Chapter 1: Analyzing Trigonometric Functions   **Suggested Time frame: 21 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
F-IF.2 Use function notation, evaluate functions, and interpret statements that use function notation in context **F-IF.4** For a function that models a relationship between two quantities, interpret graphs and tables in terms of the quantities and sketch graphs showing key features **F-IF.5** Relate the domain of a function to its graph **F-IF.7** Graph functions expressed symbolically and show key features of the graph **F-IF.7e** Graph exponential, logarithmic and trigonometric functions showing key attributes **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 x, $\pi + x$, and $2\pi - x$ in terms of their values for x **MP-1** Make sense of problems and persevere in solving them (tinkering, trying ideas and refining guesses) **MP-7** Look for and make use of structure (reducing problems to simpler ones) **MP-8** Look for and express regularity in repeated reasoning (generalizing repeated calculations)	**Analyzing Trigonometric Functions** ● The Cosine and Sine Functions ● Other Trigonometric Functions ● Sinusoidal Functions and Their Graphs Unit vocabulary and notation: CME p. 3	Students will be able to: ● Understand the relationship between degree and radian measure as the length of an arc on the unit circle subtended by a central angle ● Relate the motion of an object around a circle to the graphs of the cosine and sine functions ● Solve equations involving cosine and sine ● Estimate the slope of graphs of cosine and sine functions at a given point ● Understand relationships between tangent function and unit circle ● Sketch and describe graph of tangent function ● Define inverse of cosine, sine and tangent ● Recognize secant, cosecant and cotangent functions ● Make sense of sinusoidal functions ● Model with sinusoidal functions	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments

Chapter 2: Complex Numbers and Trigonometry   **Suggested Time frame: 20 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
N-CN.1 Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ **N-CN.2** Operate on complex numbers **N-CN.3** Find the conjugate of a complex numbers; use conjugates to find moduli and quotients **N-CN.4** Represent complex numbers on the complex plane in rectangular and polar form **N-CN.5** Represent addition, subtraction, multiplication and conjugation of complex numbers geometrically **N-CN.7** Solve quadratic equations with real coefficients that have complex solutions. **N.CN.8+** Extend polynomial identities to the complex numbers **MP-2** Reason abstractly and quantitatively (multiple representation of functions) **MP-4** Model with mathematics (functions and function-modeling language) **MP-8** Express regularity in repeated reasoning (describe patterns explicitly, explain inconsistencies)	**Complex Numbers and Trigonometry** ● Graphing Complex Numbers ● Trigonometric Identities ● De Moivre's Theorem Unit vocabulary and notation: CME p. 83	Students will be able to: ● Determine magnitude and argument of complex numbers ● Represent complex numbers using rectangular and polar coordinates ● Decide when to use each representation of complex numbers ● Show the basic addition rules for cosine and sine using Multiplication Law for complex numbers ● Test trig equations to predict whether they are identities ● Use Pythagorean identities and algebra to prove a trig equation is an identity ● Calculate powers of complex numbers using De Moivre's Theorem ● Understand the geometry of roots of unity, and connection to roots of equations of the form $x^2-1=0$ ● Find exact algebraic expressions for certain trigonometric values ● Apply roots of unity	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments

Chapter 3: Analysis of Functions   **Suggested Time frame: 21 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources

A-SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression
A-CED.2 Create equations in two or more variables to represent relationships between quantities
A-REI.11 Explain why the x-coordinates of the points of the graphs of the equations $y=f(x)$ and $y=g(x)$ intersect are the solutions of equation $f(x)=g(x)$
F-IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables
F-IF.7 Graph functions expressed symbolically and show key features of the graph
F-IF.7e Graph exponential, logarithmic and trigonometric functions, showing key attributes
 	
MP-3 Construct arguments and critique the reasoning of others (deductive reasoning)
MP-7 Look for and make use of structure (operations as transformations)
MP-8 Look for and express regularity in repeated reasoning (complex numbers as *extension* of real numbers)
	Analysis of Functions
	
	● Polynomial Functions
	
	● Rational Functions
	
	● Exponential and Logarithmic Functions
	
	   Unit vocabulary and notation:
	     CME p. 165
		Students will be able to:
		
		● State the Change of Sign Theorem and the Intermediate Value Theorem for Polynomials and use them to analyze graphs of polynomial functions
		● Find the equation of a line secant to a polynomial function and the average rate of change of a function between two points
		● Write the Taylor expansion for a polynomial function about a point
		● Find the equation of the tangent to a polynomial curve at a point
		● Sketch the graph of a rational function w/ asymptotes and holes
		● Evaluate limits of rational expressions
		● Find the equation of the tangent to the graph of a rational function at a point
		● Use matrices to write linear fractional transformations of the function $f(x)=1/x$
		● State and use the limit definitions of e and e^x
		● State and use the factorial definitions of e and e^x
		● Use the inverse relationship between e^x and In x to solve equations
			Summative assessments:
			● Chapter Assessment
			● Common Mid-year & Final Exams
			● Regular (weekly) assessments/quizzes
			● Performance tasks (semester/quarter)
			
