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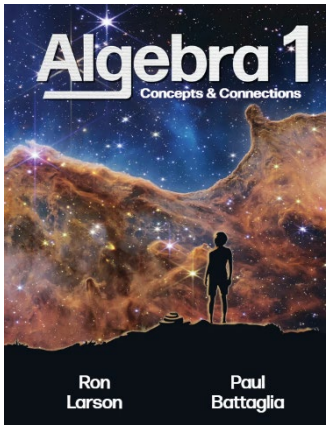
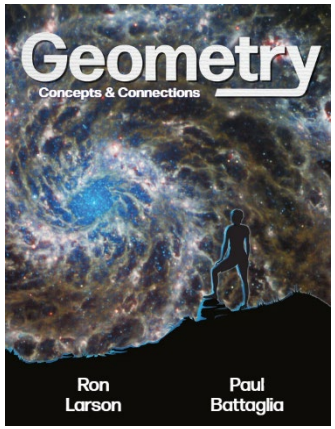
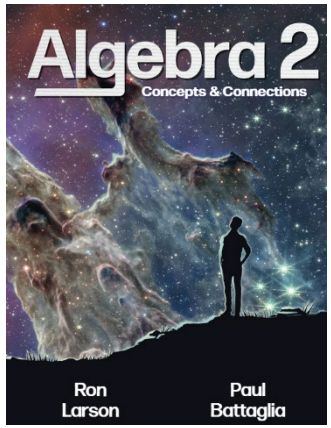
Algebra 1, Geometry, and Algebra 2







Big Ideas Learning

Standard		Algebra 1 Concepts & Connections
Expressions and Equations		
Interpret the structure of expressions and equations in terms of the context they model.		
M.A1HS.1	Interpret linear, exponential, and quadratic expressions that represent a quantity in terms of its context.	
	a. Interpret parts of an expression, such as terms, factors, and coefficients.	2.1, 3.6, 7.1, 7.3, See Algebra 2 Concepts & Connections: lesson 2.4
	b. Interpret complicated expressions by viewing one or more of their parts as a single entity.	1.2, 2.5, 6.4, 7.2, 7.4, See Algebra 2 Concepts & Connections: lessons 3.2, 4.5, 6.1, 6.2
	c. Interpret the parameters in a linear function or exponential function of the form $f(x)=a*b^x$ in terms of a context.	3.6, 4.4, 6.4
M.A1HS.2	Use the structure of quadratic and exponential expressions to identify ways to rewrite them.	7.5, 7.6, 7.7, 7.8
Extend the properties of exponents to rational exponents.		
M.A1HS.3	Explain the connections between expressions with rational exponents and expressions with radicals using properties of exponents. Extend from application of properties of exponents for expressions with integer exponents.	6.2
M.A1HS.4	Rewrite expressions involving radicals, including simplifying, and rational exponents using the properties of exponents.	6.1, 6.2
Write expressions in equivalent forms to solve problems.		
M.A1HS.5	Choose and produce an equivalent form of linear, exponential, and quadratic expressions to reveal and explain properties of the quantity represented by the expression through connections to a graphical representation of the function.	
	a. Factor a quadratic expression to reveal the zeros of the function it defines.	7.4, 7.5, 7.6, 7.7, 7.8, 8.5
	b. Complete the square in a quadratic expression, when a=1 only, to reveal the maximum or minimum value of the function it defines.	9.4
	c. Use properties of exponents to transform expressions for exponential functions. For example, the expression 1.15^t can be written as $(1.15^{1/12})^{12t} = 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.	6.4

