

# PRE-CALCULUS

<b>Numbers and Operations Standard:</b> Understands and applies concepts of numbers and operations.				
<b>Power Benchmark 1:</b> Understands numbers, ways of representing numbers, relationships among numbers, and number systems				
Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Understands basic counting techniques	<ul style="list-style-type: none"> <li>• Multiplication principle</li> <li>• Factorial</li> <li>• Permutation</li> <li>• Combination</li> </ul>	<ul style="list-style-type: none"> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• Uses the multiplication principles to solve problems -</li> <li>• Uses permutations and combinations to solve problems</li> </ul>	
b. Explores sequences and series	<ul style="list-style-type: none"> <li>• Infinite sequence</li> <li>• Finite sequence</li> <li>• Recursive formula</li> <li>• Summation</li> <li>• Arithmetic sequence</li> <li>• Geometric sequence</li> <li>• Arithmetic means</li> <li>• Geometric means</li> <li>• Common difference</li> </ul>	<ul style="list-style-type: none"> <li>• Knows basic operations</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluates the first n terms of a arithmetic and geometric sequence</li> <li>• Evaluates the sum for and arithmetic and geometric series</li> <li>• Evaluates the arithmetic and geometric means -</li> </ul>	

<b>Algebra Standard:</b> Understands and applies concepts of algebra and functions				
<b>Power Benchmark 1:</b> Understands patterns, relations and functions.				
a. <u>Recognizes patterns and relationships of periodic functions</u>	<ul style="list-style-type: none"> <li>• Periodic Function</li> <li>• Domain</li> <li>• Range</li> <li>• Phase and Vertical Shift</li> <li>• Dilation</li> <li>• Amplitude</li> <li>• Period</li> <li>• Asymptote</li> <li>• Inverse Trig Function</li> </ul>	<ul style="list-style-type: none"> <li>• Knows the unit circle.</li> </ul>	<ul style="list-style-type: none"> <li>• Represents the six trig functions graphically -</li> </ul>	

**Algebra Standard:** Understands and applies concepts of algebra and functions

**Power Benchmark 3:** Uses mathematical models to represent and understand quantitative relationships

Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
<p>a. Uses <u>linear or quadratic equations as a mathematical model</u></p>	<ul style="list-style-type: none"> <li>• Mathematical model</li> <li>• Field properties</li> <li>• Properties of Equality</li> <li>• Relation</li> <li>• Function</li> <li>• Domain</li> <li>• Range</li> <li>• One-to-one function</li> <li>• Composite function</li> <li>• Inverse Function</li> <li>• Absolute Value Function</li> <li>• Greatest Integer Function</li> <li>• Increasing Function</li> <li>• Decreasing Function</li> <li>• Constant Function</li> <li>• Piecewise Function</li> </ul>	<ul style="list-style-type: none"> <li>• Knows the Cartesian Coordinate System</li> <li>• Knows the Quadratic Formula</li> <li>• Knows Slope-intercept form</li> <li>• Knows Point-slope form</li> <li>• Recognizes linear functions</li> <li>• Recognizes quadratic functions</li> </ul>	<ul style="list-style-type: none"> <li>• Represents linear and quadratic functions graphically -</li> <li>• Identifies the domain and range of a function -</li> <li>• Uses the vertical and horizontal line test -</li> <li>• Determines the sum, difference, product, sum, and composition of functions -</li> <li>• Graphs special functions -</li> </ul>	
<p>b. Uses formulas to evaluate trig functions and uses algebraic techniques in solving trig equations</p>	<ul style="list-style-type: none"> <li>• Sum Identity</li> <li>• Difference Identity</li> <li>• Double-Angle Identity</li> <li>• Half-Angle Identity</li> <li>• Conditional equation</li> <li>• Identity equation</li> </ul>	<ul style="list-style-type: none"> <li>• Knows how to factor</li> <li>• Knows the unit circle</li> <li>• Simplifies a complex fraction</li> </ul>	<ul style="list-style-type: none"> <li>• Solves a trig equation -</li> <li>• Determines exact value for a trig expression. -</li> </ul>	

