

## Trigonometry

Strand	Common Curriculum Goal	Standard	Unit Name	Course Topic Description
<b>MA.CM.CE</b> Calculations and Estimations	Understand numbers, ways of representing numbers, relationships among numbers, and number systems	<b>MA.CM.CE.01</b> Compare real numbers		
		<b>MA.CM.CE.02</b> Order and compare numbers expressed in scientific notation to each other and to other forms of real numbers		
		<b>MA.CM.CE.03</b> Recognize that the set of real numbers contains the set of irrational numbers and the set of rational numbers and know the difference between them		
		<b>MA.CM.CE.04</b> Locate real numbers on a number line (including approximations of irrational numbers)		
		<b>MA.CM.CE.05</b> Apply equivalent forms of real numbers to solve problems		
<b>MA.CM.CE</b> Calculations and Estimations	Compute fluently and make reasonable estimates	<b>MA.CM.CE.06</b> Compute with real numbers, including absolute value and numbers expressed in scientific notation		
		<b>MA.CM.CE.07</b> Compute with integer exponents and whole number roots		
		<b>MA.CM.CE.08</b> Mentally multiply and divide by powers of 10 to estimate results of computations involving numbers expressed in scientific notation		
		<b>MA.CM.CE.09</b> Develop and use strategies to estimate the results of real number computations, determine the amount of error, and judge the reasonableness of results		
		<b>MA.CM.CE.10</b> Estimate the results of computations with integer powers and roots of real numbers.		
<b>MA.CM.CE</b> Calculations and Estimations	Understand meanings of operations and how they relate to one another	<b>MA.CM.CE.11</b> Recognize that taking the $n$ th root of a number corresponds to prime factorization		
		<b>MA.CM.CE.12</b> Use the inverse operations of $n$ th power and $n$ th root to solve problems and check solutions		
		<b>MA.CM.CE.13</b> Apply the associative, commutative, and distributive properties to simplify computations with real		

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		numbers		
		<b>MA.CM.CE.14</b> Use properties of numbers to demonstrate whether assertions are true or false		
<b>MA.CM.SP</b> Statistics and Probability	Select and use appropriate statistical methods to analyze data	<b>MA.CM.SP.01</b> Estimate from a graph or a set of data the mean and standard deviation of a normal distribution and draw conclusions about the distribution of data using measures of center and spread (e.g., analyze a variety of summary statistics and graphical displays)		
		<b>MA.CM.SP.02</b> Analyze bivariate data and identify the type of function (linear, quadratic, exponential) that could be used to model the data		
<b>MA.CM.SP</b> Statistics and Probability	Understand and apply basic concepts of probability	<b>MA.CM.SP.03</b> Compute the probability of a compound event (e.g., toss a coin three times to find the probability of two heads)		
		<b>MA.CM.SP.04</b> Determine probabilities of dependent and independent events (e.g., use colored marbles with and without replacement)		
		<b>MA.CM.SP.05</b> Use conditional probability to solve problems (e.g., from a sample set for the roll of two tetrahedral die; given that a sum is even, what is the probability that the sum is 6?)		
		<b>MA.CM.SP.06</b> Determine all possible outcomes of a particular event or all possible arrangements of objects in a given set by applying counting strategies, combinations, and permutations		
<b>MA.CM.SP</b> Statistics and Probability	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them	<b>MA.CM.SP.07</b> Determine appropriate designs for simulations (surveys, observational studies, and experiments) and modeling to study a problem and construct empirical probability distributions to represent results		
		<b>MA.CM.SP.08</b> Use matrices, histograms, scatter plots, stem-and-leaf plots, and box-and whisker-plots to interpret data		

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		<b>MA.CM.SP.09</b> Identify examples of populations that are normally distributed		
<b>MA.CM.SP</b> Statistics and Probability	Develop and evaluate inferences and predictions that are based on data	<b>MA.CM.SP.10</b> Make inferences and predictions from data in histograms, scatter plots, and parallel box plots		
		<b>MA.CM.SP.11</b> Make predictions about populations based on reported sample statistics		
		<b>MA.CM.SP.12</b> Understand that inferences about a population drawn from a sample involve uncertainty and that the role of statistics is to measure that uncertainty		
<b>MA.CM.AR</b> Algebraic Relationships	Understand patterns, relations, and functions	<b>MA.CM.AR.01</b> Represent and generalize sequences resulting from linear, quadratic, and exponential relationships using recursive or explicit formulas, tables of values, and graphs		
		<b>MA.CM.AR.02</b> Produce a valid conjecture using inductive reasoning by generalizing from a pattern of observations		
		<b>MA.CM.AR.03</b> Evaluate and make a table for two-variable formulas and match a graph or table of values to its formula		
		<b>MA.CM.AR.04</b> Identify independent and dependent variables and determine the domain and range of a function in a problem situation	Linear Relations and Functions	Relations, Functions and Graphs
<b>MA.CM.AR</b> Algebraic Relationships	Represent and analyze mathematical situations and structures using algebraic symbols	<b>MA.CM.AR.05</b> Algebraically represent situations and solve problems involving quadratic and exponential equations, including exponential growth and decay	Graphs and Functions	Polynomial Functions, Roots and Zeroes
		<b>MA.CM.AR.06</b> Use graphs to solve non-linear equations, including quadratics	Graphs and Functions	Polynomial Functions, Roots and Zeroes
		<b>MA.CM.AR.07</b> Represent and solve systems of linear equations with two variables using simultaneous equations and by graphing.		
		<b>MA.CM.AR.08</b> Recognize and generate equivalent forms for algebraic expressions, including combining like terms and expanding binomials		

