Indiana Mathematics Standards

Content Standards

Precalculus/Trigonometry	Boardworks Precalculus and Trigonometry presentations
Precalculus	
Standard 1 - Relations and Functions	
PC.1.1 Recognize and graph various types of functions, including polynomial, rational, algebraic, and absolute value functions. Use paper and pencil methods and graphing calculators.	Plotting and sketching graphs Even, odd and periodic functions Absolute value functions Graphs of quadratic functions Transforming functions part 1 Transforming functions part 2 Polynomials of degree 3 or more The equation of a straight line Linear graphs The equation of a circle Graphs os important non-linear functions Piecewise-defined functions Graphing rational functions Using graphing calculators in applications
PC.1.2 Find domain, range, intercepts, zeros, asymptotes, and points of discontinuity of functions. Use paper and pencil methods and graphing calculators.	Domain, range and composite functions Plotting and sketching graphs Limits Piecewise-defined functions Graphing rational functions Polynomials of degree 3 or more Graphs of quadratic functions Inverse functions The inverse trigonometric functions Solving quadratic equations Graphs of important non-linear functions
PC.1.3 Model and solve word problems using functions and equations.	Graphs of quadratic functions Transforming trigonometric functions Using graphing calculators in applications

PC.1.4 Define, find, and check inverse functions.	Inverse functions The inverse trigonometric functions
PC.1.5 Describe the symmetry of the graph of a function.	Even, odd and periodic functions Transforming trigonometric functions
PC.1.6 Decide if functions are even or odd.	Even, odd and periodic functions Trigonometric graphs and exact values
PC.1.7 Apply transformations to functions.	Graphs of quadratic functions Transforming functions part 1 Transforming functions part 2 Graphs of important non-linear functions The laws of logarithms Exponentials and logarithms Parametic equations of curves Conic sections part 1 Conic sections part 2 Transforming trigonometric functions The reciprocal trigonometric functions
PC.1.8 Understand curves defined parametrically and draw their graphs.	Parametric equations of curves Parametric functions
PC.1.9 Compare relative magnitudes of functions and their rates of change.	Exponentials and logarithms Linear and exponential modeling Using graphing calculators in applications Rate of change Slopes and intercepts
PC.1.10 Write the equations of conic sections in standard form (completing the square and using translations as necessary), in order to find the type of conic section and to find its geometric properties (foci, asymptotes, eccentricity, etc.).	Conic sections part 1 Conic sections part 2 The equation of a circle Parametric equations of curves Graphs of quadratic functions
Standard 2 - Logarithmic and Exponential Functions	
PC.2.1 Solve word problems involving applications of logarithmic and exponential functions.	Linear and exponential modeling Exponential growth and decay Exponentials with bases other than e

PC.2.2 Find the domain, range, intercepts, and asymptotes of logarithmic and exponential functions.	The laws of logarithms Exponentials and logarithms Exponential growth and decay Exponentials with bases other than e
PC.2.3 Draw and analyze graphs of logarithmic and exponential functions.	The laws of logarithms Exponentials and logarithms Exponential growth and decay Linear and exponential modeling Exponentials with bases other than e
PC.2.4 Define, find, and check inverse functions of logarithmic and exponential functions.	The laws of logarithms Exponentials and logariths Exponential growth and decay Solving equations using logariths
Standard 3 - Trigonometry in Triangles	
PC.3.1 Solve word problems involving right and oblique triangles.	The inverse trigonometric functions Transforming trigonometric functions The sine, cosine and tangent of any angle Degrees and radians Solving equations using radians The law of cosines The law of sines and the area of a triangle Questions on trigonometry
PC.3.2 Apply the laws of sines and cosines to solving problems.	The law of cosines The law of sines and the area of a triangle
PC.3.3 Find the area of a triangle given two sides and the angle between them.	The law of sines and the area of a triangle
Standard 4 - Trigonometric Functions	
PC.4.1 Define sine and cosine using the unit circle.	The sine, cosine and tangent of any angle Trigonometric graphs and exact values
PC.4.2 Convert between degree and radian measures.	Degrees and radians Solving equations using radians
PC.4.3 Learn exact sine, cosine, and tangent values for 0,π/2 ,π/3 , π/4 , π/6 , and multiples of π. Use those values to find other trigonometric values.	Degrees and radians Solving equations using radians Trigonometric graphs and exact values

