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| <b>Course Code</b>        | 1202340      |
| <b>Course Category</b>    | 6-12         |
| <b>Subject Area</b>       | Mathematics  |
| <b>Course Type</b>        | Core         |
| <b>Course Title</b>       | Pre-Calculus |
| <b>Course Level</b>       | 3            |
| <b>Course Length</b>      | Full Year    |
| <b>Credit Description</b> | 1            |
| <b>Abbreviated Title</b>  | Pre-Calculus |

**RELATED BENCHMARKS (53) :**

| Scheme        | Descriptor  |
|---------------|---|
| LA.1112.1.6.1 | The student will use new vocabulary that is introduced and taught directly;   |
| LA.1112.1.7.1 | The student will use background knowledge of subject and related content areas, prereading strategies (e.g., previewing, discussing, generating questions), text features, and text structure to make and confirm complex predictions of content, purpose, and organization of a reading selection; |
| LA.1112.1.7.4 | The student will identify cause-and-effect relationships in text;   |
| LA.1112.3.1.2 | The student will prewrite by making a plan for writing that addresses purpose, audience, a controlling idea, logical sequence, and time frame for completion; and   |
| LA.1112.3.1.3 | The student will prewrite by using organizational strategies and tools (e.g., technology, spreadsheet, outline, chart, table, graph, Venn Diagram, web, story map, plot pyramid) to develop a personal organizational style.  |
| LA.1112.3.2.2 | The student will draft writing by establishing a logical organizational pattern with supporting details that are substantial, specific, and relevant; and   |
| MA.912.A.4.5  | Graph polynomial functions with and without technology and describe end behavior.   |
| MA.912.A.4.6  | Use theorems of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, the Rational Root Theorem, Descartes' Rule of Signs, and the Conjugate Root Theorem) to find the zeros of a polynomial function.   |
| MA.912.A.4.7  | Write a polynomial equation for a given set of real and/or complex roots.   |
| MA.912.A.4.8  | Describe the relationships among the solutions of an equation, the zeros of a function, the x-intercepts of a graph, and the factors of a polynomial expression, with and without technology.   |
| MA.912.A.5.6  | Identify removable and non-removable discontinuities, and vertical, horizontal,   |

and oblique asymptotes of a graph of a rational function, find the zeros, and graph the function.

- MA.912.A.9.1 Write the equations of conic sections in standard form and general form, in order to identify the conic section and to find its geometric properties (foci, asymptotes, eccentricity, etc.).
- MA.912.A.9.2 Graph conic sections with and without using graphing technology.
- MA.912.A.9.3 Solve real-world problems involving conic sections
- MA.912.C.1.1 Understand the concept of limit and estimate limits from graphs and tables of values.
- MA.912.C.1.2 Find limits by substitution.
- MA.912.C.1.3 Find limits of sums, differences, products, and quotients.
- MA.912.C.1.4 Find limits of rational functions that are undefined at a point.
- MA.912.C.1.5 Find one-sided limits.
- MA.912.C.1.9 Understand continuity in terms of limits.
- MA.912.C.1.10 Decide if a function is continuous at a point.
- MA.912.C.1.11 Find the types of discontinuities of a function.
- MA.912.C.1.12 Understand and use the Intermediate Value Theorem on a function over a closed interval.
- MA.912.C.1.13 Understand and apply the Extreme Value Theorem: If  $f(x)$  is continuous over a closed interval, then  $f$  has a maximum and a minimum on the interval.
- MA.912.D.1.3 Use mathematical induction to prove various concepts in number theory (such as sums of infinite integer series, divisibility statements, and parity statements), recurrence relations, and other applications.
- MA.912.D.9.1 Demonstrate an understanding of the geometric interpretation of vectors and vector operations including addition, scalar multiplication, dot product and cross product in the plane and in three-dimensional space.
- MA.912.D.9.2 Demonstrate an understanding of the algebraic interpretation of vectors and vector operations including addition, scalar multiplication, dot product and cross product in the plane and in three-dimensional space.
- MA.912.D.9.3 Use vectors to model and solve application problems.
- MA.912.D.10.1 Sketch the graph of a curve in the plane represented parametrically, indicating the direction of motion.
- MA.912.D.10.2 Convert from a parametric representation of a plane curve to a rectangular equation, and vice-versa.
- MA.912.D.10.3 Use parametric equations to model applications of motion in the plane.
- MA.912.D.11.4 Find partial sums of arithmetic and geometric series, and find sums of infinite convergent geometric series. Use Sigma notation where applicable.

- MA.912.T.1.1 Convert between degree and radian measures.
- MA.912.T.1.2 Define and determine sine and cosine using the unit circle.  
State and use exact values of trigonometric functions for special angles, i.e.
- MA.912.T.1.3 multiples of  $\frac{\pi}{6}$  and  $\frac{\pi}{4}$  (degree and radian measures)
- MA.912.T.1.4 Find approximate values of trigonometric and inverse trigonometric functions using appropriate technology.
- MA.912.T.1.5 Make connections between right triangle ratios, trigonometric functions, and circular functions.
- MA.912.T.1.6 Define and graph trigonometric functions using domain, range, intercepts, period, amplitude, phase shift, vertical shift, and asymptotes with and without the use of graphing technology.
- MA.912.T.1.7 Define and graph inverse trigonometric relations and functions.
- MA.912.T.1.8 Solve real-world problems involving applications of trigonometric functions using graphing technology when appropriate.
- MA.912.T.2.1 Define and use the trigonometric ratios (sine, cosine, tangent, cotangent, secant, cosecant) in terms of angles of right triangles.
- MA.912.T.2.2 Solve real-world problems involving right triangles using technology when appropriate.
- MA.912.T.2.3 Apply the laws of sines and cosines to solve real-world problems using technology.
- MA.912.T.2.4 Use the area of triangles given two sides and an angle or three sides to solve real-world problems.
- MA.912.T.3.1 Verify the basic Pythagorean identities, e.g.,  $\sin^2 x + \cos^2 x = 1$ , and show they are equivalent to the Pythagorean Theorem.
- MA.912.T.3.2 Use basic trigonometric identities to verify other identities and simplify expressions.
- MA.912.T.3.3 Use the sum and difference, half-angle and double-angle formulas for sine, cosine, and tangent, when formulas are provided.
- MA.912.T.3.4 Solve trigonometric equations and real-world problems involving applications of trigonometric equations using technology when appropriate.
- MA.912.T.4.1 Define polar coordinates and relate polar coordinates to Cartesian coordinates with and without the use of technology.
- MA.912.T.4.2 Represent equations given in rectangular coordinates in terms of polar coordinates.
- MA.912.T.4.3 Graph equations in the polar coordinate plane with and without the use of graphing technology.

- MA.912.T.4.4 Define the trigonometric form of complex numbers, convert complex numbers to trigonometric form, and multiply complex numbers in trigonometric form.
- MA.912.T.4.5 Apply DeMoivre's Theorem to perform operations with complex numbers.