<b>Algebra Standard:</b> Understands and applies concepts of algebra and functions				
<b>Power Benchmark 4:</b> Analyzes change in a variety of situations				
<b>Course Level Benchmark</b>	<b>Vocabulary</b>	<b>Background Knowledge/Prior Skills</b>	<b>Skills to Assess</b>	
a. Solves problems using exponential and logarithmic equations	<ul style="list-style-type: none"> <li>Exponential and Logarithmic Function</li> <li>Common logarithmic function</li> <li>Exponential growth and decay</li> <li>Natural log function</li> </ul>	<ul style="list-style-type: none"> <li>Knows the properties of rational exponents</li> <li>Identifies increasing/decreasing functions</li> <li>Identifies domain, range, intercepts, and asymptotes</li> <li>Understands concepts of inverse functions</li> </ul>	<ul style="list-style-type: none"> <li>Simplifies expressions with rational exponents -</li> <li>Graphs exponential and logarithmic equations -</li> <li>Solves exponential and logarithmic equations -</li> </ul>	

<b>Geometry Standard:</b> Understands and applies concepts of geometry.				
<b>Power Benchmark 1:</b> Analyzes characteristics and properties of two- and three-dimensional geometric shapes and develops mathematical arguments about geometric relationships.				
a. Graphs and identifies the critical parts of the four conic sections	<ul style="list-style-type: none"> <li>Circle</li> <li>Ellipse</li> <li>Hyperbola</li> <li>Conic Sections</li> <li>Parabola</li> <li>Foci</li> <li>Degenerate circle</li> <li>Radius</li> <li>Eccentricity</li> <li>Major and minor axes</li> <li>Vertices</li> <li>Asymptotes</li> <li>Conjugate and transverse axes</li> <li>Axis of symmetry</li> <li>Directrix</li> <li>Latus rectum</li> </ul>	<ul style="list-style-type: none"> <li>Computes distance from a point to a line</li> <li>Uses the distance and midpoint formulas</li> <li>Completes the square</li> <li>Solves a system of equations with 3 variables</li> <li>Uses the quadratic formula</li> </ul>	<ul style="list-style-type: none"> <li>Identifies each conic section from an equation -</li> <li>Writes each conic section in standard and general form. -</li> <li>Writes each conic section in standard and general form. -</li> </ul>	

**Geometry Standard:** Understands and applies concepts of geometry.

**Power Benchmark 2:** Specifies locations and describes spatial relationships using coordinate geometry and other representational systems

Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
<p>a. <u>Defines the 6 trig functions and uses the unit circle to determine their exact values.</u></p>	<ul style="list-style-type: none"> <li>• Coterminal <math>\angle</math>'s</li> <li>• Initial side</li> <li>• Standard Position</li> <li>• Terminal Side</li> <li>• Clockwise rotation</li> <li>• Counterclockwise rotation</li> <li>• Degrees Minutes Seconds Notation</li> <li>• Radian</li> <li>• Angular Velocity</li> <li>• Linear Velocity</li> <li>• Sine</li> <li>• Cosine</li> <li>• Reference <math>\Delta</math></li> <li>• Tangent</li> <li>• Cotangent</li> <li>• Cosecant</li> <li>• Secant</li> <li>• Quadrantal Angle</li> <li>• Reciprocal Identities</li> <li>• Pythagorean Identities</li> <li>• Even and Odd identities</li> <li>• Ratio Identities</li> </ul>	<ul style="list-style-type: none"> <li>• Understands basic properties of the coordinate plane</li> <li>• Knows properties of special right triangles</li> <li>• Knows the Sine, Cosine, and Tangent ratios</li> </ul>	<ul style="list-style-type: none"> <li>• Completes the unit circle -</li> <li>• Evaluates circular functions to four decimal places -</li> <li>• Demonstrates knowledge of radians -</li> <li>• Calculates arc length and area of a sector -</li> <li>• Calculates linear and angular velocity -</li> <li>• Calculates linear and angular velocity -</li> <li>• Calculates linear and angular velocity -</li> <li>• Calculates linear and angular velocity -</li> </ul>	