PC.4.4 Solve word problems involving applications of trigonometric functions.	The inverse trigonometric functions Transforming trigonometric functions The sine, cosine and tangent of any angle Degrees and radians
PC.4.5 Define and graph trigonometric functions (i.e., sine, cosine, tangent, cotangent, secant, cosecant).	The sine, cosine and tangent of any angle Trigonometric graphs and exact values The reciprocal trigonometric functions
PC.4.6 Find domain, range, intercepts, periods, amplitudes, and asymptotes of trigonometric functions.	Trigonometric graphs and exact values The inverse trigonometric functions The reciprocal trigonometric functions Transforming trigonometric functions
PC.4.7 Draw and analyze graphs of translations of trigonometric functions, including period, amplitude, and phase shift.	Trigonometric graphs and exact values The reciprocal trigonometric functions Transforming trigonometric functions
PC.4.8 Define and graph inverse trigonometric functions.	The inverse trigonometric functions
PC.4.9 Find values of trigonometric and inverse trigonometric functions.	Trigonometric equations The sine, cosine and tangent of any angle The inverse trigonometric functions The reciprocal trigonometric functions The additions formulas The double angle formulas Expressions of the form acos x plus bsin x Trigonometric identites Degrees and radians Solving equations using radians Trigonometric identities using reciprocal functions Questions on trigonometry 3D trigonometry
PC.4.10 Know that the tangent of the angle that a line makes with the x-axis is equal to the slope of the line.	The sine, cosine and tangent of any angle Slopes and intercepts
PC.4.11 Make connections between right triangle ratios, trigonometric functions, and circular functions.	The sine, cosine and tangent of any angle Trigonometric equations Trigonometric graphs and exact values Transforming trigonometric functions Degrees and radians
Standard 5 - Trigonometric Identities and Equations	

PC.5.1 Know the basic trigonometric identity $\cos^2 x + \sin^2 x = 1$ and prove that it is equivalent to the Pythagorean Theorem.	Trigonometric identities
PC.5.2 Use basic trigonometric identities to verify other identities and simplify expressions.	Trigonometric identities The reciprocal trigonometric functions Trigonometric identities using reciprocal functions The double angle formulas Parametric functions
PC.5.3 Understand and use the addition formulas for sines, cosines, and tangents.	The addition formulas The double angle formulas
PC.5.4 Understand and use the half-angle and double-angle formulas for sines, cosines, and tangents.	The double angle formulas Parametric functions
PC.5.5 Solve trigonometric equations.	The sine, cosine and tangent of any angle Trigonometric equations Trigonometric identites Degrees and radians Solving equations using radians The inverse trigonometric functions The reciprocal trigonometric functions The additions formulas The double angle formulas Expressions of the form acos x plus bsin x Questions on trigonometry 3D trigonometry
PC.5.6 Solve word problems involving applications of trigonometric equations.	The inverse trigonometric functions Transforming trigonometric functions The sine, cosine and tangent of any angle Degrees and radians Solving equations using radians
Standard 6 - Polar Coordinates and Complex Numbers	
PC.6.1 Define polar coordinates and relate polar coordinates to Cartesian coordinates.	Polar coordinates
PC.6.2 Represent equations given in rectangular coordinates in terms of polar coordinates.	Polar coordinates
PC.6.3 Graph equations in the polar coordinate plane.	Polar coordinates
PC.6.4 Define complex numbers, convert complex numbers to trigonometric form, and multiply complex numbers in trigonometric form.	Polar coordinates

