

## WARREN COUNTY SCHOOL DISTRICT

### PLANNED INSTRUCTION

#### **COURSE DESCRIPTION**

**Course Title:** Pre-Calculus CP

**Course Number:** 00270

**Course Prerequisites:** Recommended Grade of 75% or higher in Algebra I CP, Algebra II CP, and Geometry CP

**Course Description:** Pre-Calculus College Preparatory is an academic course designed to solidify the fundamental concepts of high school algebra and geometry. Major topics include functions and their graphs, polynomial and rational functions, conics, exponential and logarithmic functions, trigonometric functions, and analytic trigonometry. District marking period assessments and final exam required.

**Suggested Grade Level:** Grades 11-12

**Length of Course:** Two Semesters

**Units of Credit:** 1

**PDE Certification and Staffing Policies and Guidelines (CSPG) Required Teacher Certifications:**

CSPG Mathematics #50 (7-12)

To find the CSPG information, go to [CSPG](#)

**Certification verified by the WCSD Human Resources Department:** ☒ Yes ☐ No

#### **WCSD STUDENT DATA SYSTEM INFORMATION**

**Course Level:** Academic

**Mark Types:** Check all that apply.

☒ F – Final Average ☒ MP – Marking Period ☒ EXM – Final Exam

**GPA Type:** ☐ GPAEL-GPA Elementary ☐ GPAML-GPA for Middle Level ☒ NHS-National Honor Society

☒ UGPA-Non-Weighted Grade Point Average ☒ GPA-Weighted Grade Point Average

**State Course Code:** 02110

To find the State Course Code, go to [State Course Code](#), download the Excel file for SCED, click on SCED 6.0 tab, and choose the correct code that corresponds with the course.

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#### **TEXTBOOKS AND SUPPLEMENTAL MATERIALS**

##### **Board Approved Textbooks, Software, and Materials:**

**Title:** *Pre-Calculus with Limits: A Graphing Approach with CalcChat and CalcView, 8e*  
**Publisher:** Cengage Learning  
**ISBN #:** 978-1-337-90428-5  
**Copyright Date:** 2020  
**WCSD Board Approval Date:** 6/29/2020

**Supplemental Materials:** Kuta Software, pdesas.org, Khan Academy, Desmos, TI-89 Titanium Graphing Calculator

#### **Curriculum Document**

##### **WCSD Board Approval:**

**Date Finalized:** 5/23/2022  
**Date Approved:** 6/13/2022  
**Implementation Year:** 2022-2023

#### **SPECIAL EDUCATION, 504, and GIFTED REQUIREMENTS**

The teacher shall make appropriate modifications to instruction and assessment based on a student's Individual Education Plan (IEP), Chapter 15 Section 504 Plan (504), and/or Gifted Individual Education Plan (GIEP).

## **SCOPE AND SEQUENCE OF CONTENT, AND CONCEPTS**

### **Marking Period 1: Polynomial and Rational Functions**

- Quadratic Functions
- Polynomial Functions of Higher Degree
- Real Zeros of Polynomial Functions
- Complex Numbers
- The Fundamental Theorem of Algebra
- Review: Operations with Rational Functions
- Rational Functions and Asymptotes
- Graphs of Rational Functions
- Quadratic Models
- Marking Period 1 Review and Assessment

### **Marking Period 2: Exponential and Logarithmic Functions, and Trigonometric Functions**

- Exponential Functions and Their Graphs
- Logarithmic Functions and Their Graphs
- Properties of Logarithms
- Exponential and Logarithmic Equation: Solving
- Exponential and Logarithmic Models
- Nonlinear Models
- Radian and Degree Measure
- Trigonometric Functions: The Unit Circle
- Mid-Term Review and Assessment

### **Marking Period 3: Trigonometric Functions and Analytic Trigonometry: Identities**

- Right Triangle Trigonometry
- Trigonometric Functions of Any Angle
- Graphs of Sine and Cosine Functions
- Graphs of Other Trigonometric Functions
- Inverse Trigonometric Functions
- Applications and Models of Trigonometric Functions
- Fundamental Identities
- Verification of Trigonometric Identities
- Marking Period 3 Review and Assessment

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**Marking Period 4: Analytic Trigonometry, Law of Sines, Law of Cosines, and Analytic Geometry**

- Trigonometric Equations
- Sum and Difference Formulas
- Multiple-Angle and Product-to-Sum Formulas
- Law of Sines
- Law of Cosines
- Circles and Parabolas
- Ellipses
- Hyperbolas
- Final Exam Review and Assessment

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**Standards/Eligible Content and Skills**

