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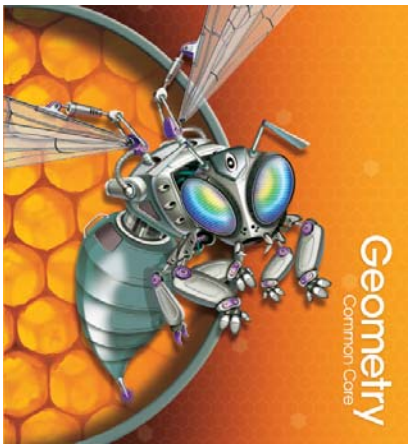

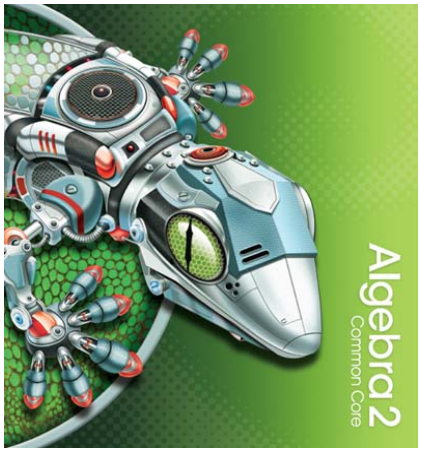

To The

Minnesota Academic Standards for Mathematics 2007 High School

ALWAYS LEARNING PEARSON

A Correlation of *Pearson High School Mathematics*, ©2015
To the Minnesota Academic Standards for Mathematics 2007

Table of Contents

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***To* the Minnesota Academic Standards for Mathematics 2007**

Minnesota Academic Standards for Mathematics 2007	Pearson High School Mathematics ©2015 Lessons
Algebra	
Understand the concept of function, and identify important features of functions and other relations using symbolic and graphical methods where appropriate.	
9.2.1.1 Understand the definition of a function. Use functional notation and evaluate a function at a given point in its domain. *For example*: If $f(x)=\frac{1}{x^2-3}$, find *f* (-4).	For related content, please see: **Algebra 1** 4-6: Congruence in Right Triangles **Algebra 2** 2-1: Relations and functions 2-2: Direct Variation
9.2.1.2 Distinguish between functions and other relations defined symbolically, graphically or in tabular form.	For related content, please see: **Algebra 1** 7-6: Exponential Functions 9-2: Quadratic Functions **Algebra 2** 2-4: More About Linear Equations 4-2: Patterns and Linear Functions 5-9: Transforming Polynomial Functions 7-3: Logarithmic Functions as Inverses
9.2.1.3 Find the domain of a function defined symbolically, graphically or in a real-world context. *For example*: The formula $f(x) = \pi x^2$ can represent a function whose domain is all real numbers, but in the context of the area of a circle, the domain would be restricted to positive *x*.	For related content, please see: **Algebra 1** 4-4: Graphing a Function Rule 7-6: Exponential Functions 9-1: Quadratic Graphs and Their Properties 11-6: Inverse Variation **Algebra 2** 4-3: Modeling With Quadratic Functions 5-8: Polynomial Models in the Real World
9.2.1.4 Obtain information and draw conclusions from graphs of functions and other relations. *For example*: If a graph shows the relationship between the elapsed flight time of a golf ball at a given moment and its height at that same moment, identify the time interval during which the ball is at least 100 feet above the ground.	**Algebra 1** 4-1: Using Graphs to Relate Two Quantities 4-4: Graphing a Function Rule 4-6: Formalizing Relations and Functions **Algebra 2** 2-1: Relations and Functions

