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

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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

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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

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.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

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.2 Represent sequences graphically, numerically, and symbolically. PC.PAR.7.2

.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