<b>Geometry Standard:</b> Understands and applies concepts of geometry.				
<b>Power Benchmark 3 :</b> Applies transformations and uses symmetry to analyze mathematical situations.				
<b>Course Level Benchmark</b>	<b>Vocabulary</b>	<b>Background Knowledge/Prior Skills</b>	<b>Skills to Assess</b>	
a. Analyzes polynomial functions	<ul style="list-style-type: none"> <li>• Identity function</li> <li>• Squaring function</li> <li>• Cubing function</li> <li>• Square root function</li> <li>• Absolute Value function</li> <li>• Reciprocal Function</li> <li>• Dilation</li> <li>• Reflection</li> <li>• Translation</li> <li>• Transformation</li> <li>• Linear function</li> <li>• Multiplicity</li> <li>• Even function</li> <li>• Odd function</li> </ul>	<ul style="list-style-type: none"> <li>• Computes slope</li> <li>• Solves problems using the zero product property</li> <li>• Determines the nature of the solutions using the discriminate</li> <li>• Calculates using the distance and midpoint formulas</li> </ul>	<ul style="list-style-type: none"> <li>• Solves a polynomial equation -</li> <li>• Graphs a function using transformations -</li> <li>• Determines symmetries for a function -</li> </ul>	
<b>Power Benchmark 4 :</b> Uses visualization, special reasoning, and geometric modeling to solve problems				
a. <u>Applies properties of trig to solve problems involving triangles</u>	<ul style="list-style-type: none"> <li>• Ambiguous case</li> <li>• Angle of depression</li> <li>• Angle of elevation</li> <li>• Heron’s formula</li> <li>• Law of Cosines</li> <li>• Law of Sines</li> <li>• Oblique Triangle</li> <li>• Semiperimeter</li> <li>• Triangulation</li> </ul>	<ul style="list-style-type: none"> <li>• Knows the trig ratios</li> <li>• Knows the Pythagorean Theorem</li> <li>• Knows the Triangle Angle Sum Theorem</li> </ul>	<ul style="list-style-type: none"> <li>• Computes missing values of a given triangle -</li> <li>• Calculates the area of a given triangle without using <math>A = .5bh</math> -</li> </ul>	

<b>Measurement Standard: Understand and applies concepts of measurement</b>				
<b>Power Benchmark 2: Applies appropriate techniques, tools and formulas to determine measurements</b>				
<b>Course Level Benchmark</b>	<b>Vocabulary</b>	<b>Background Knowledge/Prior Skills</b>	<b>Skills to Assess</b>	
a. Converts between radians and degrees	<ul style="list-style-type: none"> <li>• Degrees</li> <li>• Radians</li> <li>• Pi</li> </ul>	<ul style="list-style-type: none"> <li>• Simplifying fractions</li> </ul>	<ul style="list-style-type: none"> <li>• Compute radians given degrees -</li> <li>• Compute degrees given radians -</li> </ul>	
b. Converts between rectangular and polar coordinates	<ul style="list-style-type: none"> <li>• Cartesian coordinate system</li> <li>• Polar coordinate</li> <li>• Pole</li> <li>• Polar axis</li> </ul>	<ul style="list-style-type: none"> <li>• Unit circle</li> </ul>	<ul style="list-style-type: none"> <li>• Compute degrees given radians -</li> <li>• Converts from rectangular to polar coordinates -</li> </ul>	

<b>Problem Solving Standard: Understands and applies problem solving strategies.</b>				
<b>Power Benchmark 1 : Uses a variety of strategies to solve problems</b>				
<b>Course Level Benchmark</b>	<b>Vocabulary</b>	<b>Background Knowledge/Prior Skills</b>	<b>Skills to Assess</b>	
a. <u>Evaluates functions using an appropriate method and justifies the method used to solve</u>	<ul style="list-style-type: none"> <li>• Evaluate</li> <li>• Solve</li> <li>• Zeros</li> <li>• Roots</li> <li>• Solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Uses a calculator to find solutions to a function</li> <li>• Knows the methods available to solve a function</li> </ul>	<ul style="list-style-type: none"> <li>• Solves a problem using the appropriate method -</li> </ul>	