HN Pre-Calculus with Trigonometry

Unit:	**Linear Relations and Functions (Days 1-13)**						
Big Ideas:	Relations, Functions, Linear Equations						
Unit Essential Questions:	What is the difference between a relation and a function? What information can be obtained from the graph of linear functions?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
Course Introduction and Pre-Requisite Concepts (6 Days)	CC.2.1.HS.F.2 CC.2.2.HS.D.3 CC.2.2.HS.D.6 CC.2.2.HS.D.10			Solve one-variable equations and inequalities. Simplify and valuate expressions. Factor polynomials. Perform operations with polynomials. Perform operations with radicals. Graph linear equations. Write linear equations. Write equations of parallel and perpendicular lines.		Pre-requisites packet, calculators	Pre-requisites Packet Pre-requisites Test
1.1 – Relations and Functions (1 Day)	CC.2.2.HS.C.1 CC.2.2.HS.C.3	relation, domain, range, function notation	How can one determine if a relation is a function?	Determine whether a given relation is a function. Identify the domain and range of a relation or function. Evaluate functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 9-11 #4, 23, 29, 34, 36, 40, 42, 43, 44, 48, 49, 50*
1.2 – Composition of Functions (2 Days)	CC.2.2.HS.C.3	composition of functions	How does one find the composite of two functions?	Perform operations with functions. Find composite functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 17-18 #1, 11, 14, 16, 17, 20, 21, 22, 23, 24, 29, 31
1.7 – Piecewise Functions (2 Days)	CC.2.2.HS. C.2	piecewise function, step function, greatest integer function, absolute value function	How does one graph piecewise functions?	Identify and graph piecewise functions including greatest integer, step, and absolute value functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 48-49 #3, 11,12, 13, 14, 15, 16, 17, 19, 20, 23, 24 (for 23 & 24 only graph, do not write function)
3.8 – Direct, Inverse, and Joint Variation (1 Day)	CC.2.2.HS.D.10	direct variation, inverse variation, joint variation	How are direct, inverse, and joint variation used to solve problems?	Solve problems involving direct, inverse, and joint variation.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 194-196 #13, 15, 17, 19, 21, 23, 25, 27, 29, 33, 36, 39
Review and Evaluate (1 Day)							Chapter 1 Quiz

Unit:	Systems of Linear Equations and Inequalities (Days 14-28)						
Big Ideas:	Solve systems of equations and inequalities, use matrices to solve problems						
Unit Essential Questions:	How can equations be used to predict what will happen in real-life situations? What are matrices and how are they used to solve algebraic equations?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
2.1 – Solving Systems of Equations in Two Variables (1 Day)	CC.2.2.HS.D.10	systems of equations, solution	How does one determine what is the best method to use to solve a system of equations?	Solve systems of equations graphically. Solve systems of equations algebraically.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 70-72 #17, 19, 21, 24, 25, 31, 32, 34, 38
2.2 – Solving Systems of Equations in Three Variables (2 Days)	CC.2.2.HS.D.10		How does one solve a system of equations in three variables?	Solve systems of equations involving three variables algebraically.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 76-77 #9, 10, 11, 13, 17, 19
2.6 – Solving Systems of Linear Inequalities (2 Days)	CC.2.2.HS.D.10	polygonal convex set	How does one display the solution set to a system of inequalities?	Graph systems of inequalities. Find the maximum or minimum of a function defined for a polygonal convex set.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 109-111 #9, 10, 11, 12, 15, 17, 20, 21
2.7 – Linear Programming (2 Days)	CC.2.2.HS.D.9		How does one use linear programming to solve real-life applications?	Use linear programming to solve applications. Recognize situations where exactly one solution to a linear programming application may not exist.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 115-118 #9, 10, 11, 13, 15, 16, 18, 20
Review and Evaluate (1 Day)							Chapter 2 Quiz
2.3 – Modeling Real-World Data with Matrices (1 Day)	CC.2.2.HS.D.10	matrix, square matrix, row matrix, column matrix	What are matrices and how does one perform operations with them?	Model data using matrices. Add, subtract, and multiply matrices.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 82-86 #17, 20, 25, 27, 29, 31, 33, 39, 41, 43, 45, 50
2.4 – Modeling Motion with Matrices (2 Days)	CC.2.2.HS.C.4	reflection, translation, dilation	How is motion modeled using matrices?	Use matrices to determine the coordinates of polygons under a given transformation.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 92-96 #11, 14, 16, 17, 19, 20, 21, 22, 23, 24, 26, 31
Determinants and Multiplicative Inverses of Matrices (2 Days)	CC.2.2.HS.D.2	determinant, identity matrix, inverse matrix	How can matrices be used to solve systems of equations?	Evaluate determinants. Find inverses of matrices. Solve systems of equations by using inverses of matrices.	matrices in the graphing calculator	Advanced Mathematical Concepts Textbook, calculators, notes	p. 102-105 #17, 19, 21, 22, 23, 27, 29, 31, 35, 36, 37, 39
Review and Evaluate (2 Days)							Chapter 2 Multiple Choice Test Chapter 2 Free Response Test

