DELAWARE VALLEY SCHOOL DISTRICT

PLANNED INSTRUCTION

A PLANNED COURSE FOR:

Honors Precalculus

Grade Level: 11

Date of Board Approval: _____2023_____

Course Weighting:

Gradebook Policy Honors Precalculus

Marking Period	*Quiz*	*Test*	*Homework*	*Total Points*
MP 1	*200*	*200*	*50*	*450*
MP 2	*190*	*200*	*50*	*440*
MP 3	*170*	*300 (midterm included)*	*50*	*520*
MP 4	*150*	*200 (final included)*	*35*	*385*
Total Points	*710*	*900*	*185*	*1795*
Total Percents	*40%*	*50%*	*10%*	*100%*

Curriculum Map

Overview:
This course follows Honors Algebra 2 with Trigonometry. It is a rigorous course for college bound students and is designed to challenge the students as they investigate functions (polynomial, rational, exponential, trigonometric and logarithmic) in a detailed manner. The course also covers conic sections, complex numbers, and introductory Calculus concepts such as limits and rates of change. One of the primary objectives of this course is for students to develop the knowledge and skills necessary to be successful in Advanced Placement Calculus during their senior year. In compliance with the goals of Advanced Placement Calculus, this course emphasizes a multi-representational approach to Precalculus, with concepts, results, and problems being expressed graphically, numerically, analytically, and verbally. The connections among these representations also are important. Technology is integrated whenever appropriate to support and challenge the learning of the students. Such technological instruction will be through the use of graphing calculators and/or internet-based learning sites.

Time/Credit for the Course: Full year/1 credit

Curriculum Writing Committee:

Christine Marcial, Elizabeth Katz

Goals:

Marking Period One – 45 days:
Understanding of:

- Data analysis and percentages - SAT review
- Sets of numbers; analyzing and graphing
- Distance formula, midpoint formula, intercepts, and symmetry
- Writing equations of and graphing circles and ellipses
- Defining functions
- Properties of various functions: linear, quadratic, absolute value, square root, piece-wise, constant, identity, cubic, cube root, greatest integer, and reciprocal functions
- Graphing techniques of functions: transformations, both by hand and with graphing utility
- Mathematical models and applications of functions
- Quadratic functions and their properties
- Quadratic models
- Quadratic equations and inequalities

Marking Period Two – 45 days:
Understanding of:

- Polynomial functions and models
- Real and complex zeros of polynomial functions
- Properties of rational functions
- Graphs of polynomial and rational functions
- Polynomial and rational equations and inequalities
- Evaluating and writing composite functions
- One-to-one functions and their inverses
- Exponential functions and their properties
- Logarithmic functions and their properties
- Logarithmic and exponential equations
- Applications of exponential and logarithmic equations

Marking Period Three – 45 days:
Understanding of:

- Angles and their measure in radians and degrees
- Trigonometric functions with a Unit Circle approach in degrees and radian measures
- Properties of the trigonometric functions
- Graphs of sine, cosine, tangent, cosecant, cotangent, and secant
- Phase shifts with trigonometric functions: inverse sine and cosine functions
- Elementary trigonometric identities: quotient, reciprocal, Pythagorean, even-odd

- Sum and difference formulas
- Double angle and half-angle formulas
- Finding all solutions of a trigonometric equation
- Trigonometric equation quadratic in form
- Solving trigonometric equations by using identities

Marking Period Four – 45 days:
Understanding of:

- Applications involving right triangle trigonometry
- The Law of Sines
- The Law of Cosines
- Heron's Formula and the area of a triangle using trigonometry
- Polar Coordinates: Converting to and from Rectangular Coordinates
- Basic Polar graphs
- Introduction to Parametric Equations
- Introduction to Limits
- Systems of linear and nonlinear equations using substitution or elimination
- Conic Sections: equations and graphs
- Arithmetic and geometric sequences and series
- Summation Notation
- Common Final Assessment

Big Idea # 1: Numbers, measures, expressions, equations, and inequalities can represent mathematical situations and structures in many equivalent forms.

Essential Question:

- How can you extend algebraic properties and processes to linear, quadratic, absolute value, square root, piece-wise, constant, identity, cubic, cube root, greatest integer, reciprocal, polynomial, rational, exponential, logarithmic, and trigonometric functions and then apply them to solve real world problems?

Concept:

- Algebraic properties, processes, and representations

Competencies:

- Extend algebraic properties and processes to functions, expressions, and equations, and apply them to solve real world problems.
- Represent a function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated equation to each representation.

