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	Domain	Cluster	Standard	Scope and Clarifications
Number and Quantity	Quantities (N-Q)	Reason quantitatively and use units to solve problems.	2. Define appropriate quantities for the purpose of descriptive modeling.	This standard will be assessed in Math III by ensuring that some modeling tasks (involving Math III content or securely held content from previous grades and courses) require the student to create a quantity of interest in the situation being described (i.e., a quantity of interest is not selected for the student by the task). For example, in a situation involving periodic phenomena, the student might autonomously decide that amplitude is a key variable in a situation, and then choose to work with peak amplitude.
Algebra	Seeing Structure in Expressions (A-SSE)	Interpret the structure of expressions	2. Use the structure of an expression to identify ways to rewrite it. *For example, see* $x^4 - y^4$ *as* $(x^2)^2 - (y^2)^2$, *thus recognizing it as a difference of squares that can be factored as* $(x^2 - y^2)(x^2 + y^2)$.	i) Tasks are limited to polynomial and rational expressions. ii) Examples: see $x^2 - y^2$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$. In the equation $x^2 + 2x + 1 + y^2 = 9$, see an opportunity to rewrite the first three terms as $(x+1)^2$, thus recognizing the equation of a circle with radius 3 and center (-1, 0). See $(x^2 + 4)/(x^2 + 3)$ as $((x^2+3) + 1)/(x^2+3)$, thus recognizing an opportunity to write it as $1 + 1/(x^2 + 3)$.
		Write expressions in equivalent forms to solve problems	4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*★	*There is no additional scope or clarification information for this standard.*
	Arithmetic with Polynomials and Rational Expressions (A-APR)	Understand the relationship between zeros and factors of polynomials	2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x - a$ is $p(a)$, so $p(a) = 0$ if and only if $(x - a)$ is a factor of $p(x)$.	*There is no additional scope or clarification information for this standard.*
			3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.	*There is no additional scope or clarification information for this standard.*
		Use polynomial identities to solve Problems	4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*	*There is no additional scope or clarification information for this standard.*
		Rewrite rational expressions	6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.	*There is no additional scope or clarification information for this standard.*

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	Domain	Cluster	Standard	Scope and Clarifications
Algebra	Creating Equations★ (A-CED)	Create equations that describe numbers or relationships	1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	i) Tasks are limited to simple rational or exponential equations ii) Tasks have a real-world context.
			2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	i) Tasks are limited to simple polynomial, rational, or exponential equations ii) Tasks have a real-world context.
	Reasoning with Equations and Inequalities (A-REI)	Understand solving equations as a process of reasoning and explain the reasoning	1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.	i) Tasks are limited to simple rational or radical equations.
			2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	*There is no additional scope or clarification information for this standard.*
		Represent and solve equations	11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.★	i) Tasks may involve any of the function types mentioned in the standard.

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	Domain	Cluster	Standard	Scope and Clarifications
Functions	Interpreting Functions (F-IF)	Interpret functions that arise in applications in terms of the context	4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*★	i) Tasks have a real-world context. ii) Tasks may involve polynomial, logarithmic, and trigonometric functions. The function types listed here are the same as those listed in the Math III column for standards F-IF.6 and F-IF.9.
			6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.★	i) Tasks have a real-world context. ii) Tasks may involve polynomial, logarithmic, and trigonometric functions. The function types listed here are the same as those listed in the Math III column for standards F-IF.4 and F-IF.9.
		Analyze functions using different representations	7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.★ c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	For F-IF.7e: i) Tasks are limited to logarithmic and trigonometric functions.
			9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	i) Tasks have a real-world context. ii) Tasks may involve polynomial, logarithmic, and trigonometric functions. The function types listed here are the same as those listed in the Math III column for standards F-IF.4 and F-IF.6.