Unit:	The Nature of Graphs (Days 29-48)						
Big Ideas:	Identify transformations of simple graphs, graph non-linear equations						
Unit Essential Questions:	What causes parent graphs to be dilated, translated, and reflected? What do the graphs of non-linear equations look like?						
Concept & Pacing	**Pa Core Standard**	**Key Vocabulary**	**Essential Questions**	**Competencies (skills, knowledge, abilities)**	**Mini-Lessons/ Activities**	**Instructional Materials**	**Assessments**
3.1 – Symmetry and Coordinate Graphs (2 Days)	CC.2.2.HS.C.2	point symmetry, line symmetry, even function, odd function	How can symmetry be used to graph relations and functions?	Use algebraic tests to determine whether the graph of a relation is symmetrical. Classify functions as even or odd.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 134-136 #15, 17, 19, 21, 23, 25, 27, 28, 29, 30, 33, 35
3.2 – Families of Graphs (4 Days)	CC.2.2.HS.C.4	parent graph, reflections, translations, dialations	How can parent graphs and transformations be used to graph functions?	Identify transformations of simple graphs. Sketch graphs of related functions.	Children of =) activity Transformations project	Advanced Mathematical Concepts Textbook, calculators, notes, silly putty, Transformations project packet	p. 142-145 #1, 5, 15, 17, 19, 21, 23, 25, 27, 31, 32, 33
3.3 – Graphs of Non-Linear Inequalities (1 Day)	CC.2.2.HS.C.4		How does one graph nonlinear inequalities?	Graph polynomial, absolute value, and radical inequalities in two variables. Solve absolute value inequalities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 149-151 #13, 15, 17, 21, 23, 25, 29, 31, 33, 35, 37, 39
3.4 – Inverse Functions and Relations (2 Days)	CC.2.2.HS.C.4	inverse relations, horizontal line test, inverse functions	How does one determine the inverse of a function?	Determine inverses of relations and functions. Graph functions and their inverses.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 156-158 #15, 17, 21, 23, 25, 27, 29, 31, 33, 39, 40, 45
Review and Evaluate (1 Day)							Chapter 3 Quiz
3.5 – Continuity and End Behavior (2 Days)	CC.2.2.HS.C.2	discontinuous function, continuous, continuity on an interval, end behavior, increasing, decreasing, and constant functions	How can one prove that a function is continuous or discontinuous at a point? What factors determine the end behavior of a function?	Determine whether a function is continuous or discontinuous. Identify the end behavior of functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 165-168 #1, 3, 13, 15, 16, 17, 19, 20, 21, 22 23, 25
3.6 – Critical Points and Extrema (2 Days)	CC.2.2.HS.C.6	critical points, maximum, minimum, point of inflection, absolute extrema, relative extrema	What are critical points and how are they used to determine the shape of a graph?	Determine whether a function is increasing or decreasing on an interval. Find the extrema of a function.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 166 #26, 27, 28, 30 p. 176-179 #3, 13, 14, 16, 19, 23, 29, 31
3.7 – Graphs of Rational Functions (2 Days)	CC.2.2.HS.D.6 CC.2.2.HS.C.7	rational function, vertical asymptote, horizontal asymptote, slant asymptote	What are asymptotes and how are they used to graph rational functions?	Graph rational functions. Determine vertical, horizontal, and slant asymptotes.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 185-188 #1, 15, 17, 19, 21, 25, 27, 32, 33, 35, 37, 39
15.1 – Limits (2 Days)	CC.2.2.HS.C.2	limit	What is a limit and how can limits be determined from a graph or an equation?	Calculate limits of polynomial and rational functions algebraically.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 946-948 #12, 13, 14, 15, 16, 19, 21, 23, 25, 27, 29, 33
Review and Evaluate (2 Days)							Chapter 3 Multiple Choice Test Chapter 3 Free Response Test