Perform arithmetic operations on polynomials.		
M.A1HS.6	Recognize that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. Focus on linear or quadratic terms.	7.1, 7.2, 7.3, See Algebra 2 Concepts & Connections: lesson 4.2
Create equations that describe numbers or relationships.		
M.A1HS.7	Create equations and inequalities in one variable, representing linear and exponential relationships, and use them to solve problems. In the case of exponential equations, limit to situations with integer inputs.	1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 6.5, 93, 9.4, 9.5, 10.3, See Algebra 2 Concepts & Connections: lessons 3.6, 7.1
M.A1HS.8	Create equations in two or more variables representing linear and exponential relationships between quantities. In the case of exponential equations, limit to situations with integer inputs.	3.4, 3.5, 3.6, 3.7, 3.8, 4.1, 4.2, 4.7, 6.3, 6.4, 8.1, 8.2, 8.3, 8.4, 8.5, 10.1, 10.2, See Math & YOU Algebra 2: lessons 1.3, 2.4, 4.9, 6.7, 7.1, 9.6
M.A1HS.9	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context.	5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, See Algebra 2 Concepts & Connections: lessons 1.4, 3.6
Solve equations and inequalities in one variable.		
M.A1HS.10	Solve linear equations including equations with coefficients represented by letters, simple exponential equations that rely on application of the laws of exponents, and compound linear inequalities in one variable.	1.1, 1.2, 1.4, 2.2, 2.3, 2.4, 2.5, 2.6
M.A1HS.11	Solve quadratic equations in one variable by inspection (e.g., for $x^2=49$), taking square roots, factoring, completing the square when a=1 only, and the quadratic formula, as appropriate for the initial form of the equation.	
	a. Recognize the concept of complex solutions when the quadratic formula gives complex solutions.	7.4, 9.3, 9.4, 9.5
	b. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$. Derive the quadratic formula from this method of completing the square.	9.4, 9.5
Solve systems of equations.		
M.A1HS.12	Analyze and solve pairs of simultaneous linear equations.	
	a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersections of their graphs, because points of intersection satisfy both equations simultaneously.	5.1, See Math & YOU Grade 8 lessons: 5.1, 5.4
	b. Solve simple cases by inspection e.g., 3x+2y=5 and 3x+2y=6 have no solution because 3x+2y cannot simultaneously be 5 and 6.	5.4, See Math & YOU Grade 8 lessons: 5.1, 5.2, 5.3, 5.4

	c. Solve real-world and mathematical problems leading to two linear equations in two variables (e.g., given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second par).	5.1, 5.4, See Math & YOU Grade 8 lessons: 5.1, 5.2, 5.3, 5.4
M.A1HS.13	Understand and demonstrate ways to manipulate a system of two equations in two variables while preserving its solution set.	5.3
M.A1HS14	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables. Include examples of solution sets with no solutions, an infinite number of solutions, and one solution.	5.1, 5.2, 5.3, 5.4, 5.5
M.A1HS15	Solve a simple system consisting of a linear equation and a quadratic equation in two variables graphically.	9.6
Represent and solve equations and inequalities graphically.		
M.A1HS16	Recognize that the graph of a linear or exponential equation in two variables is the set of all its solutions plotted in the coordinate plane.	3.3
M.A1HS17	Explain why the x-coordinates of the points where the graphs of the linear and/or exponential 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).	5.5, 6.5, 9.6, See Algebra 2 Concepts & Connections: lesson 3.5
M.A1HS18	Graph the solutions to a linear inequality in two variables as a halfplane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.	5.6, 5.7
Functions		
Understand the concept of a function and use function notation.		
M.A1HS.19	Use multiple representations of linear and exponential functions to recognize that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. Develop function notation utilizing the definition of a function to represent situations both algebraically and graphically.	3.1, 3.4
M.A1HS.20	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	3.4
M.A1HS.21	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*	4.6, 6.6, 6.7, See Algebra2 Concepts & Connections lessons: 10.1, 10.2, 10.3, 10.4, 10.5

Interpret functions that arise in applications in terms of a context.		
M.A1HS.22	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. Relate the domain of a function to its linear, exponential, and quadratic graphs and, where applicable, to the quantitative relationship it describes.	
	a. Key features of linear and exponential graphs include: intercepts; intervals where the function is increasing, decreasing, positive, or negative.	3.2, 3.6, 3.8, 8.1, 8.3, 8.4, 9.2, See Algebra 2 Concepts & Connections lessons: 2.2, 2.3, 4.1, 4.8
	b. Key features of quadratic graphs include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetry; and end behavior.	
Analyze functions using different representations.		
M.A1HS.23	Graph linear, exponential, and quadratic functions expressed symbolically and show key features of the graph.	
	a. For linear functions, focus on intercepts.	3.4, 3.5, 3.6, 3.7, 8.1, 8.2, 8.3, 8.4, 8.5, 9.2
	b. For exponential functions, focus on intercepts and end behavior.	6.3, 6.5, See Algebra 2 Concepts & Connections lessons: 6.1, 6.2, 6.3, 9.4, 9.5
	c. For quadratic functions, focus on intercepts, maxima, minima, end behavior, and the relationship between coefficients and roots to represent in factored form.	3.4, 3.5, 3.6, 3.7, 8.1, 8.2, 8.3, 8.4, 8.5, 9.2
M.A1HS.24	Compare properties of two linear, exponential, and quadratic functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	3.2, 3.4, 8.3, 8.6, 10.1, 10.2, See Algebra 2 Concepts & Connections lessons: 1.3, 2.2
M.A1HS.25	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.	
	a. Use the process of factoring and completing the square for a=1 only in a quadratic function to show zeros, extreme values, symmetry of the graph, the relationship between coefficients and roots represented in factored form and interpret these in terms of a context.	8.5, 9.4
	b. Use the properties of exponents to interpret expressions for exponential functions.	6.4
Build a function that models a relationship between two quantities.		
M.A1HS.26	Write linear, exponential, and quadratic functions that describe a relationship between two quantities.	
	a. Determine an explicit expression, a recursive process, or steps for calculation from a context.	4.1, 4.2, 4.6, 6.3, 6.4, 8.4, 8.5, 8.6

