**COURSE DESCRIPTION**

**Course Title:** Honors Pre-Calculus

**Course Number:** 00271

**Course Prerequisites:** Recommended grade average of 80% of higher in Honors Algebra II and Honors Geometry.

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| **Course Description:** | Pre-Calculus Honors is an academic course designed primarily for students who plan to enter college and pursue a program of studies in mathematics or a mathematically related field such as engineering, accounting, or pre-medicine. We will study functions and graphs (linear, quadratic, polynomial, rational, exponential, logarithmic, and trigonometric), analytic trigonometry, and analytic geometry. It is strongly recommended that students planning to enroll in Calculus are first exposed to the rigors of Pre-Calculus. After successful completion of this course, it is recommended that students take Calculus or Advanced Placement Calculus.  |

**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:**

Mathematics #50

To find the CSPG information, go to [CSPG](https://www.education.pa.gov/Educators/Certification/Staffing%20Guidelines/Pages/default.aspx)

**Certification verified by the WCSD Human Resources Department:** [x] Yes [ ] No

**WCSD STUDENT DATA SYSTEM INFORMATION**

**Course Level:** Honors & Dual Enrollment (1) GPA +5%

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

[x] F – Final Average [x] MP – Marking Period [x] EXM – Final Exam

**GPA Type**: [ ]  GPAEL-GPA Elementary [ ]  GPAML-GPA for Middle Level [x]  NHS-National Honor Society

[x]  UGPA-Non-Weighted Grade Point Average [x]  GPA-Weighted Grade Point Average

**State Course Code**: 02110

To find the State Course Code, go to [State Course Code](https://nces.ed.gov/forum/sced.asp), download the Excel file for *SCED*, click on SCED 6.0 tab, and chose the correct code that corresponds with the course.

**TEXTBOOKS AND SUPPLEMENTAL MATERIALS**

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

**Title:**  Pre-Calculus with Limits: A Graphing Approach

**ISBN #:**  978-1-337-90428-5

**Copyright Date:** 2020

**WCSD Board Approval Date:** 6/29/2020

**Supplemental Materials:** Click or tap here to enter text.

**Curriculum Document**

**WCSD Board Approval:**

**Date Finalized:** 6/5/2020

**Date Approved:**  6/29/2020

**Implementation Year:** 2020-2021

**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, CONCEPTS, AND SKILLS**

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| **Performance Indicator** | **PA Core Standard and/or Eligible Content** | **Month Taught and Assessed for Mastery**  |
| Apply basic rules and properties of Algebra. | 2.1, 2.2 | AugustSeptember |
| Apply properties of exponents and radicals.  | 2.1, 2.2 | AugustSeptember |
| Factor polynomials. | 2.1, 2.2 | AugustSeptember |
| Simplify Rational Expressions and Functions. | 2.1, 2.2 | AugustSeptember |
| Solve linear equations.  |  2.2 | AugustSeptember |
| Solve multi-step linear inequalities.  |  2.2 | AugustSeptember |
| Solve quadratic equations | 2.2 | AugustSeptember |
| Find the slopes of lines.  | 2.2 | SeptemberOctober |
| Write linear equations given points on lines and their slopes.  | 2.2 | SeptemberOctober |
| Use slope intercept form of linear functions to sketch lines.  | 2.2 | SeptemberOctober |
| Use slopes to identify parallel and perpendicular lines.  | 2.2 | SeptemberOctober |
| Determine if a relation between two variables represents a function. | 2.2 | SeptemberOctober |
| Use function notation and evaluate functions.  | 2.2 | SeptemberOctober |
| Find the domain of functions.  | 2.2 | SeptemberOctober |
| Use functions to model and solve real like problems.  | 2.2 | SeptemberOctober |
| Evaluate difference quotients.  | 2.2 | SeptemberOctober |
| Find the domain and range of functions and use the vertical line test for functions.  | 2.2 | SeptemberOctober |
| Determine intervals on which functions are increasing, decreasing, or constant.  | 2.2 | SeptemberOctober |
| Determine relative minimums and relative maximums of functions.  | 2.2 | SeptemberOctober |
| Identify and graph step functions and other piece-wise defined functions.  | 2.2 | SeptemberOctober |
| Identify even and odd functions. | 2.2 | SeptemberOctober |
| Recognize graphs of parent functions. | 2.2 | SeptemberOctober |
| Use vertical and horizontal shifts to sketch graphs of functions.  | 2.2 | SeptemberOctober |
| Use reflections to sketch graphs of functions.  | 2.2 | SeptemberOctober |