			Formative assessments:
			● Do Now
			● Presentation of student work
			● Student notebooks
			● Facilitated student discourse
			● Questioning (T>S, S>S) of randomly called students
			● Open Response questions, writing prompts
			● Probing for multiple representations
			● Peer assessment
			● Student-developed problems and solutions
			● Exit ticket/poll question
				CME Precalculus Text
				
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				Common Core Standards of Mathematical Practice
				
				Illustrative Mathematics Project
				
				Common Core Standards of Mathematical Practice
				
				Problem solving strategy: *Noticing* and *Wondering*
				
				For intervention and remediation: Khan Academy videos and assessments

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Chapter 4: Combinatorics   **Suggested Time frame: 17 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources

A-CED.2 Create equations in two or more variables to represent relationships between quantities
A-APR.5 Know and apply the Binomial Theorem for the expansion of $(x+y)^n$ in powers of x and y for positive integer n
S-CP.9 Use permutations and combinations to compute probabilities of compound events and solve problems
 	
MP-3 Construct viable arguments and critique the reasoning of others (logical reasoning)
MP-8 Look for and express regularity in repeated reasoning (extending substitution and elimination to Gaussian elimination)
MP-2 Reason abstractly and quantitatively (connecting real-world contexts to matrix calculations)
MP-4 Model with mathematics (using matrix calculations to model real-world contexts)
	Combinatorics
	
	● Learning to Count
	
	● Permutations and Combinations
	
	● Making Connections
	
	   Unit vocabulary and notation:
	     CME p. 275
		Students will be able to:
		
		● Recognize the kinds of problems you can solve using combinatorics
		● Develop their own strategies for systematic counting
		● Develop and use formulas for finding the number of permutations of n objects, taken k at a time
		● Develop and use formulas for finding the number of combinations of n objects, taken k at a time
		● Find the number of anagrams for a word
		● Explain why the coefficients of a binomial expansion are found in Pascal's Triangle
		● See the entries of Pascal's Triangle from a variety of perspectives
			Summative assessments:
			● Chapter Assessment
			● Common Mid-year & Final Exams
			● Regular (weekly) assessments/quizzes
			● Performance tasks (semester/quarter)
			
			Formative assessments:
			● Do Now
			● Presentation of student work
			● Student notebooks
			● Facilitated student discourse
			● Questioning (T>S, S>S) of randomly called students
			● Open Response questions, writing prompts
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				Problem solving strategy: *Noticing* and *Wondering*
				
				For intervention and remediation: Khan Academy videos and assessments

Chapter 5: Functions and Tables   **Suggested Time frame: 20 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
F-IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers **F-IF.8** Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function **F-BF.1** Write a function that describes a relationship between two quantities **F-BF.2** Write arithmetic and geometric sequences, both recursively and with an explicit formula; use them to model situations and solve problems **A-SSE.4** Derive the formula for the sum of a finite geometric series (when common ratio $\neq$ 1) and use the formula to solve problems **MP-3** Construct viable arguments and critique the reasoning of others (logical reasoning, conjectures) **MP-7** Look for and make use of structure (reducing problems to simpler ones) **MP-8** Look for and express regularity in repeated reasoning (generalizing repeated calculations)	**Functions and Tables:** ● A New Method of Proof ● Fitting Functions to Tables ● Closed-Form and Recursive Definitions Unit vocabulary and notation: CME p. 341	Students will be able to: ● Construct closed-form and recursive function definitions to fit a table ● Compare the efficiency of different recursive definitions that generate the same function ● Analyze multistep recursive definitions of functions ● Verify that a closed-form and recursive definition agree at the first few inputs in a domain ● Prove by induction that two function definitions agree for all inputs in an infinite domain ● Apply induction to geometric proofs ● Find a polynomial function that fits a difference table ● Explain how the up-and-over rule of difference tables relates to Pascal's Triangle ● Quickly find rules for summations, like the sum of the first n squares ● Find general classes of functions that fit a recurrence ● Relate a solution for a two-term recurrence to a quadratic polynomial ● Calculate the monthly payment for a car loan and write a general rule for similar problems	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments