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	Domain	Cluster	Standard	Scope and Clarifications
Functions	Building Functions (F-BF)	Build new functions from existing functions	3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\,f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	i) Tasks are limited to exponential, polynomial, logarithmic, and trigonometric functions. ii) Tasks may involve recognizing even and odd functions. The function types listed in note (i) are the same as those listed in the Math III column for standards F-IF.4, F-IF.6, and F-IF.9.
			4. Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x–1)$ for $x \neq 1$.*	*There is no additional scope or clarification information for this standard.*
	Linear, Quadratic, and Exponential Models★ (F-LE)	Construct and compare linear, quadratic, and exponential models and solve problems	4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology.	*There is no additional scope or clarification information for this standard.*
	Trigonometric Functions (F-TF)	Extend the domain of trigonometric functions using the unit circle	1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	*There is no additional scope or clarification information for this standard.*
			2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	*There is no additional scope or clarification information for this standard.*
		Model periodic phenomena with trigonometric functions	5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.★	*There is no additional scope or clarification information for this standard.*
		Prove and trigonometric identities	8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ given $\sin(\theta)$, $\cos(\theta)$, or $\tan(\theta)$ and the quadrant of the angle.	*There is no additional scope or clarification information for this standard.*

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	Domain	Cluster	Standard	Scope and Clarifications
Geometry	Congruence (G-CO)	Make geometric constructions	12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment ;and constructing a line parallel to a given line through a point not on the line.*	*There is no additional scope or clarification information for this standard.*
			13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	*There is no additional scope or clarification information for this standard.*
	Circles (G-C)	Understand and apply theorems about circles	1. Prove that all circles are similar.	*There is no additional scope or clarification information for this standard.*
			2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*	*There is no additional scope or clarification information for this standard.*
			3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	*There is no additional scope or clarification information for this standard.*
		Find arc lengths and areas of sectors of circles	5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.	*There is no additional scope or clarification information for this standard.*

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	Domain	Cluster	Standard	Scope and Clarifications
Geometry	Expressing Geometric Properties with Equations (G-GPE)	Translate between the geometric description and the equation for a conic section	1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.	*There is no additional scope or clarification information for this standard.*
			2. Derive the equation of a parabola given a focus and directrix.	*There is no additional scope or clarification information for this standard.*
		Use coordinates to prove simple geometric theorems algebraically	4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, $\sqrt{3}$) lies on the circle centered at the origin and containing the point (0, 2).*	*There is no additional scope or clarification information for this standard.*
			5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).	*There is no additional scope or clarification information for this standard.*
			6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	*There is no additional scope or clarification information for this standard.*
			7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★	*There is no additional scope or clarification information for this standard.*
	Geometric Measurement and Dimension (G-GMD)	Visualize relationships between two-dimensional and three-dimensional objects	4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	*There is no additional scope or clarification information for this standard.*
	Modeling with Geometry (G-MG)	Apply geometric concepts in modeling situations	1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★	*There is no additional scope or clarification information for this standard.*
			2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★	*There is no additional scope or clarification information for this standard.*
			3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★	*There is no additional scope or clarification information for this standard.*

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	Domain	Cluster	Standard	Scope and Clarifications
Statistics and Probability	Interpreting Categorical and Quantitative Data (S-ID)	Summarize, represent, and interpret data on a single count or measurement variable	4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.	*There is no additional scope or clarification information for this standard.*
		Summarize, represent, and interpret data on two categorical and quantitative variables	6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.* b. Informally assess the fit of a function by plotting and analyzing residuals.	For S-ID.6a: i) Tasks have a real-world context. ii) Tasks are limited to exponential functions with domains not in the integers and trigonometric functions.
	Making Inferences and Justifying Conclusions (S-IC)	Understand and evaluate random processes underlying statistical experiments	1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.	*There is no additional scope or clarification information for this standard.*
			2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*	*There is no additional scope or clarification information for this standard.*
		Make inferences and justify conclusions from sample surveys, experiments, and observational studies	3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	*There is no additional scope or clarification information for this standard.*
			4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.	*There is no additional scope or clarification information for this standard.*
			5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.	*There is no additional scope or clarification information for this standard.*
			6. Evaluate reports based on data.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*

Major Content	Supporting Content	Additional Content

*Mathematical Modeling is a Standard for Mathematical Practice (MP4) and a Conceptual Category, and specific modeling standards appear throughout the high school standards indicated with a star (*). Where an entire domain is marked with a star, each standard in that domain is a modeling standard.