	b. Combine standard function types using arithmetic operations.	6.4, 8.2, See Algebra 2 Concepts & Connections lessons: 5.2, 5.5
M.A1HS.27	Construct linear and exponential functions, including arithmetic and geometric sequences to model situations, given a graph, a description of a relationship or given input-output pairs (including reading these from a table.)	10.2, 10.3
Build new functions from existing functuons.		
M.A1HS.28	Identify the effect on the graphs of linear and exponential functions, $f(x)$, with $f(x) + k$, and the graphs of quadratic functions, *g(x), with g(x)+k, g (kx), k g(x), and g(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.	3.7, 3.8, 8.1, 8.2, 8.4, 10.1, 10.2, See Algebra 2 Concepts & Connections lessons: 1.1, 1.2, 2.1, 4.7, 4.8, 5.3, 6.4, 7.2, 9.4, 9.5
Construct and compare linear, quadratic, and exponential models and solve problems.		
M.A1HS.29	Distinguish between situations that can be modeled with linear functions, with exponential models, and with quadratic functions.	
	a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.	3.6, 6.3
	b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	3.3, 4.1, 4.2
	c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.	6.4
	d. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. Extend the comparison of linear and exponential growth to quadratic growth.	8.6
Geometry		
Use coordinates to prove simple geometric theorems algebraically.		
M.A1HS.30	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).	See Geometry Concepts & Connections lessons: 3.5, 8.3
M.A1HS.31	Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.	See Geometry Concepts & Connections lesson: 1.4
Statistics and Probability		
Summarize, represent, and interpret data on a single count or measurement variable.		
M.A1HS.32	Select applicable representations to display data on the real number line (e.g., dot plots, histograms, and box plots).	11.2, 11.3, 11.6

M.A1HS.33	Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.	11.3
M.A1HS.34	Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).	11.1, 11.2, 11.3
Summarize, represent, and interpret data on two categorical and quantitative variables.		
M.A1HS.35	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.*	4.4, 4.5, 6.3, 9.2
	b. Informally assess the fit of a function by plotting and analyzing residuals.	4.5
	c. Fit a linear function for a scatter plot that suggests a linear association.	4.4, 4.5
Interpret linear models.		
M.A1HS.36	Interpret the rate of change and the constant term of a linear model in the context of the data.	4.4
M.A1HS.37	Distinguish between correlation and causation.	4.4

Standard		Geometry Concepts & Connections
Basics of Geometry		
Experiment with transformations in the plane.		
M.GHS.1	Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.	1.1, 1.2, 1.5, 1.6, 2.1, 3.1, 10.1
Identify and utilize inductive and deductive reasoning.		
M.GHS.2	Construct and justify the validity of a logical argument.	
	a. Identify the converse, inverse, and contrapositive of a conditional statement.	2.1
	b. Translate a short, verbal argument into symbolic form.	2.1
	c. Use Venn diagrams to represent set relationships.	2.1
	d. Use inductive and deductive reasoning.	2.2
Prove geometric theorems.		
M.GHS.3	Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent.	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 6.1
Use coordinates to prove geometric theorems algebraically.		
M.GHS.4	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.	3.5, 8.4
Make geometric constructions.		
M.GHS.5	Make formal geometric constructions with a variety of tools and methods such as a compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc. Constructions include: copying segments; copying angles; bisecting segments; bisecting angles; 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.	1.2, 1.3, 1.5, 3.3, 3.4