<b>Performance Indicator</b>	<b>PA Core Standard and/or Eligible Content</b>	<b>Marking Period Taught</b>
Analyze graphs of quadratic functions	CC.2.2.HS.C.5 CC.2.2.HS.D.7 CC.2.2.HS.D.10	MP1
Write quadratic functions in standard form and use the results to sketch graphs of functions	CC.2.2.HS.D.10	MP1
Find minimum and maximum values of quadratic functions in real-world and mathematical problems	CC.2.2.HS.C.6 F-IF.7A	MP1
Use transformations to sketch graphs of polynomial functions	CC.2.2.HS.C.4 F-BF.3	MP1
Use the Leading Coefficient Test to graph end behavior of polynomial functions	F-IF.7C	MP1
Find and use zeros of polynomial functions as sketching aides	CC.2.2.HS.D.4 F-IF.7C	MP1
Use the Intermediate Value Theorem to locate zeros of polynomial functions	CC.2.2.HS.D.4	MP1
Use long division to divide polynomials by other polynomials	CC.2.2.HS.D.3 A-APR.6	MP1
Use synthetic division to divide polynomials by binomials	CC.2.2.HS.D.3 A-APR.2	MP1
Use the remainder and factor theorems	CC.2.2.HS.D.3 A-APR.2	MP1
Use the Rational Zero Test to determine possible rational zeros of polynomial functions	CC.2.2.HS.D.3	MP1
Use the Descartes' Rules of Signs and the upper and lower bounds to find real zeros of polynomials	CC.2.2.HS.D.3	MP1
Use the imaginary unit $i$ to write complex numbers	CC.2.1.HS.F.6	MP1
Add, subtract, and multiply complex numbers	CC.2.1.HS.F.6	MP1
Use complex conjugates to write the quotient of two complex numbers in standard form	CC.2.1.HS.F.6	MP1
Find the complex solutions of quadratic equations	CC.2.1.HS.F.7	MP1
Use the Fundamental Theorem of Algebra to determine the number of zeros of a polynomial function	CC.2.2.HS.D.4	MP1
Find all zeros of polynomial functions	CC.2.2.HS.D.4	MP1
Find conjugate pairs of complex zeros	CC.2.2.HS.D.4	MP1
Find zeros of polynomials by factoring	CC.2.2.HS.D.4	MP1
Review: Rational Functions: Add, Subtract, Multiply, Divide	CC.2.2.HS.D.6 A-APR.6	MP1
Find the domains of rational functions	F-IF.5 F-IF.7	MP1
Find the vertical and horizontal asymptotes of rational functions	CC.2.2.HS.C.2 F-IF.7      F-IF.7D	MP1

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Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Use rational functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.2 CC.2.2.HS.C.6	MP1
Analyze and sketch graphs of rational functions	CC.2.2.HS.C.2 F-IF.7	MP1
Sketch graphs of rational functions that have slant asymptotes	F-IF.7 F-IF.7D	MP1
Use graphs of rational functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7	MP1
Classify quadratic scatterplots	CC.2.2.HS.C.5 S-ID.6	MP1
Use a graphing utility to find quadratic models of data from a scatterplot	CC.2.2.HS.C.6 S-ID.6	MP1
Determine the quadratic model that best fits a set of data	CC.2.2.HS.C.6 S-ID.6	MP1
<b>Marking Period 1 Review and Assessment</b>		MP1
<ul style="list-style-type: none"> <li>Review and extend knowledge of Polynomial and Rational Functions</li> </ul>		MP1
Recognize and evaluate exponential functions with base a	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-LE.4	MP2
Graph exponential functions with base a	F-IF.7E	MP2
Recognize, evaluate, and graph exponential functions with base e	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7E F-LE.4	MP2
Use exponential functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6	MP2
Recognize and evaluate logarithmic functions with base a	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-LE.4	MP2
Graph logarithmic functions with base a	F-IF.7E	MP2
Recognize, evaluate, and graph natural logarithmic functions	CC.2.2.HS.C.2 CC.2.2.HS.C.6 F-IF.7E F-LE.4	MP2
Use logarithmic functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6	MP2
Rewrite logarithms with different bases	CC.2.2.HS.D.2 F-BF.5	MP2
Use properties of logarithms to evaluate/review logarithmic expressions	CC.2.2.HS.D.2 F-BF.5	MP2
Use properties of logarithms to expand /condense logarithmic expressions	CC.2.2.HS.D.2 F-BF.5	MP2