Chapter 6: Analytic Geometry   **Suggested Time frame: 21 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
N-VM.1 Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments and use appropriate notation **N-VM.2** Find components of a vector by subtracting coordinates of an initial point from those 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 **N-VM.5** Multiply a vector by a scalar **G-GPE.1** Derive the equation of a parabola given a focus and directrix **G-GPE.4** Use coordinates to prove simple geometric theorems algebraically **G-GMD.4** Identify shapes of 2D cross-sections of 3D objects and 3D objects generated by rotations of 2D objects **MP-1** Make sense of problems and persevere in solving them (tinkering) **MP-7** Look for and make use of structure (reducing problems to simpler ones) **MP-8** Look for and express regularity in repeated reasoning (generalizing repeated calculations)	**Analytic Geometry:** ● Coordinate Geometry ● Conic Sections ● Vector Algebra and Geometry Unit vocabulary and notation: CME p. 439	Students will be able to: ● Sketch the graphs of equations in two variables ● Use distance and slope relationships to prove geometric results ● Evaluate and use the signed power of a point with respect to a circle ● Visualize each of the conic sections as the intersection of a plane with an infinite double cone ● Give a locus definition for each of the conic sections ● Identify the equations for the graphs of the conic sections, and sketch their graphs ● Interpret sums and scalar multiples of ordered pairs geometrically ● Express lines with vector equations and solve for intersections and other useful information using these equations ● Use convex and affine combinations to locate specific points, such as midpoint and trisection points of a line segment	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments

Chapter 7: Probability and Statistics   **Suggested Time frame: 25 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
S-ID.2 Use statistics appropriate to the shape of the distribution to compare center and spread of data sets **S-IC.2** Decide if a specified model is consistent with results from a given data-generating process **S-CP.3** Understand the conditional probability of A given B as $P(A$ and $B)/P(B)$ **S-CP.4** Construct and interpret 2-way frequency tables of data when two categories are associated with each object being classified **S-CP.5** Recognize and explain concepts of conditional probability and independence **S-CP.6** Find conditional probability of A given B as the fraction of B's outcomes that also belong to A **S-MD.5** Weigh possible outcomes of a decision by assigning probabilities to payoff values and finding expected values **MP-1** Make sense of problems and persevere in solving them (tinkering) **MP-7** Look for and make use of structure (reducing problems to simpler ones) **MP-8** Look for and express regularity in repeated reasoning (generalizing repeated calculations)	**Probability and Statistics** ● Probability and Polynomials ● Expectation and Variation ● The Normal Distribution Unit vocabulary and notation: CME p. 536	Students will be able to: ● Calculate probabilities of simple random events ● Build a set of equally likely outcomes for a probability experiment ● Find a polynomial to model a probability experiment and interpret expansions of its powers ● Calculate the expected value of a random variable ● Define conditional probability; use it to develop informal test for independence of 2 events ● Complete two-way tables probabilities ● Determine whether two events are independent in the context of a scientific experiment ● Calculate expected value, mean absolute deviation, variance & standard deviation ● Calculate statistics for compound events ● Calculate statistics for repeated experiments ● Identify Bernoulli trials and compute related statistics ● Write an equation for a normal distribution given mean and standard deviation ● Use appropriate normal distribution to find approximate probabilities ● Recognize biased and unbiased samples and sampling techniques	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments

Chapter 8: Ideas of Calculus   **Suggested Time frame: 16 days**

Standards	Concepts	Learning Outcomes	Assessment	Resources
Extends the following: **A-CED.3** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context **A-SSE.4** Derive the formula for the sum of a finite geometric series (when common ratio $\neq$ 1) and use the formula to solve problems **F-BF.5** Understand inverse relationship between exponents and logarithms and use relationship to solve problems involving logarithms and exponents **MP-1** Make sense of problems and persevere in solving them (tinkering) **MP-7** Look for and make use of structure (reducing problems to simpler ones) **MP-8** Look for and express regularity in repeated reasoning (generalizing repeated calculations)	**Ideas of Calculus** ● Finding Areas of Shapes ● Finding Areas Under Curves ● A Function Emerges Unit vocabulary and notation: CME p. 665	Students will be able to: ● Estimate areas of irregularly-shaped objects ● Estimate the area under the graph of $y=x$ for $0 \leq x \leq 1$ ● Calculate the area under the graph of $y=x$ for $0 \leq x \leq 1$ ● Calculate the area under the graph of $y=x^m$ for $0 \leq x \leq 1$ for any positive integer m ● Develop formulas for calculating $S[1,a](x^m)$ for any positive integer m ● Investigate the famously familiar function $\zeta(a)$ ● Find the area under the graph of $y=e^x$ for $0 \leq x \leq 1$	Summative assessments: ● Chapter Assessment ● Common Mid-year & Final Exams ● Regular (weekly) assessments/quizzes ● Performance tasks (semester/quarter) Formative assessments: ● Do Now ● Presentation of student work ● Student notebooks ● Facilitated student discourse ● Questioning (T>S, S>S) of randomly called students ● Open Response questions, writing prompts ● Probing for multiple representations ● Peer assessment ● Student-developed problems and solutions ● Exit ticket/poll question	CME Precalculus Text LHS Math Website (includes resources for planning, instruction and assessment): https://sites.google.com/site/lawrencehsmath/ CME Project website: http://cmeproject.edc.org Pearson Online text and resources: www.pearsonsuccessnet.com Common Core Standards of Mathematical Practice Illustrative Mathematics Project Common Core Standards of Mathematical Practice Problem solving strategy: *Noticing* and *Wondering* For intervention and remediation: Khan Academy videos and assessments