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		<b>MA.CM.AR.09</b> Evaluate algebraic expressions and formulas by substituting real numbers		
		<b>MA.CM.AR.10</b> Translate between and interpret quadratic and exponential relationships represented by words, symbols, tables, and graphs	Graphs and Functions	Polynomial Functions, Roots and Zeroes
		<b>MA.CM.AR.11</b> Determine and interpret maxima or minima and zeros of quadratic functions, and linear functions where $y = \text{constant}$	Graphs and Functions	Polynomial Functions, Roots and Zeroes
		<b>MA.CM.AR.12</b> Graph linear inequalities in two variables		
		<b>MA.CM.AR.13</b> Graph quadratic and exponential equations	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.AR.14</b> Analyze how changing a parameter (i.e., $k$ , $b$ ) in a quadratic or exponential function of the form $y=k^x+b$ , $y=kx^2+b$ , or $y=k(x+b)^2$ affects its graph	Graphs and Functions	The Nature of Graphs
<b>MA.CM.AR</b> Algebraic Relationships	Use mathematical models to represent and understand quantitative relationships	<b>MA.CM.AR.15</b> Model situations, make predictions and inferences, and solve problems using linear, quadratic, and exponential functions	Linear Relations and Functions	Linear Relations, Scatter Plots and Linear Equalities
		<b>MA.CM.AR.16</b> Determine when data represented in a table or graph represents a linear, quadratic, or exponential relationship		
<b>MA.CM.AR</b> Algebraic Relationships	Analyze change in various contexts	<b>MA.CM.AR.17</b> Approximate and interpret rates of change in graphical and numeric data	Graphs and Functions	Polynomial and Rational Functions
		<b>MA.CM.AR.18</b> Analyze the nature of change of each variable in a non-linear relationship as suggested by a table of values, a graph, or a formula	Graphs and Functions	Inverse Functions, Continuity and Extrema
<b>MA.CM.ME</b> Measurement	Understand measurable attributes of objects and the units, systems and processes of measurement	<b>MA.CM.ME.01</b> Determine the appropriate units, scales, and tools for problem situations involving measurement		
		<b>MA.CM.ME.02</b> Solve problems involving unit conversions (e.g., mile per hour to feet per second) given the unit equivalencies.		
		<b>MA.CM.ME.03</b> Determine the precision of a given measuring tool (e.g., 1 degree for a standard protractor)		

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	Apply appropriate techniques, tools, and formulas to determine measurements	<b>MA.CM.ME.04</b> Develop and use strategies and formulas for calculating surface area and volume of cones and spheres		
		<b>MA.CM.ME.05</b> Use formulas to solve problems involving finding missing dimensions given perimeter, area, surface area, and volume of polygons, circles, prisms, pyramids, cones, cylinders, and spheres		
		<b>MA.CM.ME.06</b> Develop and understand, and use the formula for determining arc length (e.g., portion of a circle).		
		<b>MA.CM.ME.07</b> Determine perimeter and area of shapes of circles and polygons (annulus, etc.) in context		
		<b>MA.CM.ME.08</b> Determine the surface area and volume of a complex figure composed of a combination of two or more geometric figures or a figure derived from a regular solid (e.g., hemisphere, frustum of a cone)		
		<b>MA.CM.ME.09</b> Compare and contrast the formulas for surface area and volume of cylinders and cones		
		<b>MA.CM.ME.10</b> Determine a shape that has minimum or maximum perimeter, area, surface area, or volume under specified conditions		
		<b>MA.CM.ME.11</b> Make and use scale drawings and models to solve problems		
<b>MA.CM.GE</b> Geometry	Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships	<b>MA.CM.GM.01</b> Determine defining properties that characterize classes of three-dimensional figures and their component parts		
		<b>MA.CM.GM.02</b> Recognize and represent three-dimensional figures and their component parts		
		<b>MA.CM.GM.03</b> Justify and use theorems involving the angles formed by parallel lines cut by a transversal		
		<b>MA.CM.GM.04</b> Develop, understand, and apply properties of circles and of inscribed and circumscribed polygons		