PC.6.5 State, prove, and use De Moivre's Theorem.	Polar coordinates
Standard 7 - Sequences and Series	
PC.7.1 Understand and use summation notation.	The sum of an arithmetic series The sum of a geometric series
PC.7.2 Find sums of infinite geometric series.	The sum of a geometric series
PC.7.3 Prove and use the sum formulas for arithmetic series and for finite and infinite geometric series.	The sum of an arithmetic series The sum of a geometric series
PC.7.4 Use recursion to describe a sequence.	Sequences Arithmetic sequences Geometric sequences Quadratic sequences part 1 Quadratic sequences part 2 Other types of sequences
PC.7.5 Understand and use the concept of limit of a sequence or function as the independent variable approaches infinity or a number. Decide whether simple sequences converge or diverge.	The sum of a geometric series
PC.7.6 Solve word problems involving applications of sequences and series.	Sequences Arithmetic sequences Quadratic sequences part 2 Linear and exponential modeling
Standard 8 - Data Analysis	
PC.8.1 Find linear models using the median fit and least squares regression methods. Decide which model gives a better fit.	–
PC.8.2 Calculate and interpret the correlation coefficient. Use the correlation coefficient and residuals to evaluate a "best-fit" line.	Using graphing calculators in applications
PC.8.3 Find a quadratic, exponential, logarithmic, power, or sinusoidal function to model a data set and explain the parameters of the model.	Graphs of quadratic functions Transforming trigonometric functions Using graphing calculators in applications
Standard 9 - Mathematical Reasoning and Problem Solving	

PC.9.1 Use a variety of problem-solving strategies, such as drawing a diagram, guess-and-check, solving a simpler problem, examining simpler problems, and working backwards.	Trigonometric equations Trigonometric identities The reciprocal trigonometric functions Questions on trigonometry The sine, cosine and tangent of any angle Transforming trigonometric functions The inverse trigonometric functions Degrees and radians Vectors in two and three dimensions Vector arithmetic Questions on vectors Intersecting lines Polar coordinates Conic sections part 1 Conic sections part 2 Graphing rational functions Exponential growth and decay Linear and exponential modeling Exponentials with bases other than e
PC.9.2 Decide whether a solution is reasonable in the context of the original situation.	Solving rational equations Using a graphing calculator in applications Solving quadratic equations Trigonometric identities Exponentials with bases other than e
PC.9.3 Decide if a given algebraic statement is true always, sometimes, or never (statements involving rational or radical expressions, trigonometric, logarithmic or exponential functions).	Trigonometric identities Trigonometric identities using reciprocal functions The double angle formulas The addition formulas Expressions in the form acos x + bsin x The laws of logarithms Exponentials and logarithms Graphing rational functions Solving rational equations

PC.9.4 Use the properties of number systems and order of operations to justify the steps of simplifying functions and solving equations.	Simplifying rational functions Operations with algebraic fractions Improper fractions Partial fractions Solving rational equations Solving quadratic equatios Operations with polynomials The Factor Theorem Dividing polynomials Polynomials of degree 3 or more
PC.9.5 Understand that the logic of equation solving begins with the assumption that the variable is a number that satisfies the equation, and that the steps taken when solving equations create new equations that have, in most cases, the same solution set as the original. Understand that similar logic applies to solving systems of equations simultaneously.	Solving rational equations Trigonometric equations Trigonometric identities The sine, cosine and tangent of any angle Degrees and radians Solving equations using radians The reciprocal trigonometric functions Questions on trigonometry 3D trigonometry Solving equations involving logarithms Exponential growth and decay Exponentials with bases other than e Linear and exponential modeling Solving quadratic equations Adding and subtracting vectors The magnitude of a vector Vector arithmetic Using vectors The dot product Intersecting lines Questions on vectors Using graphing calculators in applications
PC.9.6 Define and use the mathematical induction method of proof.	–