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| Use non-rigid transformations to sketch graphs of functions.  | 2.2 | SeptemberOctober |
| Add, subtract, multiply, and divide functions.  | 2.2 | SeptemberOctober |
| Find compositions of one function with another function.  | 2.2 | SeptemberOctober |
| Use combinations of functions to model and solve real life problems. | 2.2 | SeptemberOctober |
| Find inverse functions informally and verify that two functions are inverse functions of each other.  | 2.2 | SeptemberOctober |
| Use graphs of functions to determine if functions have inverse functions.  | 2.2 | SeptemberOctober |
| Determine if functions are one to one.  | 2.2 | SeptemberOctober |
| Find inverse functions algebraically.  | 2.2 | SeptemberOctober |
| Construct scatterplots and interpret correlation.  | 2.2 | SeptemberOctober |
| Use scatterplots in a graphing utility to find linear models for data.  | 2.2 | SeptemberOctober |
| Analyze graphs of quadratics functions.  | 2.2 | OctoberNovember |
| Write quadratic functions in standard form and use the results to sketch graphs of functions.  | 2.2 | OctoberNovember |
| Find minimum and maximum values of quadratics functions in real life situations.  | 2.2 | OctoberNovember |
| Use transformations to sketch graphs of polynomial functions.  | 2.2 | OctoberNovember |
| Use the leading coefficient test to graph the end behavior of polynomial functions. | 2.2 | OctoberNovember |
| Find and use zeros of polynomial functions as sketching aides.  | 2.2 | OctoberNovember |
| Use the intermediate value theorem to help locate zeros of polynomial functions.  | 2.2 | OctoberNovember |
| Use long division to divide polynomials by other polynomials.  | 2.2 | OctoberNovember |
| Use synthetic division to divide polynomials by binomials. | 2.2 | OctoberNovember |
| Use the remainder and factor theorems.  | 2.2 | OctoberNovember |
| Use the rational zero test to determine possible rational zeros of polynomials functions  | 2.2 | OctoberNovember |
| Use Descartes’ Rules of signs and the upper and lower bounds to find real zeros of polynomials.  | 2.2 | OctoberNovember |
| Use the imaginary unit i to write complex numbers.  | 2.2 | OctoberNovember |
| Add, subtract, multiply, and divide complex numbers.  | 2.2 | OctoberNovember |
| Use complex conjugates to write the quotient of two complex numbers in standard form.  | 2.2 | OctoberNovember |
| Find complex solutions of quadratic equations.  | 2.2 | OctoberNovember |
| Use the fundamental theorem of algebra to determine the number of zeros of a polynomial function. | 2.2 | OctoberNovember |
| Find all zeros of polynomial functions. | 2.2 | OctoberNovember |
| Find conjugate pairs of complex zeros.  | 2.2 | OctoberNovember |
| Find zeros of polynomials by factoring.  | 2.2 | OctoberNovember |
| Find the domains of rational functions.  | 2.2 | OctoberNovember |
| Find vertical and horizontal asymptotes of rational functions.  | 2.2 | OctoberNovember |
| Use rational functions to model and solve real life problems.  | 2.2 | OctoberNovember |
| Analyze and sketch graphs of rational functions.  | 2.2 | OctoberNovember |
| Sketch graphs of rational functions that have slant asymptotes.  | 2.2 | OctoberNovember |
| Use graphs of rational functions to model and solve real life problems.  | 2.2 | OctoberNovember |
| Classify scatter plots. | 2.2 | OctoberNovember |
| Use scatter plots and a graphing utility to find quadratic models for data. | 2.2 | OctoberNovember |
| Choose a model that best fits a set of data. | 2.2 | OctoberNovember |
| Recognize and evaluate exponential functions with base a. | 2.2 | DecemberJanuary |
| Graph exponential functions with base a. | 2.2 | DecemberJanuary |
| Recognize and evaluate and graph exponential functions with base e. | 2.2 | DecemberJanuary |
| Use exponential functions to model and solve real life problems. | 2.2 | DecemberJanuary |
| Recognize and evaluate logarithmic functions with base a. | 2.2 | DecemberJanuary |
| Graph logarithmic functions with base a. | 2.2 | DecemberJanuary |
| Recognize, evaluate, and graph natural logarithmic functions. | 2.2 | DecemberJanuary |
| Use logarithmic functions to model and sole real life problems. | 2.2 | DecemberJanuary |
| Rewrite logarithms with different bases. | 2.2 | DecemberJanuary |
| Use properties of logarithms to evaluate or rewrite logarithmic expressions. | 2.2 | DecemberJanuary |
| Use properties of logarithms to expand or condense logarithmic expressions. | 2.2 | DecemberJanuary |
| Use logarithmic functions to model and solve real life problems. | 2.2 | DecemberJanuary |
| Solve simple exponential and logarithmic equations. | 2.2 | DecemberJanuary |
| Solve more complicated exponential equations. | 2.2 | DecemberJanuary |
| Solve more complicated logarithmic equations. | 2.2 | DecemberJanuary |
| Use exponential and logarithmic equations to model and solve real life problems. | 2.2 | DecemberJanuary |
| Recognize the five most common types of models involving exponential or logarithmic functions. | 2.2 | DecemberJanuary |
| Use exponential growth and decay functions to model and solve real life problems. | 2.2 | DecemberJanuary |
| Use Gaussian functions to solve and model real life problems.  | 2.2 | DecemberJanuary |
| Use logistic growth functions to model and solve real life problems.  | 2.2 | DecemberJanuary |
| Use logarithmic functions to model and solve real life problems.  | 2.2 | DecemberJanuary |
| Classify scatterplots.  | 2.2 | DecemberJanuary |
| Use scatterplots and a graph utility to find models for data and determine the model that best fits a set of data.  | 2.2 | DecemberJanuary |
| Use a graphing utility to find exponential and logistic models for data.  | 2.2 | DecemberJanuary |
| Describe angles.  | 2.3 | JanuaryFebruary |
| Use radian measure.  | 2.2 | JanuaryFebruary |
| Use degree measure and convert between degrees and radians.  | 2.2 | JanuaryFebruary |
| Use angles to model and solve real life problems.  | 2.3 | JanuaryFebruary |
| Identify the unit circle and describe its relationship to real numbers.  | 2.2 | JanuaryFebruary |
| Evaluate trigonometric functions using the unit circle.  | 2.2 | JanuaryFebruary |
| Use domain and period to evaluate sine and cosine functions.  | 2.2 | JanuaryFebruary |
| Use a calculator to evaluate trigonometric functions.  | 2.2 | JanuaryFebruary |
| Evaluate trigonometric functions of acute angles.  | 2.2 | JanuaryFebruary |
| Use fundamental trigonometric identities.  | 2.2 | JanuaryFebruary |
| Use trigonometric identities to solve and model real life problems.  | 2.2 | JanuaryFebruary |
| Evaluate trigonometric functions of any angle.  | 2.2 | JanuaryFebruary |
| Find reference angles.  | 2.2 | JanuaryFebruary |
| Evaluate trigonometric functions of real numbers.  | 2.2 | JanuaryFebruary |
| Sketch the graphs of basic sine and cosine functions.  | 2.2 | JanuaryFebruary |
| Use amplitude and period to sketch the graphs of sine and cosine functions.  | 2.2 | JanuaryFebruary |
| Sketch translations of graphs of sine and cosine functions.  | 2.2 | JanuaryFebruary |
| Use sine and cosine functions to model real life data.  | 2.2 | JanuaryFebruary |
| Sketch the graph of tangent functions.  | 2.2 | JanuaryFebruary |

