosines and use them to solve problems. **G.SRT.11** (+) 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	trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.★ **F.TF.8** 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. **F.TF.9** (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. **F.IF.7d** (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. **A.APR.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,	N.VM.2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point. N.VM.3. (+) Solve problems involving velocity and other quantities that can be represented by vectors. N.VM.4. (+) Add and subtract vectors. a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes. b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum. c. Understand vector subtraction v − w as v + (−w), where −w is the additive inverse of w, with the same magnitude as w and pointing in the opposite direction. Represent vector subtraction graphically	level work and is beyond the scope of the Common Core Standards.

	forces). **F.TF.1** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle **F.TF.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. **F.IF.4** 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 F.BF.3 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	subtract, multiply, and divide rational expressions. **F.TF.4** (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions. **F.TF.5** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★ **F.TF.6** (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed. **F.TF.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. ★	by connecting the tips in the appropriate order, and perform vector subtraction component-wise. N.VM.5. (+) Multiply a vector by a scalar. a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as c(vx, vy) = (cvx, cvy). b. Compute the magnitude of a scalar multiple cv using $\|cv\| = |c|v$. Compute the direction of cv knowing that when $|c|v \neq 0$, the direction of cv is either along v (for c > 0) or against v (for c < 0). N.CN.4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.	

| | | N.CN.5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + \sqrt{3}\,i)3 = 8$ because $(-1 + \sqrt{3}\,i)$ has modulus 2 and argument 120°. | |

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.

F.BF.4 Find inverse functions.
 a.   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. For example, $f(x) = 2 x3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$.
 b.   (+) Verify by composition that one function is the inverse of another.
 c.   (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
 d.   (+) Produce an invertible function from a non-invertible function by restricting the domain.

F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

F.LE.4 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			
Resources	**CPM (College Preparatory Math)** **ODE Model Curriculum** GAISE model framework Kahn Academy	**CPM (College Preparatory Math)** **ODE Model Curriculum** GAISE model framework Kahn Academy	**CPM (College Preparatory Math)** **ODE Model Curriculum** GAISE model framework Kahn Academy	**CPM (College Preparatory Math)** **ODE Model Curriculum** GAISE model framework Kahn Academy
Notes:	**Mathematical Practices** **1.** Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.			