Course Title: Pre-Calculus
Board Approval Date: 06/16/16
Credit / Hours: 1 credit
Reviewed Annually

Course Description:

The course provides students with knowledge of linear, quadratic, polynomial, rational, exponential, logarithmic and trigonometric functions. Students learn to graph these functions and likewise to investigate various applications of these functions. Practical applications and solution of triangular problems are also studied as well as verifying and proving trigonometric identities.

*Students will need a TI-89 graphing calculator for this course.

Learning Activities / Modes of Assessment:

Large group instruction	Tests and Quizzes
Checklists / Teacher Observation	Small group work
Projects with Rubrics	Lab Journals / Write-ups

Instructional Resources:

PreCalculus with Limits: A Graphing Approach (Larson – 2012)

Course Pacing Guide

Course: **Pre-Calculus**

Course Unit (Topic)	**Length of Instruction (Days/Periods)**
1. Review of Linear Functions	20 days
2. Polynomial Functions of Higher Degree	30 days
3. Rational Functions	35 days
4. Exponential and Logarithmic Functions	35 days
5. Trigonometric Functions	55 days
6. Analytic	
DAYS TOTAL	175 days

Topic: 1 Review of Linear Functions
Subject(s): Math

Days: 20
Grade(s): 11th, 12th

Know:	Understand:	Do:
Review of identifying types of lines and linear functions Review of characteristics of functions Review of composition and inverse functions		CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and system of equations/ inequalities algebraically and graphically. CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between different representations. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

Curriculum: CCSD CURRICULUM

Course: Precalculus

2021-2022

Days: 20

Topic: 1 Review of Linear Functions

Subject(s): Math

Key Learning: **Functions and their representations in the Cartesian Plane.**

Unit Essential Question(s):

What are the main characteristics and components of a Linear function **and how are they used to model real-life problems?**

Concept: **Lines in the Cartesian Plane**	**Concept:** **Review of Functions**	**Concept:** **Shifting, Reflecting, and Stretching Graphs**
Lesson Essential Question(s): How do you find the slope of a line and use it to write an equation of the line? (A)	**Lesson Essential Question(s):** What are the important defining characteristics and representations of a function? (A) How is the graph of a function used to determine the key elements of that function? (A)	**Lesson Essential Question(s):** How do you write equations and draw graphs for the simple transformations of functions? (A)
Vocabulary:	**Vocabulary:**	**Vocabulary:**

Concept: **Combinations of Functions**	**Concept:** **Inverse Functions**	**Concept:** **Linear Models and Scatterplots**
Lesson Essential Question(s): How do you combine two functions to form a new function? (A) **Vocabulary:**	**Lesson Essential Question(s):** What is the inverse of a function and how do we represent it graphically and algebraically? **Vocabulary:**	**Lesson Essential Question(s):** How do we write the equation of aline to model real world data? **Vocabulary:**

Topic: 2 Polynomial Functions of higher degree

Days: 30

Subject(s): Math

Grade(s): 11th, 12th

Know:	Understand:	Do:
Graph Polynomial Functions	How to graph polynomial Functions	CC.2.2.HS.D.2 Extend the knowledge of arithmetic operations and apply to polynomials. CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs. CC.2.2.HS.D.5 Use polynomial identities to solve problems. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between different representations. CC.2.2.HS.C.3 Construct and compare linear, quadratic, and exponential models to solve problems.

Curriculum: CCSD CURRICULUM

Course: Precalculus 2021-2022

Topic: 2 Polynomial Functions of higher degree

Days: 1.

Subject(s): Math

Key Learning: **Analyzing and Graphing polynomial functions**

Unit Essential Question(s):

How are polynomial functions used to represent real life applications?

Concept:	**Concept:**
Graphing polynomial functions of higher degree	**Applications of polynomial functions**
Lesson Essential Question(s): How do we sketch polynomial functions? (A) How do we find the REAL zeros of a nonfactorable polynomial function? (A) How do we write the equations of a polynomial function from characteristics and/or a sketch of the function ? (A)	**Lesson Essential Question(s):** How are polynomial functions used to model real life applications? (A)
Vocabulary: zeros, fundamental theorem of algebra, rational root theorem	**Vocabulary:**

Topic: 3 Rational Functions
Subject(s): Math

Days: 35
Grade(s): 11th, 12th

Know:	Understand:	Do:
Graph Rational Functions Use rational functions to model and solve real life problems	How to find asymptotes and other discontinuities of rational graphs How to determine Domain and Range of rational functions	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs. CC.2.2.HS.D.5 Use polynomial identities to solve problems. CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.C.6 Interpret functions in terms of situations they model.

Curriculum: CCSD CURRICULUM

Course: Precalculus 2021-2022

Topic: 3 Rational Functions **Days:** 15

Subject(s): Math

Key Learning:

How to find asymptotes and other discontinuities of rational functions

How to the find the Domain and Range of rational functions.