Unit:	Polynomial and Rational Functions (Days 49-65)						
Big Ideas:	Solve polynomial, rational, and radical equations and inequalities						
Unit Essential Questions:	How do the roots of an equation indicate what the graph will look like? What methods can be used to solve polynomial, rational, and radical equations?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
4.1 – Polynomial Functions (2 Days)	CC.2.2.HS.D.4	degree, leading coefficient, zeros, roots, complex numbers, imaginary numbers, fundamental theorem of algebra	How does one determine the roots of polynomial equations?	Determine roots of polynomial equations. Apply the Fundamental Theorem of Algebra.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 210-212 #17, 25, 27, 31, 33, 35, 37, 41, 43, 45, 49, 54
4.2 – Quadratic Equations (2 Days)	CC.2.2.HS.D.5	quadratic formula, complete the square	What methods can be used to solve quadratic equations?	Solve quadratic equations. Use the discriminant to describe the roots of quadratic equations.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 219-221 #13, 15, 16, 17, 19, 21, 23, 25, 27, 29, 31, 37
4.3 – The Remainder and Factor Theorem (1 Day)	CC.2.2.HS.D.4	Remainder theorem, Factor theorem, synthetic division, depressed polynomial	What is synthetic division and how can it be used to solve problems?	Find the factors of polynomials using the Remainder and Factor Theorems.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 226-228 #15, 17, 19, 21, 23, 25, 29, 31, 33, 37, 39, 44
4.4 – The Rational Root Theorem (2 Days)	CC.2.2.HS.D.4	Rational Root theorem, Integral Root theorem, Descartes rule of signs	How does one determine possible rational roots of a polynomial equation?	Identify all possible rational roots of a polynomial equation by using the Rational Root Theorem. Determine the number of positive and negative real roots a polynomial function has.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 233-235 #11, 13, 14, 15, 17, 18, 19, 20, 21, 23, 25, 27
Review and Evaluate (1 Day)							Chapter 4 Quiz
4.5 – Locating Zeros of a Polynomial Function (2 Days)	CC.2.2.HS.D.4	location principle, upper bound theorem, lower bound theorem	What methods can be used to approximate the zeros of a polynomial function?	Approximate the real zeros of a polynomial function.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 240-242 #13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 32, 33
4.6 – Rational Equations and Partial Fractions (2 Days)	CC.2.2.HS.D.6	partial fractions	How does one solve an equation involving algebraic fractions?	Solve rational equations and inequalities. Decompose a fraction into partial fractions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 247-250 #13, 15, 17, 21, 23, 24, 25, 27, 29, 31, 33, 35
4.7 – Radical Equations and Inequalities (1 Day)	CC.2.2.HS.D.8		How does one solve an equation involving radicals?	Solve radical equations and inequalities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 255-257 #13, 15, 17, 19, 21, 23, 27, 31, 33, 35, 37, 38
4.8 – Modeling Real-World Data with Polynomial Functions (2 Days)	CC.2.2.HS.D.7		How can technology be used to find equations of polynomial functions to model real-world data?	Write polynomial functions to model real-world data. Use polynomial functions to interpret real-world data.	Scatter plots in the graphing calculator	Advanced Mathematical Concepts Textbook, calculators, notes	p. 262-264 #8, 9, 10, 11, 13, 14, 15, 16, 17, 19, 22, 23
Review and Evaluate (2 Days)							Chapter 4 Multiple Choice Test Chapter 4 Free Response Test

Unit:	Conics (Days 66-79)
Big Ideas:	Graph and write equations of conic sections, solve systems of second degree equations and inequalities
Unit Essential Questions:	What are conic sections? How are conic sections graphed?