Big Idea #2: Families of functions exhibit properties and behaviors that can be recognized across representations. Functions can be transformed, combined, and composed to create new functions in mathematical and real-world situations.

Essential Question:

- How do functions and their graphs and/or tables help us interpret events that occur in the world around us?

Concept:

- Algebraic properties, processes, and representations

Competencies:

- Extend algebraic properties and processes to functions, expressions, and equations, and apply them to solve real world problems.
- Represent functions in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated equation to each representation.

Big Idea #3: Mathematical functions are relationships that assign each member of one set (domain) to a unique member of another set (range), and the relationship is recognizable across representations.

Essential Question:

- How do you explain the benefits of multiple methods of representing functions (tables, graphs, equations, and contextual situations)?

Concept:

- Algebraic properties, processes, and representations

Competencies:

- Extend algebraic properties and processes to functions, expressions, and equations and apply them to solve real-world problems.

- Represent a function in multiple ways, including tables, graphs, equations, and contextual situations, and make connections among representations; relate the solution of the associated equation to each representation.

Big Idea #4: Mathematical relations and functions can be modeled through multiple representations and analyzed to raise and answer questions.

Essential Question:

- How can data be organized and represented to provide insight into the relationship between quantities?
- How does the type of data influence the choice of display?

Concept:

- Data

Competencies:

- Recognize and evaluate random processes underlying real-world applications.

Primary Textbook(s) and Supplemental Resources:

Name of Textbook: Sullivan & Sullivan Precalculus Enhanced with Graphing Utilities 7th Edition

Textbook ISBN #: 0-13-430837-9

Textbook Publisher &Year of Publication: Pearson, 2017

Curriculum Textbook is utilized in: Precalculus

Supplemental Resources:

- Sullivan & Sullivan online student resources
- TI-84 Plus Graphing calculator
- TI-SmartView for the Smartboard
- Smart notebook gallery essentials
- Software: IXL, Kuta, etc.
- Websites such as Khan Academy and College Board

Curriculum Plan

Unit 1: Functions and Their Graphs

Marking Period: 1

Standard(s): Common Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.4.8.B.1	CC.2.1.HS.D.2	CC.2.1.HS.D.10	CC.2.3.HS.A.1
CC.2.4.HS.B.1	CC.2.1.HS.D.3	CC.2.2.HS.C.1	CC.2.3.HS.A.11
CC.2.4.HS.B.2	CC.2.1.HS.D.4	CC.2.2.HS.C.2	CC.2.4.HS.B.1
CC.2.4.HS.B.3	CC.2.1.HS.D.7	CC.2.2.HS.C.3	CC.2.4.HS.B.2
CC.2.1.HS.F.3	CC.2.1.HS.D.8	CC.2.2.HS.C.4	CC.2.4.HS.B.3
CC.2.1.HS.D.1	CC.2.1.HS.D.9	CC.2.2.HS.C.5	

Anchors:

- M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
- M08.B-E.2 Understand the connections between proportional relationships, lines, and linear equations.
- M08.B-E.3 Analyze and solve linear equations and pairs of simultaneous linear equations.
- M08.B-F.1 Analyze and interpret functions.
- M08.B-F.2 Use functions to model relationships between quantities.
- A2.1.2.1 Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems.
- A2.1.2.2 Simplify expressions involving polynomials.
- A2.2.2.2 Describe and/or determine families of functions.

Eligible Content:

- Determine whether a number is rational or irrational.
- Apply one or more properties of integer exponents in order to generate equivalent numerical expressions.
- Use square root and cube root symbols to represent functions.
- Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear.

- Graph proportional relationships, interpreting the unit rate as the slope of the graph.
- Compare two different proportional relationships represented in different ways.
- Determine whether a relation is a function.
- Compare properties of two functions represented in different ways (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions).
- Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.
- Interpret the rate of change and initial value of a function in terms of the situation it models and in terms of its graph or a table of values.
- Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).
- Sketch or determine a graph that exhibits the qualitative features of a function that has been described.

