

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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PLANNED INSTRUCTION

Standards/Eligible Content and Skills

| Performance Indicator | PA Core Standard and/or Eligible Content | Marking Period Taught |
|--|--|------------------------------|
| 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 |
| Marking Period 1 Review and Assessment | | MP1 |
| <ul style="list-style-type: none"> Review and extend knowledge of Polynomial and Rational Functions | | 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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| Performance Indicator | PA Core Standard and/or Eligible Content | Marking Period Taught |
|--|---|------------------------------|
| 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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| Performance Indicator | PA Core Standard and/or Eligible Content | Marking Period Taught |
|--|--|------------------------------|
| Use a calculator to evaluate trigonometric functions | F-TF.7 | MP2 |
| Mid-Term Review and Assessment | | MP2 |
| <ul style="list-style-type: none"> Review and extend knowledge of Polynomial and Rational Functions | | MP2 |
| <ul style="list-style-type: none"> Review and extend knowledge of Exponential and Logarithmic Functions | | MP2 |
| <ul style="list-style-type: none"> Review and extend knowledge of Trigonometric Functions | | 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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|---|---|------------------------------|
| 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 |
| Marking Period 3 Review and Assessment | | MP3 |
| <ul style="list-style-type: none"> Review and extend knowledge of Trigonometric Functions | | MP3 |
| <ul style="list-style-type: none"> Review and extend knowledge of Analytic Trigonometry: Identities | | 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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| Performance Indicator | PA Core Standard and/or Eligible Content | Marking Period Taught |
|---|---|------------------------------|
| 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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| Performance Indicator | PA Core Standard and/or Eligible Content | Marking Period Taught |
|--|---|------------------------------|
| 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 |
| Final Exam Review and Assessment | | MP4 |
| <ul style="list-style-type: none"> • Review and extend knowledge of Trigonometric Functions | | MP4 |
| <ul style="list-style-type: none"> • Review and extend knowledge of Analytic Trigonometry | | MP4 |
| <ul style="list-style-type: none"> • Review and extend knowledge of the Law of Sines and the Law of Cosines | | MP4 |
| <ul style="list-style-type: none"> • Review and extend knowledge of topics in Analytic Geometry | | 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