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| Sketch the graph of cotangent functions.  | 2.2 | JanuaryFebruary |
| Sketch the graph of secant and cosecant functions.  | 2.2 | JanuaryFebruary |
|  Evaluate and graph inverse sine functions.  | 2.2 | JanuaryFebruary |
| Evaluate and graph other inverse functions.  | 2.2 | JanuaryFebruary |
| Evaluate composition of trigonometric functions. | 2.2 | JanuaryFebruary |
| Solve real life problems involving right triangles.  | 2.2, 2.3 | JanuaryFebruary |
| Solve real life problems involving directional bearings.  | 2.2 | JanuaryFebruary |
| Solve real life problems involving harmonic motion.  | 2.2 | JanuaryFebruary |
| Recognize and write the fundamental trigonometric identities. | 2.2 | FebruaryMarch |
| Use the fundamental trigonometric identities to evaluate trigonometric functions, simplify trigonometric expressions, and rewrite trigonometric expressions.  | 2.2 | FebruaryMarch |
| Verify trigonometric identities. | 2.2 | FebruaryMarch |
| Use standard algebraic techniques to solve trigonometric equations. | 2.2 | FebruaryMarch |
| Solve trigonometric equations of quadratic type. | 2.2 | FebruaryMarch |
| Solve trigonometric equations involving multiple angles. | 2.2 | FebruaryMarch |
| Use inverse trigonometric functions to solve trigonometric equations. | 2.2 | FebruaryMarch |
| Use sum and difference formulas to evaluate trigonometric functions, verify trigonometric identities, and solve trigonometric equations. | 2.2 | FebruaryMarch |
| Use multiple-angle formulas to rewrite and evaluate trigonometric functions. | 2.2 | FebruaryMarch |
| Use power-reducing formulas to rewrite and evaluate trigonometric functions. | 2.2 | FebruaryMarch |
| Use half-angle formulas to rewrite and evaluate trigonometric functions. | 2.2 | FebruaryMarch |
| Use product-to-sum and sum-to-product formulas to rewrite and evaluate trigonometric functions. | 2.2 | FebruaryMarch |
| Use the Law of Sines to solve oblique triangles. | 2.2 | March April |
| Find areas of oblique triangles and use the Law of Sines to model and solve real-life problems. | 2.2 | March April |
| Use the Law of Cosines to solve oblique triangles. | 2.2 | March April |
| Use the Law of Cosines to model and solve real-life problems. | 2.2 | March April |
| Use Heron’s Area Formula to find areas of triangles. | 2.2 | March April |