Objectives: Students will be able to

- Identify and analyze properties of real numbers (DOK Level Three)
- Use set notation to determine unions, intersections, complements, and subsets of given sets (DOK Level Two)
- Use the distance and midpoint formula (DOK Level One)
- Graph equations by plotting points (DOK Level Two)
- Find intercepts from a graph and an equation (DOK Level One)
- Test an equation for symmetry with respect to the x-axis, the y-axis, and the origin (DOK Level Three)
- Solving equations using a graphing utility (DOK Level Two)
- Calculate and interpret the slope of a line (DOK Level One)
- Graph lines given a point and the slope (DOK Level Two)
- Find the equation of a vertical and a horizontal line (DOK Level One)
- Use the point-slope form of a line (DOK Level One)
- Determine the equation of a line given two points (DOK Level Two)
- Write the equation of a line in slope-intercept form (DOK Level Two)
- Identify the slope and y-intercept of a line from its equation (DOK Level One)
- Graph lines written in general form using intercepts (DOK Level Two)
- Write the equation of a secant line to a graph (DOK Level Two)
- Draw the line tangent to a graph and determine its equation (DOK Level Three)

- Identify the point on a line that is closest to a given point and determine its coordinates (DOK Level Three)
- Formulate equations of parallel and perpendicular lines (DOK Level Three)
- Write the equation of a circle in various forms (DOK Level Two)
- Graph a circle in various forms by completing the square (DOK Level One)
- Determine whether a relation represents a function (DOK Level Three)
- Calculate the value of a function (DOK Level One)
- List the domain and the range of a function (DOK Level Two)
- Perform operations on functions (DOK Level Three)
- Identify the graph of a function (DOK Level One)
- Obtain information from or about the graph of a function (DOK Level Three)
- Determine and identify even and odd functions (DOK Level Two)
- Use a graph to determine where a function is increasing, decreasing, or constant (DOK Level Two)
- Use a graph to locate local maxima and local minima (DOK Level Two)
- Find the average rate of change of a function (DOK Level Two)
- Explain the difference between average rate of change and instantaneous rate of change (DOK Level Two)
- Graph the following functions: linear, quadratic, absolute value, square root, piecewise, constant, identity, cubic, cube root, greatest integer, and reciprocal (DOK Level Three)
- Graph functions using transformations (DOK Level Three)
- Analyze non-routine transformations of graphs, such as absolute value and/or reciprocal of a given function (DOK Level Four)
- Identify the vertex and axis of symmetry of a quadratic function (DOK Level Two)
- Graph a quadratic function using its vertex, axis of symmetry, and intercepts using various forms (DOK Level Three)
- Build and analyze functions and models (DOK Level Four)
- Solve inequalities involving a quadratic function algebraically and graphically (DOK Level Three)
- Apply the greatest integer function to real-world examples (DOK Level Four)
- Understand and use the relationship between percent change and growth factor. (DOK Level Three)
- Choose an appropriate graphical representation for a data set. (DOK Level Two)
- Analyze and interpret numerical data distributions. (DOK Level Three)

Core Activities and Corresponding Instructional Methods:

- Review students' prior knowledge on finding the domain and range of a function, identifying even and odd functions, evaluating functions and finding the average rate of change of a function.
    - Diagnostic assessment, questioning.
    - Cooperative learning groups
    - Direct instruction as needed using Smart Technology
    - Guided practice using online resources and worksheets.
- Integrate academic and content specific vocabulary.
    - Direct instruction and practice on the various parent functions (linear, quadratic, cubic, cube root, piecewise, square root, constant, identity, power, polynomial, greatest integer, reciprocal, logarithmic, absolute value, exponential, and trigonometric)
    - Classroom discussion that prompts students to compare and contrast various properties of functions using appropriate vocabulary.
    - Guided practice including step-by-step written/verbal instruction using necessary vocabulary of functions (even, odd, domain, range, compression, stretch, reflection, inverse, one-to-one)
    - Utilize the graphing calculators and TI-SmartView to support key vocabulary.
    - Writing activities incorporating appropriate math language
- Analyze functions and their transformations in the coordinate plane.
    - Direct instruction by using visual demonstration of sets of points in the Cartesian coordinate plane by hand and in the TI-84 graphing calculator.
    - Classroom discussion by using content specific vocabulary.
    - Guided practice on identifying the content through online resources.
    - Use Graphing Utility (TI-SmartView) to enhance instruction.
- Identify properties of and graph functions
    - Direct instruction and classroom discussion about properties: intervals of increase, intervals of decrease; constant intervals; local extrema and intercepts supported by visual aids on the Smart Board
    - Guided practice: Include step-by-step written/verbal explanation of the behavior of a graph.
    - Cooperative group activities
    - Graphing utility practice (TI-SmartView and TI-84 graphing calculators)
- Develop students' ability to solve real world applications by applying their understanding of various functions and their properties
    - Guided practice
    - Cooperative learning groups

- Step-by-step written/verbal explanation of the behavior of a graph
- Graphing utility (TI-SmartView and Ti-84 graphing calculators)

Assessments:

Diagnostic:

- Teacher prepared diagnostic test
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook and online resources for each section
- Quizzes/graded assignments from Chapters 1 and 2

Summative:

- Common Assessment Chapter Exams 1 and 2

Unit 2: Polynomial and Rational Functions

Marking Period: 2

Standard(s): Common Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.1.HS.F.1	CC.2.1.HS.D.1	CC.2.1.HS.D.6	CC.2.1.HS.D.10
CC.2.1.HS.F.3	CC.2.1.HS.D.2	CC.2.1.HS.D.7	CC.2.2.HS.C.1
CC.2.1.HS.F.6	CC.2.1.HS.D.3	CC.2.1.HS.D.8	CC.2.2.HS.C.2
CC.2.1.HS.F.7	CC.2.1.HS.D.4	CC.2.1.HS.D.9	CC.2.2.HS.C.3

Anchors:

- M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
- M08.B-F.1 Analyze and interpret functions
- M08.B-F.2 Use functions to model relationships between quantities
- A2.1.2.1 Use exponents, roots, and/or absolute values to represent equivalent forms or to solve problems.
- A2.1.2.2 Simplify expressions involving polynomials.
- A2.2.2.2 Describe and/or determine families of functions.

Eligible Content:

- Apply one or more properties of integer exponents to generate equivalent numerical expressions.
- Use square root and cube root symbols to represent functions.
- Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear.
- Graph proportional relationships, interpreting the unit rate as the slope of the graph.
- Determine whether a number is rational or irrational.
- Compare two different proportional relationships represented in different ways.
- Determine whether a relation is a function.
- Compare properties of two functions represented in different ways (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions).Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.

- Interpret the rate of change and initial value of a function in terms of the situation it models and in terms of its graph or a table of values.
- Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).
- Sketch or determine a graph that exhibits the qualitative features of a function that has been described.

Objectives: Students will be able to

- Identify polynomial functions and their degree (DOK Level One)
- Graph polynomial functions using transformations (DOK Level Two)
- Identify the real zeros of a polynomial function and their multiplicity (DOK Level One)
- Identify and describe the shape of the graph of a polynomial function near its x-intercepts (DOK Level Two)
- Formulate a sign pattern graph to represent where the graph of a polynomial function is above/below the x-axis. (DOK Level Three)
- Graph a polynomial function given its sign pattern graph (DOK Level Two)
- Analyze the graph of a polynomial function (DOK Level Four)
- Find the domain of a rational function (DOK Level One)
- Find the vertical and horizontal asymptotes of a rational function (DOK Level Two)
- Analyze the graph of a rational function (DOK Level Four)
- Graph rational functions given their sign pattern graph and other information such as vertical/horizontal asymptotes and intercepts (DOK Level Three)
- Interpret limit notation in the context of the features of graphs of rational functions (DOK Level Two)
- Determine the end-behavior of graphs of rational functions by investigating the limits as x goes to infinity (DOK Level Three)
- Evaluate one-sided limits as x approaches a vertical asymptote (DOK Level Three)
- Solve polynomial inequalities (DOK Level Two)
- Formulate a sign pattern graph to represent where the graph of a rational function is above/below/on the x-axis. (DOK Level Three)
- Solve rational inequalities (DOK Level Two)
- Assess the remainder and factor theorems (DOK Level Three)
- Use the rational zeros theorem to list the potential rational zeros of a polynomial (DOK Level Two)
- Find the real and complex zeros of a polynomial function (DOK Level Three)

- Solve polynomial equations (DOK Level Two)
- Apply the conjugate pairs theorem (DOK Level Four)
- Construct a polynomial function with specified zeros (DOK Level Three)
- Explain and apply the Intermediate Value Theorem (DOK Level Three)

Core Activities and Corresponding Instructional Methods:

- Review students' prior knowledge on finding the domain and range of a function, identifying even and odd functions, evaluating functions and finding the average rate of change of a function.
    - Diagnostic assessment, questioning
    - Cooperative learning groups
    - Direct instruction as needed using Smart Technology
    - Guided practice using online resources and worksheets
- Integrate academic and content specific vocabulary
    - Direct instruction and practice on the various polynomial and rational functions
    - Classroom discussion that prompts students to compare and contrast various properties of functions using appropriate vocabulary
    - Guided practice including step-by-step written/verbal instruction using necessary vocabulary of functions (even, odd, domain, range, compression, stretch, reflection, inverse, one-to-one)
    - Utilize the graphing calculators and TI-SmartView to support key vocabulary
    - Writing activities incorporating appropriate math language
- Analyze functions and their transformations in the coordinate plane
    - Direct instruction by using visual demonstration of sets of points in the Cartesian coordinate plane by hand and in the TI-84 graphing calculator
    - Classroom discussion by using content specific vocabulary
    - Guided practice on identifying the content through online resources
    - Use Graphing Utility (TI-SmartView) to enhance instruction
- Identify properties of and graph functions
    - Direct instruction and classroom discussion about properties: intervals of increase, intervals of decrease; constant intervals; local extrema, asymptotes, and intercepts supported by visual aids on the Smart Board
    - Guided practice: Include step-by-step written/verbal explanation of the behavior of a graph
    - Cooperative group activities
    - Graphing utility practice (TI-SmartView and TI-84 graphing calculators)
- Develop students' ability to solve real world applications by applying their understanding of various functions and their properties