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<b>Performance Indicator</b>	<b>PA Core Standard and/or Eligible Content</b>	<b>Marking Period Taught</b>
Use logarithmic functions to model and solve real-world and mathematical problems	CC.2.2.HS.C.5 CC.2.2.HS.C.6 F-BF.5	MP2
Solve simple exponential and logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Solve more complicated exponential equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Solve more complicated logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.D.2	MP2
Model and solve real-world and mathematical problems using exponential and logarithmic equations	CC.2.2.HS.C.5 CC.2.2.HS.C.6 CC.2.2.HS.D.2	MP2
Recognize the five most common types of models of exponential and logarithmic functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying exponential growth and exponential decay functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying Gaussian functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying logistic growth functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Model and solve real-world and mathematical problems applying logarithmic functions	CC.2.2.HS.C.6 F-IF.8B	MP2
Classify exponential and logarithmic scatterplots	CC.2.2.HS.C.5 S-ID.6	MP2
Use a graphing utility to find exponential and logarithmic models of data from a scatterplot	CC.2.2.HS.C.6 S-ID.6A	MP2
Determine the exponential or logarithmic model that best fits a set of data	CC.2.2.HS.C.6 S-ID.6A	MP2
Use a graphing utility to find exponential and logistic models for data	CC.2.2.HS.C.6 S-ID.6	MP2
Describe angles	G-CO.1	MP2
Use radian measure	F-TF.1	MP2
Use degree measure and convert between degrees and radians	F-TF.1	MP2
Model and solve real-world and mathematical problems using angles	CC.2.3.HS.A.14	MP2
Identify and describe the unit circle and its relationship to real numbers	CC.2.2.HS.C.7 F-TF.2	MP2
Evaluate trigonometric functions using the unit circle	CC.2.2.HS.C.7 F-TF.2	MP2
Use the domain and period to evaluate sine and cosine functions	CC.2.2.HS.C.7 F-TF.3	MP2

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<b>Performance Indicator</b>	<b>PA Core Standard and/or Eligible Content</b>	<b>Marking Period Taught</b>
Use a calculator to evaluate trigonometric functions	F-TF.7	MP2
<b>Mid-Term Review and Assessment</b>		MP2
<ul style="list-style-type: none"> <li>Review and extend knowledge of Polynomial and Rational Functions</li> </ul>		MP2
<ul style="list-style-type: none"> <li>Review and extend knowledge of Exponential and Logarithmic Functions</li> </ul>		MP2
<ul style="list-style-type: none"> <li>Review and extend knowledge of Trigonometric Functions</li> </ul>		MP2
Evaluate trigonometric functions of acute angles and use a calculator to evaluate trigonometric functions	CC.2.3.HS.A.7 F-TF.3	MP3
Use the fundamental trigonometric identities	CC.2.2.HS.C.9 CC.2.3.HS.A.7 F-TF.3	MP3
Model and solve real-world and mathematical problems applying trigonometric identities	CC.2.2.HS.C.9 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP3
Evaluate trigonometric functions of any angle	CC.2.2.HS.C.9 F-TF.2      G-SRT.8	MP3
Find reference angles	CC.2.2.HS.C.1 CC.2.2.HS.C.9 F-TF.2 G-SRT.8	MP3
Evaluate trigonometric functions of real numbers	CC.2.2.HS.C.9 F-TF.2 G-SRT.8	MP3
Sketch the graphs of basic sine and cosine functions	CC.2.2.HS.C.8 F-IF.7	MP3
Use the amplitude and period to sketch the graphs of the sine and cosine functions	CC.2.2.HS.C.8 F-IF.7      F-TF.5	MP3
Sketch translations of the graphs of sine and cosine functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-BF.3      F-IF.7 F-TF.5	MP3
Use sine and cosine functions to model real-world data	CC.2.2.HS.C.8 CC.2.3.HS.A.14 F-TF.5      G-SRT.8	MP3
Sketch the graph of tangent functions	CC.2.2.HS.C.8 F-IF.7      F-TF.5	MP3
Sketch the graph of cotangent functions	CC.2.2.HS.C.8 F-IF.7      F-TF.5	MP3
Sketch the graph of secant and cosecant functions	CC.2.2.HS.C.8 F-IF.7 F-TF.5	MP3



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Performance Indicator	PA Core Standard and/or Eligible Content	Marking Period Taught
Evaluate and graph inverse sine functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.5 F-TF.6	MP3
Evaluate and graph the other inverse trigonometric functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.5 F-TF.6	MP3
Evaluate composition of trigonometric functions	CC.2.2.HS.C.4 CC.2.2.HS.C.8 F-TF.6	MP3
Solve real-world and mathematical problems involving right triangles	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP3
Solve real-world and mathematical problems involving directional bearings	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP3
Solve real-world and mathematical problems involving harmonic motion	CC.2.2.HS.C.3 CC.2.3.HS.A.7 CC.2.3.HS.A.14 G-SRT.8	MP3
Recognize and write the Fundamental Trigonometric Identities	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3
Use the Fundamental Trigonometric Identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3
Verify trigonometric identities	CC.2.2.HS.C.1 CC.2.2.HS.C.6 F-TF.8	MP3
<b>Marking Period 3 Review and Assessment</b>		MP3
<ul style="list-style-type: none"> <li>Review and extend knowledge of Trigonometric Functions</li> </ul>		MP3
<ul style="list-style-type: none"> <li>Review and extend knowledge of Analytic Trigonometry: Identities</li> </ul>		MP3
Use standard algebraic techniques to solve trigonometric equations	CC.2.2.HS.D.10 F-TF.7	MP4
Solve trigonometric equations of the quadratic type	CC.2.2.HS.D.10 F-TF.7	MP4
Solve trigonometric equations involving multiple angles	CC.2.2.HS.D.10 F-TF.7	MP4
Use inverse trigonometric functions to solve trigonometric equations	CC.2.2.HS.C.1 F-TF.7	MP4