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| **THE FOLLOWING ARE OPTIONAL PERFORMANCE INDICATORS.** |  |  |
| Use the methods of substitution and graphing to solve systems of equations in two variables. | 2.2 | AprilMay |
| Use systems of equations to model and solve real-life problems. | 2.2 | AprilMay |
| Use the method of elimination to solve systems of linear equations in two variables. | 2.2 | AprilMay |
| Graphically interpret the number of solutions of a system of linear equations in two variables. | 2.2 | AprilMay |
| Use systems of linear equations in two variables to model and solve real-life problems. | 2.2 | AprilMay |
| Use back-substitution to solve linear systems in row-echelon form. | 2.2 | AprilMay |
| Use Gaussian elimination to solve systems of linear equations. | 2.2 | AprilMay |
| Solve non square systems of linear equations. | 2.2 | AprilMay |
| Graphically interpret three-variable linear systems. | 2.2 | AprilMay |
| Use systems of linear equations to write partial fraction decompositions of rational expressions. | 2.2 | AprilMay |
| Use systems of linear equations in three or more variables to model and solve real-life problems. | 2.2 | AprilMay |
| Write matrices and determine their dimensions. | 2.2 | AprilMay |
| Perform elementary row operations on matrices. | 2.2 | AprilMay |
| Use matrices and Gauss-Jordan elimination to solve systems of linear equations. | 2.2 | AprilMay |
| Decide whether two matrices are equal. | 2.2 | AprilMay |
| Add and subtract matrices and multiply matrices by scalars. | 2.2 | AprilMay |
| Multiply two matrices. | 2.2 | AprilMay |
| Use matrix operations to model and solve real-life problems. | 2.2 | AprilMay |
| Verify that two matrices are inverses of each other. | 2.2 | AprilMay |
| Use Gauss-Jordan elimination to find inverses of matrices. | 2.2 | AprilMay |
| Use a formula to find inverses of 2x2 matrices. | 2.2 | AprilMay |
| Use inverse matrices to solve systems of linear equations. | 2.2 | AprilMay |
| Find the determinants of 2x2 matrices. | 2.2 | AprilMay |
| Find the determinants of square matrices. | 2.2 | AprilMay |
| Recognize a conic as the intersection of a plane and a double-napped cone. | 2.2 | MayJune |
| Write equations of circles in standard form. | 2.2 | MayJune |
| Write equations of parabolas in standard form. | 2.2 | MayJune |
| Use the reflective property of parabolas to solve real-life problems. | 2.2 | MayJune |
| Write equations of ellipses in standard form. | 2.2 | MayJune |
| Use properties of ellipses to model and solve real-life problems. | 2.2 | MayJune |
| Find eccentricities of ellipses. | 2.2 | MayJune |
| Write equations of hyperbolas in standard form. | 2.2 | MayJune |
| Find asymptotes of and graph hyperbolas. | 2.2 | MayJune |
| Use properties of hyperbolas to solve real-life problems. | 2.2 | MayJune |
| Classify conics from their general equations. | 2.2 | MayJune |

**ASSESSMENTS**

**PSSA 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: Bell Ringers, Exit Ticket, Cooperative Learning, Observations, Written work, Quizzes, Oral response, Self-evaluation, Homework

**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, Tests