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
10.2 – Circles (2 Days)	CC.2.3.HS.A.10	Circle, center, radius	What is the standard form of the equation of a circle and how can it be used to graph a circle?	Use and determine the standard and general forms of the equation of a circle.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 627-630 #15, 16, 19, 23, 25, 28, 29, 43
10.3 – Ellipses (2 Days)	CC.2.3.HS.A.10	Ellipse, foci, major axis, minor axis, vertices	What is the standard form of the equation of an ellipse and how can it be used to graph an ellipse?	Use and determine the standard and general forms of the equation of an ellipse. Graph ellipses.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 638-641 #17, 19, 21, 22, 23, 24, 26, 49
10.4 – Hyperbolas (1 Day)	CC.2.3.HS.A.10	Hyperbola, asymptotes	What is the standard form of the equation of a hyperbola and how can it be used to graph a hyperbola?	Use and determine the standard and general forms of the equation of a hyperbola. Graph hyperbolas.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 650-652 #17, 18, 19, 21, 25, 26
Review and Evaluate (1 Day)							Chapter 10 Quiz
10.5 Parabolas (1 Day)	CC.2.3.HS.A.10	Parabola, directrix	What is the standard form of the equation of a parabola and how can it be used to graph a parabola?	Use and determine the standard and general forms of the equation of a parabola. Graph parabolas.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 658-661 #12, 14, 15, 17, 19, 21
10.6 – Rectangular Forms of Conic Sections (2 Days)	CC.2.3.HS.A.10		How can one determine what type of conic section is represented by a second degree equation when it is in general form?	Recognize conic sections in their rectangular form by their equations.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 667-669 #13, 14, 16, 18, 19, 20, 23, 46
10.8 – Systems of Second Degree Equations and Inequalities (3 Days)	CC.2.2.HS.D.10		How does one solve a system of second degree equations or inequalities?	Graph and solve systems of second degree equations and inequalities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 682-684 #14, 15, 18, 19, 20, 21, 23, 25, 27, 29, 31, 40
Review and Evaluate (2 Days)							Chapter 10 Multiple Choice Test Chapter 10 Free Response Test