- Guided practice
- Cooperative learning groups
- Step-by-step written/verbal explanation of the behavior of a graph
- Graphing utility (TI-SmartView and Ti-84 graphing calculators)

Assessments:

Diagnostic:

- Teacher prepared diagnostic test
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook and online resources for each section
- Quizzes/graded assignments from Chapters 3 and 4

Summative:

- Common Assessment Chapter Exams 3 and 4

Unit 3: Exponential and Logarithmic Functions

Marking Period: 3

Standard(s): Common Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.1.HS.F.1	CC.2.1.HS.D.7	CC.2.2.HS.C.1	CC.2.2.HS.C.5
CC.2.1.HS.F.3	CC.2.1.HS.D.8	CC.2.2.HS.C.2	CC.2.2.HS.C.6
CC.2.1.HS.D.1	CC.2.1.HS.D.9	CC.2.2.HS.C.3	CC.2.4.HS.B.2
CC.2.1.HS.D.2	CC.2.1.HS.D.10	CC.2.2.HS.C.4	

Anchors:

- M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
- M08.B-F.1 Analyze and interpret functions
- M08.B-F.2 Use functions to model relationships between quantities
- A2.1.2.1 Use exponents and logarithms to represent equivalent forms or to solve problems.
- A2.1.2.2 Simplify expressions involving exponents and logarithms.
- A2.2.2.2 Describe and/or determine families of functions.

Eligible Content:

- Apply one or more properties of integer exponents to generate equivalent numerical expressions.
- Use square root and cube root symbols to represent functions.
- Interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line; give examples of functions that are not linear.
- Compare two different proportional relationships represented in different ways.
- Determine whether a relation is a function.
- Compare properties of two functions represented in different ways (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions)
- Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph.
- Interpret the rate of change and initial value of a function in terms of the situation it models and in terms of its graph or a table of values.
- Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).

- Sketch or determine a graph that exhibits the qualitative features of a function that has been described.

Objectives: Students will be able to

- Form a composite function (DOK Level One)
- Find the domain of a composite function (DOK Level One)
- Determine whether a function is one-to-one (DOK Level One)
- Determine the inverse of a function defined by a map on or a set of ordered pairs (DOK Level One)
- Determine the inverse of a function defined by an equation (DOK Level Two)
- Obtain the graph of the inverse function from the graph of a function (DOK Level Two)
- Evaluate exponential functions (DOK Level Two)
- Graph exponential functions (DOK Level Two)
- Evaluate limits involving exponential functions (DOK Level Two)
- Define the number e (DOK Level One)
- Compare linear and exponential models (DOK Three)
- Solve exponential equations (DOK Level Three)
- Change exponential expressions to logarithmic expressions and logarithmic expressions to exponential expressions (DOK Level Two)
- Evaluate logarithmic expressions (DOK Level Two)
- Determine the domain of a logarithmic function (DOK Level Two)
- Graph logarithmic functions (DOK Level Two)
- Solve logarithmic equations (DOK Level Three)
- Work with the properties of logarithms (DOK Level Three)
- Write a logarithmic expression as a sum or difference of logarithms (DOK Level Three)
- Write a logarithmic expression as a single logarithm (DOK Level Three)
- Evaluate logarithms whose base is neither 10 nor e (DOK Level Three)
- Graph a logarithmic function whose base is neither 10 nor e (DOK Level Three)
- Analyze financial modeling problems (DOK Level Four)
- Analyze exponential growth and decay models (DOK Level Four)
- Explain logistic models (DOK Level Four)

Core Activities and Corresponding Instructional Methods:

- Review students' prior knowledge on finding the domain and range of a function, identifying even and odd functions, evaluating functions and finding the average rate of change of a function.

