

**Georgia High School Math
Performance Standards, 2006**

Mathematics IV	Boardworks Precalculus and Trigonometry presentations
ALGEBRA	
MM4A1. Students will explore rational functions.	
a. Investigate and explain characteristics of rational functions, including domain, range, zeros, points of discontinuity, intervals of increase and decrease, rates of change, local and absolute extrema, symmetry, asymptotes, and end behavior.	Solving rational equations Graphing rational functions Graphs of important non-linear functions Plotting and sketching graphs Domain, range and composite functions
b. Find inverses of rational functions, discussing domain and range, symmetry, and function composition.	Inverse functions Domain, range and composite functions
c. Solve rational equations and inequalities analytically, graphically, and by using appropriate technology.	Solving rational equations Graphing rational functions
MM4A2. Students will use the circle to define the trigonometric functions.	
a. Define and understand angles measured in degrees and radians, including but not limited to 0° , 30° , 45° , 60° , 90° , their multiples, and equivalences.	The sine, cosine and tangent of any angle Trigonometric graphs and exact values Degrees and radians Solving equations using radians
b. Understand and apply the six trigonometric functions as functions of general angles in standard position.	The sine, cosine and tangent of any angle Trigonometric graphs and exact values The reciprocal trigonometric functions Trigonometric equations
c. Find values of trigonometric functions using points on the terminal sides of angles in the standard position.	Trigonometric equations Trigonometric identities Solving equations using radians Questions on trigonometry

d. Understand and apply the six trigonometric functions as functions of arc length on the unit circle.	The sine, cosine and tangent of any angle Trigonometric graphs and exact values The reciprocal trigonometric functions Trigonometric equations Trigonometric identities Solving equations using radians Questions on trigonometry
e. Find values of trigonometric functions using the unit circle.	Trigonometric equations Trigonometric graphs and exact values Trigonometric identities The reciprocal trigonometric functions Questions on trigonometry Solving equations using radians
MM4A3. Students will investigate and use the graphs of the six trigonometric functions.	
a. Understand and apply the six basic trigonometric functions as functions of real numbers.	The sine, cosine and tangent of any angle Trigonometric graphs and exact values Trigonometric equations Trigonometric identities The inverse trigonometric functions The reciprocal trigonometric functions Trigonometric identities using reciprocal functions Degrees and radians Solving equations using radians The additions formulas The double angle formulas Expressions of the form $a \cos x + b \sin x$ 3-D trigonometry Questions on trigonometry
b. Determine the characteristics of the graphs of the six basic trigonometric functions.	Transforming trigonometric functions Trigonometric graphs and exact values The reciprocal trigonometric functions The inverse trigonometric functions
c. Graph transformations of trigonometric functions including changing period, amplitude, phase shift, and vertical shift.	Transforming trigonometric functions Trigonometric graphs and exact values The reciprocal trigonometric functions

d. Apply graphs of trigonometric functions in realistic contexts involving periodic phenomena.	Transforming trigonometric functions
MM4A4. Students will investigate functions.	
a. Compare and contrast properties of functions within and across the following types: linear, quadratic, polynomial, power, rational, exponential, logarithmic, trigonometric, and piecewise.	<ul style="list-style-type: none"> Plotting and sketching graphs Even, odd and periodic functions Domain, range and composite functions Graphs of quadratic functions Transforming functions part 1 Transforming functions part 2 Inverse functions Polynomials of degree 3 or more Linear graphs Graphs of important non-linear functions Solving quadratic equations Piecewise-defined functions Limits Graphing rational functions The sine, cosine and tangent of any angle Trigonometric graphs and exact values The inverse trigonometric functions The reciprocal trigonometric functions Transforming trigonometric functions The laws of logarithms Exponentials and logarithms Exponential growth and decay Exponentials with bases other than e Linear and exponential modeling Using graphing calculators in applications

<p>b. Investigate transformations of functions.</p>	<p>Graphs of quadratic functions Transforming functions part 1 Transforming functions part 2 The laws of logarithms Exponentials and logarithms Graphs of important non-linear functions Parametric equations of curves Transforming trigonometric functions The reciprocal trigonometric functions</p>
<p>c. Investigate characteristics of functions built through sum, difference, product, quotient, and composition.</p>	<p>Plotting and sketching graphs Even, odd and periodic functions Domain, range and composite functions Graphs of quadratic functions Transforming functions part 1 Transforming functions part 2 Inverse functions Polynomials of degree 3 or more Linear graphs Graphs of important non-linear functions Piecewise-defined functions Limits Graphing rational functions The laws of logarithms Exponentials and logarithms Linear and exponential modeling Exponentials with bases other than e Exponential growth and decay Transforming trigonometric functions Trigonometric graphs and exact values The inverse trigonometric functions The reciprocal trigonometric functions Using graphing calculators in applications</p>
<p>MM4A5. Students will establish the identities below and use them to simplify trigonometric expressions and verify equivalence statements.</p>	<p style="background-color: #cccccc;"></p>