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9.2.1.5 Identify the vertex, line of symmetry and intercepts of the parabola corresponding to a quadratic function, using symbolic and graphical methods, when the function is expressed in the form $f(x) = ax^2 + bx + c$, in the form $f(x) = a(x - h)^2 + k$, or in factored form.	**Algebra 1** 9-1: Quadratic Graphs and Their Properties 9-2: Quadratic Functions **Algebra 2** 4-1: Quadratic Functions and Transformations 4-2: Patterns and Linear Functions 5-9: Transforming Polynomial Functions 10-1: Exploring Conic Sections 10-2: Parabolas 10-6: Translating Conic Sections
9.2.1.6 Identify intercepts, zeros, maxima, minima and intervals of increase and decrease from the graph of a function.	**Algebra 2** 5-2: Polynomials, Linear Factors, and Zeros
9.2.1.7 Understand the concept of an asymptote and identify asymptotes for exponential functions and reciprocals of linear functions, using symbolic and graphical methods.	**Algebra 1** 7-6: Exponential Functions **Algebra 2** 7-1: Exploring Exponential Models 7-2: Properties of Exponential Functions
9.2.1.8 Make qualitative statements about the rate of change of a function, based on its graph or table of values. *For example*: The function $f(x) = 3^x$ increases for all x, but it increases faster when $x > 2$ than it does when $x < 2$.	**Algebra 1** 5-1: Rate of Change and Slope
9.2.1.9 Determine how translations affect the symbolic and graphical forms of a function. Know how to use graphing technology to examine translations. *For example*: Determine how the graph of $f(x) = \|x - h\| + k$ changes as h and k change.	**Algebra 2** 4-1: Quadratic Functions and Transformations 5-9: Transforming Polynomial Functions 10-1: Exploring Conic Sections 10-2: Parabolas 10-6: Translating Conic Sections

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9.2.2.1 Represent and solve problems in various contexts using linear and quadratic functions. *For example*: Write a function that represents the area of a rectangular garden that can be surrounded with 32 feet of fencing, and use the function to determine the possible dimensions of such a garden if the area must be at least 50 square feet.	**Algebra 1** 4-2: Patterns and Linear Functions 4-3: Patterns and Nonlinear Functions 4-5: Writing a Function Rule 4-6: Formalizing Relations and Functions 5-3: Slope-Intercept Form 5-4: Point-Slope Form 5-5: Standard Form 9-2: Quadratic Functions 9-7: Linear, Quadratic, and Exponential Models **Algebra 2** 2-1: Relations and Functions 2-3: Linear Functions and Slope-Intercept Form 2-5: Using Linear Models 2-6: Families of Functions 4-1: Quadratic Functions and Transformations 4-3: Modeling With Quadratic Functions 5-8: Polynomial Models in the Real World
9.2.2.2 Represent and solve problems in various contexts using exponential functions, such as investment growth, depreciation and population growth.	**Algebra 1** 7-6: Exponential Functions 7-7: Exponential Growth and Decay 9-7: Linear, Quadratic, and Exponential Models **Algebra 2** 7-1: Exploring Exponential Models 7-2: Properties of Exponential Functions
9.2.2.3 Sketch graphs of linear, quadratic and exponential functions, and translate between graphs, tables and symbolic representations. Know how to use graphing technology to graph these functions.	**Algebra 1** 7-6: Exponential Functions 9-1: Quadratic Graphs and Their Properties 9-2: Quadratic Functions 9-7: Linear, Quadratic, and Exponential Models **Algebra 2** 4-1: Quadratic Functions and Transformations 7-1: Exploring Exponential Models 7-2: Properties of Exponential Functions 10-1: Exploring Conic Sections 10-2: Parabolas