  - Diagnostic assessment, questioning
  - Cooperative learning groups
  - Direct instruction as needed using Smart Technology
  - Guided practice using online resources and worksheets
- Integrate academic and content specific vocabulary
  - Direct instruction and practice on the various exponential and logarithmic functions
  - Classroom discussion that prompts students to compare and contrast various properties of functions using appropriate vocabulary
  - Guided practice including step-by-step written/verbal instruction using necessary vocabulary of functions (even, odd, domain, range, compression, stretch, reflection, inverse, one-to-one)
  - Utilize the graphing calculators and TI-SmartView to support key vocabulary
  - Writing activities incorporating appropriate math language
- Analyze functions and their transformations in the coordinate plane
  - Direct instruction by using visual demonstration of sets of points in the Cartesian coordinate plane by hand and in the TI-84 graphing calculator
  - Classroom discussion by using content specific vocabulary
  - Guided practice on identifying the content through online resources
  - Use Graphing Utility (TI-SmartView) to enhance instruction
- Identify properties of and graph functions
  - Direct instruction and classroom discussion about properties: intervals of increase, intervals of decrease; constant intervals; local extrema, asymptotes, and intercepts supported by visual aids on the Smart Board
  - Guided practice: Include step-by-step written/verbal explanation of the behavior of a graph
  - Cooperative group activities
  - Graphing utility practice (TI-SmartView and TI-84 graphing calculators)
- Develop students' ability to solve real world applications by applying their understanding of various functions and their properties
  - Guided practice
  - Cooperative learning groups
  - Step-by-step written/verbal explanation of the behavior of a graph
  - Graphing utility (TI-SmartView and Ti-84 graphing calculators)

Assessments:

Diagnostic:

- Teacher prepared diagnostic test
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook and online resources for each section
- Quizzes/graded assignments from Chapter 5

Summative:

- Common Assessment Chapter Exam 5

Unit 4: Trigonometric Functions

Marking Period: 4

Standard(s): Common Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.1.HS.F.1	CC.2.1.HS.D.5	CC.2.2.HS.C.3	CC.2.2.HS.C.9
CC.2.1.HS.F.3	CC.2.1.HS.D.9	CC.2.2.HS.C.4	CC.2.3.HS.A.1
CC.2.1.HS.D.1	CC.2.2.HS.C.1	CC.2.2.HS.C.7	CC.2.3.HS.A.7
CC.2.1.HS.D.2	CC.2.2.HS.C.2	CC.2.2.HS.C.8	CC.2.3.HS.A.10

Anchors:

- M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
- M08.B-F.1 Analyze and interpret functions
- M08.B-F.2 Use functions to model relationships between quantities
- A2.1.2.1 Use trigonometry to represent equivalent forms or to solve problems.
- A2.1.2.2 Simplify expressions involving trigonometry.

Eligible Content:

- Use square root symbols to represent functions.
- Compare two different proportional relationships represented in different ways.
- Determine whether a relation is a function.
- Compare properties of two functions represented in different ways (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions).
- Determine the values of the function including reading these from a table or from a graph.
- Interpret values of a function in terms of the situation it models and in terms of its graph or a table of values.

Objectives: Students will be able to

- Convert between decimals and degrees, minutes, seconds for angles (DOK Level Two)
- Find the arc length of a circle (DOK Level Two)
- Convert from degrees to radians and radians to degrees (DOK Level One)
- Find the area of a sector of a circle (DOK Level Two)
- Find the exact values of all the trigonometric functions using a point on the unit circle (DOK Level Two)