Unit:	Exponential and Logarithmic Functions (Days 80-94)						
Big Ideas:	Graph and write equations of exponential functions, graph and write equations of logarithmic functions						
Unit Essential Questions:	What do exponential functions/graphs look like? How can logarithms be used to solve exponential equations?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
11.1 – Real Exponents (1 Day)	CC.2.1.HS.F.1		How can one convert from radical to rational form of an algebraic expression?	Use the properties of exponents. Evaluate and simplify expressions containing rational exponents. Solve equations containing rational exponents.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 700-701 #25, 28, 31, 38, 42, 45, 51, 52, 59, 63, 65, 67
11.2 – Exponential Functions (2 Days)	CC.2.2.HS.C.5	Exponential function	What do graphs of exponential functions look like?	Graph exponential functions and inequalities. Solve problems involving exponential growth and decay.	Exponential Functions Project	Advanced Mathematical Concepts Textbook, calculators, notes, exponential functions project packet	p.708-709 #12, 13, 16, 17, 19, 20, 21, 23, 25, 26, 27, 31(skip part c)
11.3 – The Number e (2 Days)	CC.2.2.HS.C.5	e	What is e and how is it used in mathematics?	Use the exponential function y = e^x.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 714-715 #1, 4, 6, 7, 8, 9, 10, 11, 12, 13 (skip part b for #12 and 13)
Review and Evaluate (1 Day)							Chapter 11 Quiz
11.4 – Logarithmic Functions (2 Days)	CC.2.2.HS.C.5	Logarithmic function	What is a logarithm and how are logarithms used to solve exponential equations?	Evaluate expressions involving logarithms. Solve equations involving logarithms. Graph logarithmic functions and inequalities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 723-724 #22, 27, 32, 34, 41, 43, 44, 49, 50, 52, 53, 58
11.5 – Common Logarithms (2 Days)	CC.2.2.HS.D.8 CC.2.2.HS.C.5	Common logarithm	What are common logarithms and how are they used to solve exponential equations?	Find common logarithms and antilogarithms of numbers. Solve equations and inequalities using common logarithms. Solve real-world applications with common logarithms.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 730-731 #28, 31, 32, 36, 37, 41, 44, 45, 46, 52, 59, 60
11.6 – Natural Logarithms (1 Day)	CC.2.2.HS.D.8 CC.2.2.HS.C.5	Natural logarithm	What are natural logarithms and how are they used to solve exponential equations?	Find natural logarithms of numbers. Solve equations and inequalities using natural logarithms. Solve real-world applications with natural logarithmic functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 736-737 #19, 22, 25, 31, 37, 38, 40, 41, 44, 46, 59, 60
11.7 – Modeling Real-World Data with Exponential and Logarithmic Functions (2 Days)	CC.2.1.HS.F.3		How can technology be used to find equations that model exponential and logarithmic functions?	Find the doubling time of an exponential quantity. Find exponential and logarithmic functions to model real-world data. Linearize data.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 745-747 #7, 9, 10, 12, 14, 15, 16, 17, 18
Review and Evaluate (2 Days)							Chapter 11 Multiple Choice Test Chapter 11 Free Response Test

Unit:	The Trigonometric Functions (Days 95-112)						
Big Ideas:	trigonometric functions and the unit circle, solve problems using right and oblique triangles						
Unit Essential Questions:	What is trigonometry? How can trigonometry be used to solve real-life problems?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
5.1 – Angles and Degree Measure (2 Days)	CC.2.2.HS.C.9	vertex, initial side, terminal side, standard position, degree, minute, second, coterminal angle, quadrantal angle, reference angle	How is degree measure used to solve problems?	Convert decimal degree measures to degrees, minutes, and seconds and vice versa. Find the number of degrees in a given number of rotations. Identify angles that are coterminal with a given angle.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 281-283 #21, 25, 33, 39, 45, 49, 51, 56, 57, 58, 61, 66
5.2 – Trigonometric Ratios in Right Triangles (2 Days)	CC.2.2.HS.C.9	sine, cosine, tangent, cosecant, secant, cotangent	What are the six trigonometric ratios and how are they found?	Find the values of trigonometric ratios for acute angles of right triangles.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 288-290 #11, 13, 15, 17, 20, 21, 22, 23, 24, 25, 30, 32
5.3 – Trigonometric Functions on the Unit Circle (2 Days)	CC.2.2.HS.C.7	unit circle, circular functions	What is the unit circle and how is it used to solve problems?	Find the values of six trigonometric functions using the unit circle. Find the values of six trigonometric functions of an angle in standard position given a point on its terminal side.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 296-298 #15, 21, 25, 27, 31, 33, 35, 37, 39, 41, 43, 49
5.4 – Applying Trigonometric Functions (2 Days)	CC.2.2.HS.C.9		How can trigonometry be used to find the measures of the sides of right triangles?	Use trigonometry to find the measures of the sides of right triangles.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 302-304 #11, 13, 15, 17, 19, 21, 22, 23, 25, 26, 29, 30
Review and Evaluate (1 Day)							Chapter 5 Quiz
5.5 – Solving Right Triangles (2 Days)	CC.2.2. HS.C.9	inverse trigonometric functions	How can measures of angles be found using inverse trigonometric functions?	Evaluate inverse trigonometric functions. Find missing angle measurements. Solve right triangles.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 309-312 #17, 19, 26, 27, 29, 31, 35, 36, 41, 43, 47, 48
5.6 – The Law of Sines (1 Day)	CC.2.2. HS.C.9	the law of sines	What is the Law of Sines and how is it used to find measures of sides of oblique triangles?	Solve triangles by using the Law of Sines if the measures of two angles and a side are given. Find the area of a triangle if the measures of two angles and a side are given.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 316-318 #11, 13, 15, 17, 19, 21, 23, 25, 27, 28, 30, 34
5.7 – The Ambiguous Case for the Law of Sines (2 Days)	CC.2.2. HS.C.9	ambiguous case	How does one determine if there will be more than one triangle that meets a given set of conditions?	Determine whether a triangle has zero, one, or two solutions. Solve triangles using the Law of Sines.	Triangle constructions	Advanced Mathematical Concepts Textbook, calculators, notes	p. 324-326 #13, 14, 15, 16, 19, 21, 23, 25, 27, 29, 31, 35
5.8 – The Law of Cosines (2 Days)	CC.2.2. HS.C.9	the law of cosines, hero's formula	What is the Law of Cosines and how is it used to solve triangles?	Solve triangles by using the Law of Cosines. Find the area of triangles if the measure of the three sides are given.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 331-332 #11, 13, 15, 17, 19, 21, 23, 25, 26, 27, 29, 31
Review and Evaluate (2 Days)							Chapter 5 Multiple Choice Test Chapter 5 Free Response Test