Transformations and Congruence		
Experiment with transformations in the plane.		
M.GHS.6	Build on prior knowledge from rigid motions to:	
	a. Represent transformations using geometric concepts in the plane.	4.1, 4.2, 4.3, 4.5
	b. Describe transformations as functions that take points in the plane as inputs and give other points as outputs.	4.1, 4.2, 4.3, 4.5
	c. Compare transformations that preserve distance and angle to those that do not.	4.1, 4.2, 4.3, 4.5
M.GHS.7	Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.	4.2, 4.3
M.GHS.8	Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	4.1, 4.2, 4.3
M.GHS.9	Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.	4.1, 4.2, 4.3, 4.4, 4.6
Understand congruence in terms of rigid motions.		
M.GHS.10	Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.	4.1, 4.2, 4.3, 4.4
M.GHS.11	Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	5.2
M.GHS.12	Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.	5.3, 5.5, 5.6
M.GHS.13	Use congruence criteria for triangles to solve problems and to prove relationships in geometric figures.	5.7
Prove geometric theorems.		
M.GHS.14	Prove theorems about triangles and lines. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point, points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 5.1, 5.4, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6

M.GHS.15	Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.	2.1, 2.2, 2.3, 2.4, 7.1, 7.2, 7.3, 7.4
Use coordinates to prove simple geometric theorems algebraically.		
M.GHS.16	Use coordinates to prove simple geometric theorems about right triangles, quadrilaterals, and circles algebraically (e.g., derive the equation of a circle of a given center and radius using the Pythagorean Theorem.	5.8, 7.5, 10.7
Similarity and Trigonometry		
Understand similarity in terms of similarity transformations		
M.GHS.17	Verify experimentally the properties of dilations given by a center and a scale factor:	
	a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.	4.5
	b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.	4.5
M.GHS.18	Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.	4.6, 8.1
M.GHS.19	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.	8.2
Prove theorems involving similarity		
M.GHS.20	Prove theorems about triangles involving similarity. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.	2.1, 2.2, 2.3, 2.4, 8.4, 9.1, 9.2
M.GHS.21	Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Use the Pythagorean Theorem and similarity criteria to derive and apply special right triangles to solve problems.	5.7, 8.1, 8.2, 8.3, 8.4, 9.3
Define trigonometric ratios and solve problems involving right triangles.		
M.GHS.22	Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.	9.4, 9.5
M.GHS.23	Explain and use the relationship between the sine and cosine of complementary angles.	9.5
M.GHS.24	Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.	9.1, 9.4, 9.5, 9.6

Apply trigonometry to general triangles		
M.GHS.25	(+) Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.	9.7
M.GHS.26	(+) Prove the Laws of Sines and Cosines and use them to solve problems.	9.7
M.GHS.27	(+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles	9.7
Circles		
Understand and apply theorems about circles.		
M.GHS.28	Prove that all circles are similar.	10.2
M.GHS.29	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.*	10.1, 10.3, 10.4, 10.5, 10.6
Find arc lengths and areas of sectors of circles.		
M.GHS.30	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.	11.1, 11.2
Make geometric constructions.		
M.GHS.31	Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.	6.2, 10.4
M.GHS.32	(+) Construct a tangent line from a point outside a given circle to the circle.	10.1
M.GHS.33	Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.	10.4
Extending to Three Dimensions and Modeling		
Explain volume formulas and use them to solve problems.		
M.GHS.34	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*	11.1, 11.2, 12.2, 12.3, 12.4
M.GHS.35	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems, including how area and volume scale under similarity transformations.	11.3, 12.2, 12.3, 12.4, 12.5

Visualize relationships between two-dimensional and three-dimensional objects and apply geometric concepts in modeling situations.		
M.GHS.36	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.	12.1, 12.7
M.GHS.37	Use geometric shapes, their measures, and their properties to describe objects:	
	a. Apply concepts of density based on area and volume in modeling situations	1.4, 11.4, 12.6
	b. Apply geometric methods to solve design problems to satisfy given constraints.	11.4
Statistics and Probability		
Understand independence and conditional probability and use them to interpret data.		
M.GHS.38	Describe events as subsets of a sample space using characteristics of the outcomes, or as unions, intersections, or complements of other events.	13.1, 13.5
M.GHS.39	Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities and use this characterization to determine if they are independent.	13.4
M.GHS.40	Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.	13.3, 13.4
M.GHS.41	Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.	13.2, 13.3, 13.4
M.GHS.42	Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.	13.4
Use the rules of probability to compute probabilities of compound events in a uniform probability model.		
M.GHS.43	Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A,* and interpret the answer in terms of the model.	13.3
M.GHS.44	Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.	13.5
M.GHS.45	(+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.	13.4
M.GHS.46	(+) Use permutations and combinations to compute probabilities of compound events and solve problems.	13.6, 13.7