- Find the exact values of all the trigonometric functions of the quadrantal angles (DOK Level Two)
- Find the exact values of the exact values of the trigonometric functions for integer multiples of $\frac{\pi}{6} = 30°$, $\frac{\pi}{4} = 45°$, and $\frac{\pi}{3} = 60°$. (DOK Level Two)
- Use a calculator to approximate the value of the trigonometric functions (DOK Level One)
- Use circle of radius r to evaluate the trigonometric functions (DOK Level Three)
- Determine the domain and range of the trigonometric functions (DOK Level Two)
- Determine the period of the trigonometric functions (DOK Level Two)
- Determine the signs of the trigonometric functions in a given quadrant (DOK Level One)
- Find the values of the trigonometric functions using fundamental identities (DOK Level Three)
- Find the exact values of the trigonometric functions of an angle given one of the functions and the quadrant of the angle (DOK Level Three)
- Use even-odd properties to find the exact values of the trigonometric functions (DOK Level Three)
- Graph functions in the form of $\mathrm{y} = \mathrm{A}\cos(\omega\theta)$ and $\mathrm{y} = \mathrm{A}\sin(\omega\theta)$ using transformations (DOK Level Four)
- Determine the amplitude and period of sinusoidal functions (DOK Level Two)
- Graph sinusoidal functions using key points (DOK Level Three)
- Find an equation for a sinusoidal graph (DOK Level Three)
- Graph sinusoidal functions of the form $\mathrm{y} = \mathrm{A}\cos(\omega\theta - \varphi) + \mathrm{B}$ and $\mathrm{y} = \mathrm{A}\sin(\omega\theta - \varphi) + B$ (DOK Level Four)
- Find a sinusoidal function from data (DOK Level Three)
- Apply trigonometric functions to real world problems (DOK Level Four)
- Find the exact value of inverse sine, cosine, and tangent functions (DOK Level Three)
- Find an approximate value of inverse sine, cosine, and tangent functions (DOK Level One)
- Use properties of inverse functions to find exact values of certain composite functions (DOK Level Four)
- Find the inverse function of a trigonometric function (DOK Level Three)
- Solve equations using inverse trigonometric functions (DOK Level Three)
- Write a trigonometric expression as an algebraic expression (DOK Level Three)
- Use algebra to simplify trigonometric expressions (DOK Level Three)
- Establish fundamental trigonometric identities (DOK Level Four)

- Use sum and difference formulas to find exact values and establish identities (DOK Level Three)
- Solve equations involving a single trigonometric function (DOK Level Three)
- Solve trigonometric equations quadratic and linear in form (DOK Level Three)
- Solve trigonometric equations using identities (DOK Level Four)
- Find the value of trigonometric functions of an acute angle using right triangles (DOK Level Three)
- Use the complementary angle theorem (DOK Level Two)
- Solve right triangles (DOK Level Three)
- Solve applied problems using right triangles (DOK Level Four)
- Solve SAA, ASA, and SSA triangles using the Law of Sines (DOK Level Three)
- Solve ASA and SSS triangles using the Law of Cosines (DOK Level Three)
- Use the Law of Sines and the Law of Cosines to solve applied problems (DOK Level Three)
- Find the area of SSS triangles using Heron's Formula (DOK Level Two)
- Find the area of SAS triangles using the lengths of two sides and the sine of the included angle (DOK Level Two)

Core Activities and Corresponding Instructional Methods:

- Review students' prior knowledge on finding the domain and range of a function, identifying even and odd functions, evaluating functions.
    - Diagnostic assessment, questioning
    - Cooperative learning groups
    - Direct instruction as needed using Smart Technology
    - Guided practice using online resources and worksheets
- Integrate academic and content specific vocabulary
    - Direct instruction and practice on the various trigonometric functions
    - Classroom discussion that prompts students to compare and contrast various properties of functions using appropriate vocabulary
    - Guided practice including step-by-step written/verbal instruction using necessary vocabulary of functions (even, odd, domain, range, compression, stretch, reflection, inverse, one-to-one)
    - Utilize the graphing calculators and TI-SmartView to support key vocabulary
    - Writing activities incorporating appropriate math language
- Analyze functions and their transformations in the coordinate plane
    - Direct instruction by using visual demonstration of sets of points in the Cartesian coordinate plane by hand and in the TI-84 graphing calculator
    - Classroom discussion by using content specific vocabulary

  - Guided practice on identifying the content through online resources
  - Use Graphing Utility (TI-SmartView) to enhance instruction
- Identify properties of and graph functions
  - Direct instruction and classroom discussion about properties: intervals of increase, intervals of decrease; constant intervals; local extrema, asymptotes, and intercepts supported by visual aids on the Smart Board
  - Guided practice: Include step-by-step written/verbal explanation of the behavior of a graph
  - Cooperative group activities
  - Graphing utility practice (TI-SmartView and TI-84 graphing calculators)
- Develop students' ability to solve real world applications by applying their understanding of various functions and their properties
  - Guided practice
  - Cooperative learning groups
  - Step-by-step written/verbal explanation of the behavior of a graph
  - Graphing utility (TI-SmartView and Ti-84 graphing calculators)

Assessments:

Diagnostic:

- Teacher prepared diagnostic test
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook and online resources for each section
- Quizzes/graded assignments from chapter 6,7, and 8

Summative:

- Common Assessment Chapter Exam 6, 7, and 8

Unit 5: Analytic Geometry

Marking Period: 4

Systems of Equations, Polar and Parametric Graphs, Introduction to Limits, Sequences and Series

Standard(s): Common Core State Standards for Mathematics
http://static.pdesas.org/content/documents/PA%20Core%20Standards%20Mathematics%20PreK-12%20March%202014.pdf