Unit Essential Question(s): **How do I graph rational functions and use them to model real life problems?**

Concept: **Graphing rational functions**	**Concept:** **Real Life Applications**	**Concept:** **Domain and asymptotes of rational functions**
Lesson Essential Question(s): How do we identify the domains and asymptotes of graphs of rational functions? (A) What are the basic characteristics of a Rational Function? (A)	**Lesson Essential Question(s):** How do we use rational functions to model real life problems? (A)	**Lesson Essential Question(s):** What do we identify the domains and asymptotes of graphs of rational functions? (A)
Vocabulary:	**Vocabulary:**	**Vocabulary:**

Curriculum: CCSD CURRICULUM
Course: Precalculus

PENNSYLVANIA
Date: : 6/2022

Topic: 4 Exponential & Logarithmic Functions
Subject(s): Math

Days: 35
Grade(s): 11th, 12th

Know:	Understand:	Do:
Graphs of exponential functions Properties of exponentials Asymptote Inverses Properties of Logarithms Logarithmic equations Definition of a logarithm Graphing Logarithmic Functions Applications of Exponential and Logarithmic Functions	To graph an exponential function To interpret the key characteristics of the graphs of exponential functions To use the properties of exponents to solve exponential equations To use the properties of logarithms to solve exponential and logarithmic equations To evaluate logarithms To solve applications of exponential and logarithmic functions	CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems. CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable. CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method. CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/ inequalities algebraically and graphically CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find teh inverses of functions. CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems. CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.

Curriculum: CCSD CURRICULUM

Course: Precalculus 2021-2022

Days: 35

Topic: 4 Exponential & Logarithmic Functions

Subject(s): Math

Key Learning:

What are the characteristics of the graph of an exponential function?

What are the characteristics of the graph of a logarithmic function?

What are the areas of application for both types of functions?

Unit Essential Question(s):

How do we use exponential and logarithmic functions to model real life application problems?

Concept:	Concept:	Concept:
Review Graphing of Exponential Functions	**Graphing Logarithmic Functions**	**Applications of Exponential and Logarithmic Functions**
Lesson Essential Question(s): What are the basic characteristics of an exponential function? (A)	**Lesson Essential Question(s):** what are the basic characteristics of a logarithmic function? (A) How are exponential and logarithmic functions related? (A)	**Lesson Essential Question(s):** What are the five most common models involving exponential or logarithmic functions? (A)
Vocabulary:	**Vocabulary:**	**Vocabulary:**

Concept:

Solving Exponential and Logarithmic Equations

Lesson Essential Question(s):
How do we solve exponential and logarithmic equations? (A)

How do we use the properties of logarithms tosolve logarithmic equations? (A)

Vocabulary:

Topic: 5 Trigonometric Functions
Subject(s): Math
Days: 55
Grade(s): 11th, 12th

Know:	Understand:	Do:
Definitions of the 6 trigonometric functions Graph of the 6 trigonometric functions Radian measure Arclength and Area of a sector Law of Sines Law of Cosines Heron's Formula Area of Triangles Trigonometric Identities	Measuring angles in degrees and radians. Interpreting the graphs of the 6 trigonometric functions Evaluating the six trigonometric functions Evaluating inverse trigonometric functions To solve triangles To find the area of triangles Solving trigonometric equations using identities Proving and Verifying trigonometric identities Applications and Modeling	CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. CC.2.2.HS.C.6 Interpret functions in terms of the situations they model. CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions. CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs. CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

Course/Subject: Precalculus

Length of instruction: 55 Days

Curriculum: CCSD HS PA

Date: 2021-2022

Topic: Unit 5 Trigonometric Functions

Unit Essential Question:

What are the properties of trigonometric functions and their graphs?

Concept:	***Concept:***	***Concept:***
Radians, Degrees and the Unit Circle	How do we evaluate the six trigonometric functions?	Graphing Trigonometric Functions and their inverses.
Lesson Essential Question/s:	***Lesson Essential Question/s:***	***Lesson Essential Question/s:***
How do you describe angles and angular movement? (A) How do you use the arc length formula to find angular velocity and linear velocity? (A)	How do we find the exact values of the six trigonometric functions given a point on the terminal side of the angle? (A) How do we find the six trigonometric functions given the measure of an angle in degrees or radians?	How do you sketch the graphs of the six trigonometric functions? (A) What are the characteristics of the inverse trigonometric function and their graphs? (A) How do we identify the characteristics of a trigonometric function including the domain, range and asymptotes? (A) How do we evaluate inverse trigonometric expressions? (A)
Vocabulary:	***Vocabulary:***	***Vocabulary:***
Radians, Angular Velocity, Linear Velocity, Arc Length, Coterminal, Initial ray, Terminal ray	Sine, Cosine, Tangent, Secant, Cosecant, Cotangent.	Inverse, Domain, Range, Vertical Line Test, Horizontal Line Test.

Course/Subject: Precalculus | Length of instruction: 55 Days

Curriculum: CCSD HS PA | Date: 2021-2022

Topic: Unit 5 Trigonometric Functions

Concept:	***Concept:***	***Concept:***
Solving Trigonometric equations	Applications of Trigonometric Functions	Area of Triangles
Lesson Essential Question/s:	***Lesson Essential Question/s:***	***Lesson Essential Question/s:***
How do you solve trigonometric equations written inquadratic form or containing more than one angle? (A) How do you simplify expressions and solve equationsthat contain sums or differences of angles? (A) How do you rewrite trigonometric expressions that contain functions of multiple or half angles or functions that involve squares or products of trigonometric expressions? (A)	What are the real life problems involving righttriangles? (A) How do I solve problems involving harmonicmotions? (A) How do we use trigonometry to solve problemsinvolving directional bearings? (A)	How do we calculate the area of ALL triangles? (A)
Vocabulary:	***Vocabulary:***	***Vocabulary:***
Trigonometric half angles and multiple angles	Angle of elevation, angle of depression.Nautical miles.	Heron's Formula