Unit:	Graphs of Trigonometric Functions (Days 113-132)
Big Ideas:	Use radian measure, graph trigonometric functions and their inverses
Unit Essential Questions:	What are radians and when should they be used in place of degrees? What real-life situations resemble sinusoidal functions?

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
6.1 – Angles and Radian Measure (2 Days)	CC.2.2.HS.C.7	radian, circular arc, central angle, sector	What is radian measure and how does it relate to degree measure?	Change from radian measure to degree measure and vice versa. Find the length of an arc given the measure of the central angle. Find the area of a sector.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 348-351 #17, 22, 25, 33, 37, 47, 51, 56, 57, 58, 59, 60
6.2 – Linear and Angular Velocity (2 Days)	CC.2.2.HS.C.7	angular displacement, angular velocity, linear velocity	How does one determine linear and angular velocity?	Find linear and angular velocity.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 355-358 #13, 15, 19, 21, 25, 29, 31, 33, 35, 37, 39, 43
6.3 – Graphing Sine and Cosine Functions (2 Days)	CC.2.2.HS.C.2	periodic function, period	What do the graphs of sine and cosine functions look like?	Use the graphs of the sine and cosine function.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 363-366 #13, 15, 17, 19, 21, 23, 25, 29, 31, 33, 35, 37
6.4 – Amplitude and Period of Sine and Cosine Functions (2 Days)	CC.2.2.HS.C.4	amplitude, frequency	How can amplitude and period be determined from an equation and how do they effect the graph of the function?	Find the amplitude and period for sine and cosine functions. Write equations of sine and cosine functions given the amplitude and period.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 373-377 #23, 27, 29, 37, 41, 43, 47, 49, 51, 56, 57, 58
6.5 – Translations of Sine and Cosine Functions (2 Days)	CC.2.2.HS.C.4	phase shift, midline, vertical shift, compound function	How can phase shift and vertical shift be determined from an equation and how do they effect the graph of the function?	Find the phase shift and the vertical translation for sine and cosine functions. Write the equations of sine and cosine functions given the amplitude, period, phase shift and vertical translation. Graph compound functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 384-386 #21, 23, 25, 27, 28, 29, 31, 33, 34, 35, 37, 38
6.6 – Modeling Real-World Data with Sinusoidal Functions (3 Days)	CC.2.2.HS.C.6	sinusoidal function	How can sinusoidal functions be used to model real-world data?	Model real-world data using sine and cosine functions. Use sinusoidal functions to solve problems.	Biorhythms Activity	Advanced Mathematical Concepts Textbook, calculators, notes, Biorthythms article and activity packet	p. 391-394 #7, 8, 10, 15, 16, 19 Biorhythms Activity
6.7 – Graphing Other Trigonometric Functions (3 Days)	CC.2.2.HS.C.4		What do the graphs of the tangent, cotangent, secant, and cosecant functions look like?	Graph tangent, cotangent, secant, and cosecant functions. Write equations of trigonometric functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 401-403 #29, 31, 32, 34, 35, 36, 37, 38, 39, 40, 41, 45
6.8 – Trigonometric Inverses and Their Graphs (2 Days)	CC.2.2.HS.C.4	principal values	How does one graph inverse trigonometric functions?	Graph inverse trigonometric functions. Find principal values of inverse trigonometric functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 410-412 #17, 18, 19, 20, 26, 31
Review and Evaluate (2 Days)					Sound Waves Lab	Sound Waves Lab	Sound Waves Lab Chapter 6 Test