Use probability to evaluate outcomes of decisions.		
M.GHS.47	Use probabilities to make fair decisions.	13.3, 13.4, 13.5, See Algebra 2 Concepts & Connections lessons: 8.1, 8.2, 8.5, 8.6
M.GHS.48	Analyze decisions and strategies using probability concepts.	13.3, 13.4, 13.5, See Algebra 2 Concepts & Connections lessons: 8.1

Standard		Algebra 2 Concepts & Connections
The Number System		
Perform arithmetic operations with complex numbers.		
M.A2HS.1	Know there is a complex number i such that $i^2=-1$, and every complex number has the form a + bi with a and b representing real numbers.	3.2
M.A2HS.2	Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.	3.2
Expressions and Equations		
Use complex numbers in polynomial identities and equations.		
M.A2HS.3	Solve quadratic equations with real coefficients that have complex solutions.	3.1, 3.2, 3.3, 3.4
M.A2HS.4	Factor special case polynomials with real coefficients that produce complex zeros.	4.6
M.A2HS.5	Show that the Fundamental Theorem of Algebra is true for quadratic polynomials with real coefficients.	4.6
Interpret the structure of expressions.		
M.A2HS.6	Interpret expressions including rational and polynomial expressions that represent a quantity in terms of its context.	
	1. Interpret parts of an expression, such as terms, factors, and coefficients.	2.4, See Math & YOU Algebra 1: lessons 1.3, 2.1, 3.6, 7.1, 7.3
	2. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1+r)_n$ *as the product of P and a factor not depending on P.*	3.2, 4.5, 6.1, 6.2, See Math & YOU Algebra 1: lessons 1.2, 2.5, 6.4, 7.2, 7.4
M.A2HS.7	Use the structure of expressions including polynomial and rational expressions to identify ways to rewrite them.	4.4, 6.5, See Math & YOU Algebra 1: lessons 7.5, 7.6, 7.7, 7.8
Write expressions in equivalent forms to solve problems.		
M.A2HS.8	Derive the formula for the sum of a finite geometric series and use the formula to solve problems.	10.3, 10.4

Perform arithmetic operations on polynomials		
M.A2HS.9	Recognize that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. Perform operations on polynomials with degree higher than two.	4.2, See Math & YOU Algebra 1: lessons 7.1, 7.2, 7.3
Understand the relationship between zeros and factors of polynomials.		
M.A2HS.10	Apply the Remainder Theorem to polynomial functions.	4.3, 4.4
M.A2HS.11	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.	4.4, 4.5, 4.6, 4.8
Use polynomial identities to solve problems.		
M.A2HS.12	Prove polynomial identities and use them to describe numerical relationships.	4.2
M.A2HS.13	Apply the Binomial Theorem for the expansion of $(x + y)_n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.	4.2
Rewrite rational expressions		
M.A2HS.14	Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ using inspection, long division, synthetic division, or, for the more complicated examples, a computer algebra system.	4.3, 7.2, 7.3, 7.4
M.A2HS.15	Recognize that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.	7.3, 7.4
Understand solving equations as a process of reasoning and explain the reasoning.		
M.A2HS.16	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.	5.1, 5.4, 7.5
Represent and solve equations and inequalities graphically.		
M.A2HS.17	Explain why the x-coordinates of the points where the graphs of the linear, polynomial, rational, absolute, exponential, and logarithmic 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).	3.5, See Math & You Algebra 1: lessons 5.5, 6.5, 9.6
Solve systems of equations.		
M.A2HS.18	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.	9.6