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9.2.2.4 Express the terms in a geometric sequence recursively and by giving an explicit (closed form) formula, and express the partial sums of a geometric series recursively. *For example*: A closed form formula for the terms t_n in the geometric sequence 3, 6, 12, 24, ... is $t_n = 3(2)^{n-1}$, where $n = 1, 2, 3, \ldots$, and this sequence can be expressed recursively by writing $t_1 = 3$ and $t_n = 2t_{n-1}$, for $n \square 2$. *Another example*: The partial sums s_n of the series 3 + 6 + 12 + 24 + ... can be expressed recursively by writing $s_1 = 3$ and $s_n = 3 + 2s_{n-1}$, for $n \square 2$.	**Algebra 1** 7-8: Geometric Sequence **Algebra 2** 9-3: Geometric Sequences 9-5: Geometric Series
9.2.2.5 Recognize and solve problems that can be modeled using finite geometric sequences and series, such as home mortgage and other compound interest examples. Know how to use spreadsheets and calculators to explore geometric sequences and series in various contexts.	**Algebra 1** 7-8: Geometric Sequence **Algebra 2** 9-3: Geometric Sequences 9-5: Geometric Series
9.2.2.6 Sketch the graphs of common non-linear functions such as $f(x)=\sqrt{x}$, $f(x)=\lvert x\rvert$, $f(x)=\frac{1}{x}$, $f(x) = x^3$, and translations of these functions, such as $f(x)=\sqrt{x-2}+4$. Know how to use graphing technology to graph these functions.	**Algebra 1** 4-4: Graphing a Function Rule
Generate equivalent algebraic expressions involving polynomials and radicals; use algebraic properties to evaluate expressions.	
9.2.3.1 Evaluate polynomial and rational expressions and expressions containing radicals and absolute values at specified points in their domains.	**Algebra 1** 5-8: Graphing Absolute Value Functions 11-1: Simplifying Rational Expressions **Algebra 2** 1-3: Algebraic Expressions 2-7: Absolute Value Functions and Graphs 5-1: Polynomial Functions 6-1: Roots and Radical Expressions 8-4: Rational Expressions

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9.2.3.2 Add, subtract and multiply polynomials; divide a polynomial by a polynomial of equal or lower degree.	**Algebra 1** 8-1: Adding and Subtracting Polynomials 8-2: Multiplying and Factoring 8-3: Multiplying Binomials 8-4: Multiplying Special Cases 11-3: Dividing Polynomials **Algebra 2** 5-4: Dividing Polynomials 6-6: Function Operations
9.2.3.3 Factor common monomial factors from polynomials, factor quadratic polynomials, and factor the difference of two squares. *For example*: $9x^6 - x^4 = (3x^3 - x^2)(3x^3 + x^2)$.	**Algebra 1** 8-2: Multiplying and Factoring 8-5: Factoring x2 + bx + c 8-6: Factoring ax2 + bx + c 8-7: Factoring Special Cases 8-8: Factoring by Grouping **Algebra 2** 5-2: Polynomials, Linear Factors, and Zeros
9.2.3.4 Add, subtract, multiply, divide and simplify algebraic fractions. *For example*: $\frac{1}{1-x}+\frac{x}{1+x}$ is equivalent to $\frac{1+2x-x^2}{1-x^2}$.	**Algebra 2** 6-6: Function Operations
9.2.3.5 Check whether a given complex number is a solution of a quadratic equation by substituting it for the variable and evaluating the expression, using arithmetic with complex numbers. *For example*: The complex number $\frac{1+i}{2}$ is a solution of $2x^2 - 2x + 1 = 0$, since $2\left(\frac{1+i}{2}\right)^2-2\left(\frac{1+i}{2}\right)+1=i-(1+i)+1=0$.	**Algebra 2** 4-8: Complex Numbers

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9.2.3.6 Apply the properties of positive and negative rational exponents to generate equivalent algebraic expressions, including those involving n^{th} roots. *For example*: $\sqrt{2}\times\sqrt{7}=2^{\frac{1}{2}}\times7^{\frac{1}{2}}=14^{\frac{1}{2}}=\sqrt{14}$. Rules for computing directly with radicals may also be used: $\sqrt[3]{2}\times\sqrt[3]{x}=\sqrt[3]{2x}$.	**Algebra 1** 7-1: Zero and Negative Exponents 7-2: Multiplying Powers With the Same Base 7-3: More Multiplication Properties of Exponents 7-4: Division Properties of Exponents 7-5: Rational Exponents and Radicals 10-3: Operations With Radical Expressions **Algebra 2** 1-3: Algebraic Expressions 6-1: Roots and Radical Expressions 6-2: Multiplying and Dividing Radical Expressions 6-4: Rational Exponents
9.2.3.7 Justify steps in generating equivalent expressions by identifying the properties used. Use substitution to check the equality of expressions for some particular values of the variables; recognize that checking with substitution does not guarantee equality of expressions for all values of the variables.	**Algebra 1** 1-4: Properties of Real Numbers **Algebra 2** 1-2: Properties of Real Numbers 1-3: Algebraic Expressions
Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential and n^{th} root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.	
9.2.4.1 Represent relationships in various contexts using quadratic equations and inequalities. Solve quadratic equations and inequalities by appropriate methods including factoring, completing the square, graphing and the quadratic formula. Find non-real complex roots when they exist. Recognize that a particular solution may not be applicable in the original context. Know how to use calculators, graphing utilities or other technology to solve quadratic equations and inequalities. *For example*: A diver jumps from a 20 meter platform with an upward velocity of 3 meters per second. In finding the time at which the diver hits the surface of the water, the resulting quadratic equation has a positive and a negative solution. The negative solution should be discarded because of the context.	**Algebra 1** 9-2: Quadratic Functions 9-3: Solving Quadratic Equations 9-4: Factoring to Solve Quadratic Equations 9-5: Completing the Square 9-6: The Quadratic Formula and the Discriminant 9-7: Linear, Quadratic, and Exponential Models **Algebra 2** 4-1: Quadratic Functions and Transformations 4-3: Modeling With Quadratic Functions 4-4: Factoring Quadratic Expressions 4-5: Quadratic Equations 4-6: Completing the Square 4-7: The Quadratic Formula 4-8: Complex Numbers 5-3: Solving Polynomial Equations 5-8: Polynomial Models in the Real World