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<b>Performance Indicator</b>	<b>PA Core Standard and/or Eligible Content</b>	<b>Marking Period Taught</b>
Use the sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP4
Use multiple-angle formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP4
Use power-reducing formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP4
Use half-angle formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP4
Use product-to-sum and sum-to-product formulas to rewrite and evaluate trigonometric functions	CC.2.2.HS.C.1 CC.2.2.HS.D.2 F-TF.9	MP4
Use the Law of Sines to solve oblique triangles: AAS, ASA, SSA	CC.2.3.HS.A.14 G-SRT.10	MP4
Find areas of oblique triangles	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP4
Model and solve real-world and mathematical problems applying the Law of Sines	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP4
Use the Law of Cosines to solve oblique triangles: SSS, SAS	CC.2.3.HS.A.14 G-SRT.10	MP4
Model and solve real-world and mathematical problems applying the Law of Cosines	CC.2.3.HS.A.14 G-SRT.10 G-SRT.11	MP4
Use Heron's Area Formula to find the area of triangles	CC.2.3.HS.A.14	MP4
Recognize a conic as the intersection of a plane and a double-napped cone	G-GMD.4	MP4
Write equations of circles in standard form	CC.2.3.HS.A.10 G-GPE.1	MP4
Write equations of parabolas in standard form	CC.2.3.HS.A.10 G-GPE.2	MP4
Use the reflective property of parabolas to solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.2	MP4
Write equations of ellipses in standard form	CC.2.3.HS.A.10 G-GPE.3	MP4
Use properties of ellipses to model and solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.3	MP4
Find eccentricities of ellipses	CC.2.3.HS.A.10 G-GPE.3	MP4

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<b>Performance Indicator</b>	<b>PA Core Standard and/or Eligible Content</b>	<b>Marking Period Taught</b>
Write equations of hyperbolas in standard form	CC.2.3.HS.A.10 G-GPE.3	MP4
Find asymptotes of and graph hyperbolas	CC.2.3.HS.A.10 G-GPE.3	MP4
Use properties of hyperbolas to solve real-world and mathematical problems	CC.2.3.HS.A.10 CC.2.3.HS.A.14 G-GPE.3	MP4
Classify conics from their general equations	CC.2.3.HS.A.10	MP4
<b>Final Exam Review and Assessment</b>		MP4
<ul style="list-style-type: none"> <li>Review and extend knowledge of Trigonometric Functions</li> </ul>		MP4
<ul style="list-style-type: none"> <li>Review and extend knowledge of Analytic Trigonometry</li> </ul>		MP4
<ul style="list-style-type: none"> <li>Review and extend knowledge of the Law of Sines and the Law of Cosines</li> </ul>		MP4
<ul style="list-style-type: none"> <li>Review and extend knowledge of topics in Analytic Geometry</li> </ul>		MP4

## **ASSESSMENTS**

**PDE Academic Standards, Assessment Anchors, and Eligible Content:** The teacher must be knowledgeable of the PDE Academic Standards, Assessment Anchors, and Eligible Content and incorporate them regularly into planned instruction.

**Formative Assessments:** The teacher will utilize a variety of assessment methods to conduct in-process evaluations of student learning.

**Effective formative assessments for this course include:**

**Suggested but not limited to:**

- Pre-assessments of prior knowledge (e.g., Entrance cards or KWL chart)
- Bellringers/Problems of the Day (PODs)
- Discussions
- Exit ticket
- Teacher observations/Questioning
- Graphic organizers (e.g., Venn Diagrams, word mapping, webbing, KWL chart, etc.)
- Outlining
- Cooperative learning
- Written work
- Quizzes
- Oral response
- Self-evaluation
- Homework
- Summarizing
- Note-taking

**Summative Assessments:** The teacher will utilize a variety of assessment methods to evaluate student learning at the end of an instructional task, lesson, and/or unit.

**Effective summative assessments for this course include:**

**Suggested but not limited to:**

- Performance assessment
- Chapter/unit tests
- Quizzes
- Marking period assessments
- Mid-Term exam
- Final exam
- Projects
- Student presentations