Unit:	**Trigonometric Identities and Equations (Days 133-146)**						
Big Ideas:	Verify trigonometric identities, solve trigonometric equations						
Unit Essential Questions:	How is solving trigonometric equations the same as solving other kinds of equations and how is it different? What does it mean to verify an identity?						

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
7.1 – Basic Trigonometric Identities (2 Days)	CC.2.2.HS.D.2	identity, counterexample, reciprocal identities, quotient identities, Pythagorean identities, opposite angle identities	What are the basic trigonometric identities and how can they be used to solve problems?	Identify and use reciprocal identities, quotient identities, Pythagorean identities, symmetry identities, and opposite-angle identities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 427-430 #18, 21, 27, 31, 45, 47, 48, 49, 50, 51, 52, 53
7.2 – Verifying Trigonometric Identities (4 Days)	CC.2.2.HS.C.7		How does one verify a trigonometric identity?	Use the basic trigonometric identities to verify other identities. Find numerical values of trigonometric functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 434-436 #13, 16, 19, 21, 23, 25
7.3 – Sum and Difference Identities (2 Days)	CC.2.2.HS.C.7	sum and difference identities	What are the sum and difference identities and how can they be used to solve problems?	Use the sum and difference identities for the sine, cosine, and tangent functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 442-445 #15, 19, 28, 31, 35, 39
7.4 – Double-Angle and Half-Angle Identities (2 Days)	CC.2.2.HS.C.7	Double-angle identity, half-angle identity	What are the double- and half-angle identities and how can they be used to solve problems?	Use the double- and half-angle identities for the sine, cosine, and tangent functions.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 454-455 #15, 17, 21, 23, 29, 33
7.5 – Solving Trigonometric Equations (2 Days)	CC.2.2.HS.D.9		How does one solve a trigonometric equation or inequality?	Solve trigonometric equations and inequalities.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 459-461 #17, 19, 21, 23, 25, 27, 31, 33, 35, 39, 45, 51
Review and Evaluate (2 Days)							Chapter 7 Multiple Choice Test Chapter 7 Free Response Test

Unit:	**Polar Coordinates and Complex Numbers (Days 147-162)**
Big Ideas:	Graph in the polar coordinate system, use the complex plane to solve problems
Unit Essential Questions:	What is the polar coordinate system and when can it be used? What is the complex plane and when is it used?