Standards Addressed:

CC.2.1.HS.F.3	CC.2.1.HS.D.5	CC.2.1.HS.D.10	CC.2.2.HS.C.4
CC.2.1.HS.D.1	CC.2.1.HS.D.7	CC.2.2.HS.C.1	CC.2.3.HS.A.1
CC.2.1.HS.D.2	CC.2.1.HS.D.8	CC.2.2.HS.C.2	CC.2.3.HS.A.10
CC.2.1.HS.D.3	CC.2.1.HS.D.9	CC.2.2.HS.C.3	

Anchors:

- M08.B-E.1 Demonstrate an understanding of expressions and equations with radicals and integer exponents.
- M08.B-F.1 Analyze and interpret functions
- M08.B-F.2 Use functions to model relationships between quantities
- A2.1.2.1 Use equivalent forms to solve problems.
- A2.1.2.2 Simplify expressions involving analytical geometry

Eligible Content:

- Compare two different proportional relationships represented in different ways.
- Determine whether a relation is a function.
- Compare properties of two functions represented in different ways (i.e., algebraically, graphically, numerically in tables, or by verbal descriptions).
- Determine the values of the function including reading these from a table or from a graph.
- Interpret values of a function in terms of the situation it models and in terms of its graph or a table of values.

Objectives: Students will be able to

- Convert from rectangular to polar coordinates and vice-versa. (DOK Level One)
- Transform equations between polar and rectangular forms. (DOK Level Two)
- Graphing polar equations by using a graphing utility. (DOK Level Two)
- Graphing parametric equations by using a graphing utility. (DOK Level Two)
- Find the limit using a table, graph, or an equation. (DOK Level Two).
- Find a one-sided limit by looking at a graph. (DOK Level One).
- Recall the names of the four conics. (DOK Level One)

- Identify the equations in standard form for each of the four conics. (DOK Level One)
- Analyze parabolas with vertex at both the origin and the point (h, k). (DOK Level Three)
- Analyze ellipses with vertex at both the origin and the point (h, k). (DOK Level Four)
- Analyze hyperbolas with vertex at both the origin and the point (h, k). (DOK Level Four)
- Analyze circles with vertex at both the origin and the point (h, k). (DOK Level Three)
- Write the standard form for the equation of a circle. (DOK Level Two)
- Graph a circle both with the center at and off of the origin. (DOK Level Two)
- Construct the general form for the equation of a circle. (DOK Level Two)
- Solve systems of linear and nonlinear equations using both elimination and substitution. (DOK Level Two)
- Identify consistent and inconsistent systems of equations containing two and three variables. (DOK Level One)
- Solve systems of three equations containing three variables. (DOK Level Two)
- Express the solution of systems of dependent equations containing two and three variables. (DOK Level Two)
- Write the first several terms of a sequence. (DOK Level One and Two)
- Write the terms of a sequence defined by a recursive formula. (DOK Three)
- Use summation notation. (DOK Level Two and Three).

Core Activities and Corresponding Instructional Methods:

- Integrate academic and content specific vocabulary
  - Direct instruction and practice.
  - Lead a classroom discussion that prompts students to compare and contrast.
  - Guided practice: Include step-by-step written explanation of solutions to open-ended questions.
  - Build background knowledge by utilizing a graphing utility and TI-SmartView to support solutions to questions and problems.
- Analyze functions
  - Direct instruction by using visual demonstration.
  - Classroom discussion by using content specific vocabulary.
  - Guided practice on identifying the content specific vocabulary.
  - Graphing utility (TI-SmartView).
- Identify properties of and graph functions

- Direct instruction and classroom discussion about properties supported by visual aids on the SmartBoard.
- Guided practice: Include step-by-step written explanation of the behavior of a graph
- Graphing utility (TI-SmartView).

- Analyze examples of applications of functions
  - Classroom discussion and guided practice on building models from analyzing data in a real-world situation.
  - Develop both a verbal and/or written logical argument to support conclusions about behaviors of graphs.
  - Determine appropriate window to view the graph of any given function.
  - Graphing utility (TI-SmartView).

Assessments:

Diagnostic:

- Teacher prepared diagnostic test
- Teacher questioning and observation

Formative:

- Teacher observations, questioning techniques
- Group activities
- Homework – example problems from the textbook and online resources for each section
- Quizzes/graded assignments from chapters 9, 10, 11, 12, and 14

Summative:

- Common Assessments for the Unit using chapters 9, 10, 11, 12 and 14
- Common Cumulative Final Exam