Functions		
Create equations that describe numbers or relationships		
M.A2HS.19	Create equations and inequalities in one variable, representing linear, quadratic, simple rational, and exponential relationships, and use them to solve problems.	3.6, 7.1, See Math & YOU Algebra 1: lessons 1.1, 1.2, 1.4, 1.5, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 6.5, 9.3, 9.4, 9.5, 10.3
M.A2HS.20	Create equations in two or more variables, representing linear, quadratic, simple rational, and exponential relationships, between quantities.	1.3, 2.4, 4.9, 6.7, 7.1, 9.6, See Math & YOU Algebra 1: lessons 3.4, 3.5, 3.6, 3.7, 3.8, 4.1, 4.2, 4.3, 4.7, 6.3, 6.4, 8.1, 8.2, 8.3, 8.4, 8.5, 10.1, 10.2
M.A2HS.21	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.	1.4, 3.6, See Math & YOU Algebra 1: lessons 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7
Interpret functions that arise in applications in terms of the context		
M.A2HS.22	Select 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. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maxima and minima; symmetries; and end behavior.*	1.1, 2.2, 2.3, 4.1, 4.8, See Math & YOU Algebra 1: lessons 3.2, 3.3, 3.6, 3.8, 8.1, 8.3, 8.4, 9.2
M.A2HS.23	Select a model function based on behavior of data and context to calculate and interpret the average rate of change of linear, exponential, quadratic, and model functions based on behavior of data and context (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.	4.1, See Math & YOU Algebra 1: lessons 8.6, 10.1, 10.2
Analyze functions using different representations		
M.A2HS.24	Graph quadratic, polynomial, square root, cube root, piecewise defined, including step functions and absolute value functions, exponential and logarithmic functions expressed symbolically and show key features of the graph. Use applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate. a. For polynomial functions, focus on identifying zeros and showing end behavior. b. For exponential and logarithmic functions focus on showing intercepts and end behavior.	1.1, 1.2, 5.1, 5.3, 6.1, 6.2, 6.3, 9.4, 9.5, See Math & YOU Algebra 1: lessons 3.8, 4.7, 6.3, 6.5, 10.1, 10.2
M.A2HS.25	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function focusing on applications and how key features to characteristics of a situation, making selection of a particular type of function model appropriate.	See Math & YOU Algebra 1: lessons 6.4, 8.5, 9.4

M.A2HS.26	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *Focus on applications and how key features relate to characteristics of a situation.*	1.3, 2.2, See Math & YOU Algebra 1: lessons 3.2, 3.4, 8.3, 8.6, 10.1, 10.2
Build a function that models a relationship between two quantities		
M.A2HS.27	Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations.	5.2, 5.5, See Math & YOU Algebra 1: lessons 6.4, 8.2
Build new functions from existing functions		
M.A2HS.28	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. Observe the effect of multiple transformations on a single graph and the common effect of each transformation across function types and use transformations to model situations.*	1.1, 1.2, 2.1, 4.7, 4.8, 5.3, 6.4, 7.2, 9.4, 9.5, See Math & YOU Algebra 1: lessons 3.7, 3.8, 8.1, 8.2, 8.4, 10.1, 10.2
M.A2HS.29	Find inverse functions for simple polynomial, simple rational, simple radical, and use simple exponential functions. 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. Consider situations where the domain of the function must be restricted in order for the inverse to exist.	5.7, 6.3, See Math & YOU Algebra 1: lesson 10.4
Construct and compare linear, quadratic, and exponential models and solve problems		
M.A2HS.30	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.	6.3, 6.5, 6.6
Statistics and Probability		
Summarize, represent, and interpret data on a single count or measurement variable		
M.A2HS.31	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.	8.1
Understand and evaluate random processes underlying statistical experiments		
M.A2HS.32	Understand statistics as a process for making inferences about population parameters based on a random sample from that population. Compare theoretical and empirical results to evaluate the effectiveness.	8.2, 8.3, 8.4
M.A2HS.33	Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation.	8.2, 8.5, 8.6

Make inferences and justify conclusions from sample surveys, experiments, and observational studies		
M.A2HS.34	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.	8.3, 8.4
M.A2HS.35	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. Informally develop the concepts of statistical significance and variability.	8.5
M.A2HS.36	Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. Recognize that some unlikely results can occur solely through randomness inherent in the system and “statistical significance” represents this likelihood. Make use of statistics as a way of dealing with, not eliminating, this inherent randomness.	8.6
M.A2HS.37	Evaluate reports based on data. Focus on data collection and how conclusions can be drawn from data.	8.4
Use probability to evaluate outcomes of decisions		
M.A2HS.38	Use probabilities to make fair decisions, including situations involving quality control, false positive, and false negative results.	8.2, 8.3, 8.4
M.A2HS.39	Analyze decisions and strategies using probability concepts. involving quality control, false positive, and false negative results.	8.2, 8.3, 8.4, 8.5, 8.6