$\tan \theta = \sin \theta / \cos \theta$	Trigonometric identities Trigonometric identities using reciprocal functions The sine, cosine and tangent of any angle Questions of trigonometry
$\cot \theta = \cos \theta / \sin \theta$	Trigonometric identities Trigonometric identities using reciprocal functions The reciprocal trigonometric functions
$\sec \theta = 1 / \cos \theta$	The reciprocal trigonometric functions Trigonometric identities using reciprocal functions
$\csc \theta = 1 / \sin \theta$	The reciprocal trigonometric functions Trigonometric identities using reciprocal functions
$\sin^2 \theta + \cos^2 \theta = 1$	Trigonometric identities Trigonometric identities using reciprocal functions The double angle formulas Questions on trigonometry Parametric functions
$1 + \tan^2 \theta = \sec^2 \theta$	Trigonometric identities The reciprocal trigonometric functions Trigonometric identities using reciprocal functions
$1 + \cot^2 \theta = \csc^2 \theta$	Trigonometric identities The reciprocal trigonometric functions Trigonometric identities using reciprocal functions
$\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$	The addition formulas The double angle formulas Expressions of the form $a\cos x$ plus $b\sin x$ Questions on trigonometry
$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \pm \sin\alpha\sin\beta$	The addition formulas The double angle formulas Expressions of the form $a\cos x$ plus $b\sin x$ Questions on trigonometry
$\sin(2\theta) = 2\sin\theta\cos\theta$	The addition formulas The double angle formulas Questions on trigonometry

$\cos(2\theta) = \cos^2 \theta - \sin^2 \theta$	The addition formulas The double angle formulas Questions on trigonometry Parametric functions
MM4A6. Students will solve trigonometric equations both graphically and algebraically.	
a. Solve trigonometric equations over a variety of domains, using technology as appropriate.	The sine, cosine and tangent of any angle Trigonometric equations Trigonometric identities The inverse trigonometric functions The reciprocal trigonometric functions Trigonometric identities using reciprocal functions Degrees and radians Solving equations using radians The addition formulas The double angle formulas Expressions of the form $a \cos x + b \sin x$ 3-D trigonometry Questions on trigonometry Using graphing calculators in applications
b. Use the coordinates of a point on the terminal side of an angle to express x as $r \cos \theta$ and y as $r \sin \theta$.	The sine, cosine and tangent of any angle Polar coordinates Questions on vectors
c. Apply the law of sines and the law of cosines.	The law of sines and the area of a triangle The law of cosines
MM4A7. Students will verify and apply $A = \frac{1}{2}ab \sin C$ to find the area of a triangle.	The law of sines and the area of a triangle Solving equations using radians
MM4A8. Students will investigate and use inverse sine, inverse cosine, and inverse tangent functions.	

a. Find values of the above functions using technology as appropriate.	The inverse trigonometric functions The law of sines and the area of a triangle The law of cosines Trigonometric equations The reciprocal trigonometric functions The sine, cosine and tangent of any angle 3–D trigonometry Questions on trigonometry
b. Determine characteristics of the above functions and their graphs.	The inverse trigonometric functions
MM4A9. Students will use sequences and series.	
a. Use and find recursive and explicit formulas for the terms of sequences.	Sequences Arithmetic sequences Geometric sequences Quadratic sequences part 1 Quadratic sequences part 2 Other types of sequences Linear and exponential modeling
b. Recognize and use simple arithmetic and geometric sequences.	Sequences Arithmetic sequences Geometric sequences Linear and exponential modeling
c. Find and apply the sums of finite and, where appropriate, infinite arithmetic and geometric series.	The sum of an arithmetic series The sum of a geometric series
d. Use summation notation to explore finite series.	The sum of an arithmetic series The sum of a geometric series
MM4A10. Students will understand and use vectors.	
a. Represent vectors algebraically and geometrically.	Vectors in two and three dimensions Adding and subtracting vectors Position vectors and coordinate geometry Vector arithmetic Using vectors
b. Convert between vectors expressed using rectangular coordinates and vectors expressed using magnitude and direction.	The vector equation of a line Using vectors Position vectors and coordinate geometry The magnitude of a vector

c. Add, subtract, and compute scalar multiples of vectors.	Vectors in two and three dimensions Adding and subtracting vectors The magnitude of a vector Using vectors Vector arithmetic Intersecting lines
d. Use vectors to solve realistic problems.	Vectors in two and three dimensions Position vectors and coordinate geometry Using vectors The magnitude of a vector Intersecting lines Questions on vectors