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
9.1 – Polar Coordinates (1 Day)	CC.2.2.HS.D.7	Polar coordinate system, polar axis	What is the polar coordinate system?	Graph points in polar coordinates. Graph simple polar equations. Determine the distance between two points with polar coordinates.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 558-559 #17, 19, 21, 25, 28, 33, 34, 38,40, 43, 45, 47
9.2 – Graphs of Polar Equations (2 Days)	CC.2.2.HS.D.7	Rose, lemniscate, spiral of Archimedes, limaçon, cardioid	How does one graph polar equations?	Graph polar equations.	Polar graphs in the graphing calculator	Advanced Mathematical Concepts Textbook, calculators, notes	p. 565 #11, 13, 15, 18, 19, 20, 21, 23, 25, 27
9.3 – Polar and Rectangular Coordinates (2 Days)	CC.2.2.HS.D.7		How does one convert between polar and rectangular coordinates?	Convert between polar and rectangular coordinates.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 572 #15, 17, 19, 21, 23, 25, 27, 28, 30, 33, 34, 35
Review and Evaluate (1Day)							Chapter 9 Quiz
9.5 – Simplifying Complex Numbers (2 Days)	CC.2.1.HS.F.6		How does one perform operations with complex numbers?	Add, subtract, multiply, and divide complex numbers in rectangular form.		Advanced Mathematical Concepts Textbook, calculators, notes	p.583 #13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 37
9.6 – The Complex Plane and Polar Form of Complex Numbers (2 Days)	CC.2.1.HS.F.6	Complex plane	How can polar form of a complex number be used to solve problems?	Graph complex numbers in the complex plane. Convert complex numbers from rectangular form and vice versa.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 590 #17, 19, 21, 23, 27, 29, 31, 33, 35, 37, 39, 41
9.7 – Products and Quotients of Complex Numbers in Polar Form (2 Days)	CC.2.1.HS.F.6		How does one find products and quotients of complex numbers in polar form?	Find the product and quotient of complex numbers in polar form.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 596-597 #11, 13, 15, 17, 19, 21, 25, 27
9.8 – Powers and Roots of Complex Numbers (2 Days)	CC.2.1.HS.F.6		How does one find powers and roots of complex numbers?	Find powers and roots of complex numbers in polar form using DeMoivre's Theorem.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 605 #13, 15, 16, 18, 19, 21, 23, 26, 27, 28
Review and Evaluate (2 Days)							Chapter 9 Multiple Choice Test Chapter 9 Free Response Test

Unit:	Vectors and Parametric Equations (Day 163-180)
Big Ideas:	Perform operations with vectors in two and three dimensions
Unit Essential Questions:	What are vectors and how can they be used to solve real-world problems?

Concept & Pacing	Pa Core Standard	Key Vocabulary	Essential Questions	Competencies (skills, knowledge, abilities)	Mini-Lessons/ Activities	Instructional Materials	Assessments
8.1 – Geometric Vectors (2 Days)	CC.2.3.HS.A.14	Vector, magnitude, resultant	What are vectors and how can they be represented geometrically?	Find equal, opposite, and parallel vectors. Add and subtract vectors geometrically.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 491 #14, 15, 16, 17, 19, 21, 25, 27, 29, 31, 33, 35
8.2 – Algebraic Vectors (2 Days)	CC.2.3.HS.A.14		How can vectors be represented algebraically?	Find ordered pairs that represent vectors. Add, subtract, multiply, and find the magnitude of vectors algebraically.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 497 #15, 17, 21, 23, 25, 27, 29, 31, 37, 39, 41
8.3 – Vectors in Three-Dimensional Space (2 Days)	CC.2.3.HS.A.13		How does one perform operations with vectors in three-dimensional space?	Add and subtract vectors in three-dimensional space. Find the magnitude of vectors in three-dimensional space.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 503 #15, 17, 19, 23, 27, 29, 31, 33
Review and Evaluate (1 Day)							Chapter 8 Quiz
8.4 – Perpendicular Vectors (2 Days)	CC.2.3.HS.A.14	Inner product, dot product, cross product	What are inner products, dot products, and cross products?	Find the inner and cross products of two vectors. Determine whether two vectors are perpendicular.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 509 #11, 13, 15, 17, 19, 21, 23, 25, 29, 31, 33
8.5 – Applications with Vectors (2 Days)	CC.2.3.HS.A.14		How can vectors be used to solve problems?	Solve problems using vectors and right triangle trigonometry.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 517-518 #11, 13, 15, 17, 19, 21, 23, 25
8.6 – Vectors and Parametric Equations (2 Days)	CC.2.3.HS.A.14	Vector equation, parametric equation, direction vector, parameter	What are parametric equations and how are they graphed?	Write vector and parametric equations of lines. Graph parametric equations.		Advanced Mathematical Concepts Textbook, calculators, notes	p. 524 #13, 15, 17, 19, 21, 23, 25, 27, 29, 33
Review and Evaluate (2 Days)							Chapter 8 Multiple Choice Test Chapter 8 Free Response Test
Course Conclusion and Final Exam (3 Days)							Final Exam