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		<b>MA.CM.GM.05</b> Use measures of sides and of interior and exterior angles of polygons to classify figures and solve problems		
		<b>MA.CM.GM.06</b> Prove congruence of two triangles or their corresponding component parts		
		<b>MA.CM.GM.07</b> Determine the measures of corresponding angles, sides, and corresponding parts of congruent and similar figures		
		<b>MA.CM.GM.08</b> Use angle, side length, and triangle inequality relationships to solve problems		
		<b>MA.CM.GM.09</b> Use trigonometric functions, and angle and side relationships of special right triangles (30- 60-right triangles and isosceles right triangles) to solve for an unknown length and determine distances and solve problems	Trigonometric Functions	Trigonometric Functions and Right Triangles
		<b>MA.CM.GM.10</b> Investigate relationships among chords, secants, tangents, inscribed angles, and inscribed and circumscribed polygons of circles		
		<b>MA.CM.GM.11</b> Construct and judge the validity of a logical argument and give counterexamples to disprove a statement		
		<b>MA.CM.GM.12</b> Justify and use theorems involving the properties of triangles, quadrilaterals, circles, and their component parts to verify congruence and similarity		
<b>MA.CM.GE</b> Geometry	Use visualization, spatial reasoning, and geometric modeling to solve problems	<b>MA.CM.GM.13</b> Model, sketch, label and where appropriate construct cones and spheres, and basic elements of geometric figures (e.g., altitudes, midpoints, medians, angle bisectors, and perpendicular bisectors) using compass and straightedge or technology		
		<b>MA.CM.GM.14</b> Describe how two or more objects are related in space (e.g., skew lines, the possible ways three planes might intersect)		
		<b>MA.CM.GM.15</b> Make a model of a three-dimensional figure		

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		from a two-dimensional drawing and make a two-dimensional representation of a three-dimensional object through scale drawings, perspective drawings, blueprints, or computer simulations		
		<b>MA.CM.GM.16</b> Recognize representations of three-dimensional objects from different perspectives and identify cross-sections of three-dimensional objects		
<b>MA.CM.GE</b> Geometry	Specify locations and describe spatial relationships using coordinate geometry and other representational systems	<b>MA.CM.GM.17</b> Determine the relative placement (e.g., intersecting, parallel, perpendicular) of two lines on a coordinate plane given the algebraic equations representing them	Linear Relations and Functions	Linear Relations, Scatter Plots and Linear Equalities
		<b>MA.CM.GM.18</b> Calculate slope, distance and midpoint between points with an emphasis on practical applications (use coordinate formulas)	Linear Relations and Functions	Relations, Functions and Graphs
<b>MA.CM.GE</b> Geometry	Apply transformations and use symmetry to analyze mathematical situations	<b>MA.CM.GM.19</b> Use coordinate geometry to determine whether a figure is symmetrical with respect to a line or a point	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.GM.20</b> Determine whether a given pair of figures on a coordinate plane represent a translation, reflection, rotation, and/or dilation	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.GM.21</b> Determine the image of a figure on a coordinate graph under translations, reflections, and rotations	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.GM.22</b> Given a figure and its image on a coordinate graph, determine the translation vector or locate the axis of reflection	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.GM.23</b> Determine the coordinates of and draw the dilation of a figure on a coordinate graph	Graphs and Functions	The Nature of Graphs
		<b>MA.CM.GM.24</b> Analyze the congruence, similarity, and line or rotational symmetry of figures using transformations	Graphs and Functions	The Nature of Graphs
<b>MA.CM.PS</b> Mathematical Problem	Select, apply, and translate among mathematical	<b>MA.CM.PS.01</b> Interpret the concepts of a problem-solving task and translate them into mathematics	Graphs and Functions	Polynomial and Rational Functions



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Solving	representations to solve problems.			
<b>MA.CM.PS</b> Mathematical Problem Solving	Apply and adapt a variety of appropriate strategies to solve problems.	<b>MA.CM.PS.01</b> Choose strategies that can work and then carry out the strategies chosen	Graphs and Functions	Polynomial and Rational Functions
<b>MA.CM.PS</b> Mathematical Problem Solving	Monitor and reflect on the process of mathematical problem solving.	<b>MA.CM.PS.03</b> Produce identifiable evidence of a second look at the concepts/strategies/calculations to defend a solution	Trigonometric Functions	Trigonometric Functions and Right Triangles
<b>MA.CM.PS</b> Mathematical Problem Solving	Communicate mathematical thinking coherently and clearly. Use the language of mathematics to express mathematical ideas precisely.	<b>MA.CM.PS.04</b> Use pictures, symbols, and/or vocabulary to convey the path to the identified solution	Trigonometric and Parametric Equations	Vectors and Parametric Equations
<b>MA.CM.PS</b> Mathematical Problem Solving	Accurately solve problems that arise in mathematics and other contexts.	<b>MA.CM.PS.05</b> Accurately solve problems using mathematics	Trigonometric Functions	The Trigonometric Functions and Law of Sines and Cosines