Georgia Mathematics

Precalculus

Mathematical Practices

0 Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals. PC.MP

- 0.1 Make sense of problems and persevere in solving them. PC.MP.1
- 0.2 Reason abstractly and quantitatively. PC.MP.2
- 0.3 Construct viable arguments and critique the reasoning of others. PC.MP.3
- 0.4 Model with mathematics. PC.MP.4
- 0.5 Use appropriate tools strategically. PC.MP.5
- 0.6 Attend to precision. PC.MP.6
- 0.7 Look for and make use of structure. PC.MP.7
- 0.8 Look for and express regularity in repeated reasoning. PC.MP.8

Mathematical Modeling

1 Apply mathematics to real-life situations; model real-life phenomena using mathematics. PC.MM.1

- 1.1 Explain contextual, mathematical problems using a mathematical model. PC.MM.1.1
- 1.2 Create mathematical models to explain phenomena that exist in the natural sciences, social sciences, liberal arts, fine and performing arts, and/or humanities contexts. PC.MM.1.2
- 1.3 Using abstract and quantitative reasoning, make decisions about information and data from a contextual situation. PC.MM.1.3
- 1.4 Use various mathematical representations and structures with this information to represent and solve real-life problems. PC.MM.1.4

Functional & Graphical Reasoning

2 **Analyze the behaviors of rational and piecewise functions to model contextual mathematical problems.** PC.FGR.2

- 2.1 Graph piecewise-defined functions, including step functions and absolute value functions. PC.FGR.2.1
- 2.2 Describe characteristics by interpreting the algebraic form and graph of a piecewise-defined function. PC.FGR.2.2
- 2.3 Represent the limit of a function using both the informal definition and the graphical interpretation in the context of piecewise-defined functions; interpret limits expressed in analytic notation. PC.FGR.2.3
- 2.4 Divide polynomials using various methods. PC.FGR.2.4
- 2.5 Graph rational functions and identify key characteristics. PC.FGR.2.5
- 2.6 Represent the behavior of a rational function using limit notation for vertical and horizontal asymptotes and end behavior. PC.FGR.2.6
- 2.7 Represent the limit of a function using both the informal definition and the graphical interpretation in the context of rational functions; interpret limits expressed in analytic notation. PC.FGR.2.7
- 2.8 Solve simple rational equations in one variable, and give examples showing how extraneous solutions may arise. PC.FGR.2.8
- 2.9 Perform partial fraction decomposition of rational functions using non-repeated linear factors. PC.FGR.2.9

3 Utilize trigonometric expressions to solve problems and model periodic phenomena with trigonometric functions. PC.FGR.3

- 3.1 Use the concept of a radian as the ratio of the arc length to the radius of a circle to establish the existence of 2π radians in one revolution. PC.FGR.3.1
- 3.2 Utilize right triangles on the unit circle to determine the values of the six trigonometric ratios for $\pi/6$, $\pi/4$, and $\pi/3$. Use reflections of the triangles as reference angles to establish known values in all four quadrants of the coordinate plane. PC.FGR.3.2
- 3.3 Define the six trigonometric ratios in terms of x, y, and r using the unit circle centered at the origin of the coordinate plane. Interpret radian measures of angles as a rotation both counterclockwise and clockwise around the unit circle. PC.FGR.3.3
- 3.4 Derive the fundamental trigonometric identities. PC.FGR.3.4
- 3.5 Determine the value(s) of trigonometric functions for a set of given conditions. PC.FGR.3.5
- 3.6 Graph and write equations of trigonometric functions using period, phase shift, and amplitude in modeling contexts. PC.FGR.3.6
- 3.7 Classify the six trigonometric functions as even or odd and describe the symmetry. PC.FGR.3.7
- 3.8 Restrict the domain of a trigonometric function to create an invertible function and graph the inverse function. Evaluate inverse trigonometric expressions. PC.FGR.3.8

Algebraic & Geometric Reasoning

4 Manipulate, prove, and apply trigonometric identities and equations to solve contextual mathematical problems. PC.AGR.4

- 4.1 Apply the fundamental trigonometric identities to simplify expressions and verify other identities. PC.AGR.4.1
- 4.2 Use sum, difference, double-angle, and half-angle formulas for sine, cosine, and tangent to establish other identities and apply them to solve problems. PC.AGR.4.2
- 4.3 Solve trigonometric equations arising in modeling contexts. PC.AGR.4.3
- 4.4 Prove and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles. PC.AGR.4.4
- 4.5 Determine the area of an oblique triangle. PC.AGR.4.5

6 Represent and model vector quantities to solve problems in contextual situations. PC.AGR.6

- 6.1 Represent vector quantities as directed line segments; represent magnitude and direction of vectors in component form using appropriate mathematical notation. PC.AGR.6.1
- 6.2 Add and subtract vectors and multiply vectors by a scalar to find the resultant vector. PC.AGR.6.2
- 6.3 Add and subtract vectors on a coordinate plane using different methods. PC.AGR.6.3
- 6.4 Solve contextual vector problems, such as those involving velocity, force, and other quantities. PC.AGR.6.4
- 6.5 Sketch the graph of a curve represented parametrically, indicating the direction of motion. PC.AGR.6.5
- 6.6 Apply parametric equations to contextual problems. PC.AGR.6.6

Geometric & Spatial Reasoning

5 Analyze the behaviors of conic sections and polar equations to model contextual mathematical problems. PC.GSR.5

- 5.1 Identify and graph different conic sections given the equations in standard form. PC.GSR.5.1
- 5.2 Identify different conic sections in general form and complete the square to convert the equation of a conic section into standard form. PC.GSR.5.2
- 5.3 Define polar coordinates and relate polar coordinates to Cartesian coordinates. PC.GSR.5.3
- 5.4 Classify special polar equations and apply to contextual situations. PC.GSR.5.4
- 5.5 Graph equations in the polar coordinate plane with and without the use of technology. PC.GSR.5.5

Patterning & Algebraic Reasoning

7 Demonstrate how sequences and series apply to mathematical models in real-life situations. PC.PAR.7

- 7.1 Demonstrate that sequences are functions whose domain is the set of natural numbers. PC.PAR.7.1
- 7.2 Represent sequences graphically, numerically, and symbolically. PC.PAR.7.2
- 7.3 Determine the limit of a sequence if it exists. PC.PAR.7.3
- 7.4 Demonstrate that a series is the sum of the sequence and represent series graphically, numerically, and symbolically. PC.PAR.7.4
- 7.5 Describe the behavior of a series in terms of the limit of its partial sums. PC.PAR.7.5
- 7.6 Derive and use the sum formula of a finite geometric series to solve contextual problems to model real-life situations. PC.PAR.7.6
- 7.7 Derive and use the sum formula of an infinite geometric series to solve contextual problems to model real-life situations. PC.PAR.7.7