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9.2.4.2 Represent relationships in various contexts using equations involving exponential functions; solve these equations graphically or numerically. Know how to use calculators, graphing utilities or other technology to solve these equations.	**Algebra 1** 7-6: Exponential Functions 7-7: Exponential Growth and Decay 9-7: Linear, Quadratic, and Exponential Models **Algebra 2** 7-1: Exploring Exponential Models 7-2: Properties of Exponential Functions 7-5: Exponential and Logarithmic Equations
9.2.4.3 Recognize that to solve certain equations, number systems need to be extended from whole numbers to integers, from integers to rational numbers, from rational numbers to real numbers, and from real numbers to complex numbers. In particular, non-real complex numbers are needed to solve some quadratic equations with real coefficients.	**Algebra 1** 1-3: Real Numbers and the Number Line 1-4: Properties of Real Numbers 9-3: Solving Quadratic Equations 9-6: The Quadratic Formula and the Discriminant **Algebra 2** 1-2: Properties of Real Numbers 4-5: Quadratic Equations 4-7: The Quadratic Formula 4-8: Complex Numbers
9.2.4.4 Represent relationships in various contexts using systems of linear inequalities; solve them graphically. Indicate which parts of the boundary are included in and excluded from the solution set using solid and dotted lines.	**Algebra 1** 6-6: Systems of Linear Inequalities **Algebra 2** 3-3: Systems of Inequalities 3-4: Linear Programming
9.2.4.5 Solve linear programming problems in two variables using graphical methods.	**Algebra 1** 6-6: Systems of Linear Inequalities **Algebra 2** 3-4: Linear Programming
9.2.4.6 Represent relationships in various contexts using absolute value inequalities in two variables; solve them graphically. *For example*: If a pipe is to be cut to a length of 5 meters accurate to within a tenth of its diameter, the relationship between the length x of the pipe and its diameter y satisfies the inequality $\lvert x - 5 \rvert \leq 0.1y$.	**Algebra 1** 3-7: Absolute Value Equations and Inequalities **Algebra 2** 1-6: Absolute Value Equations and Inequalities

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Represent real-world and mathematical situations using equations and inequalities involving linear, quadratic, exponential and n^{th} root functions. Solve equations and inequalities symbolically and graphically. Interpret solutions in the original context.	
9.2.4.7 Solve equations that contain radical expressions. Recognize that extraneous solutions may arise when using symbolic methods. *For example*: The equation $\sqrt{x-9}=9\sqrt{x}$ may be solved by squaring both sides to obtain $x - 9 = 81x$, which has the solution $x=-\frac{9}{80}$. However, this is not a solution of the original equation, so it is an extraneous solution that should be discarded. The original equation has no solution in this case. *Another example*: Solve $\sqrt[3]{-x+1}=-5$.	**Algebra 1** 10-4: Solving Radical Equations **Algebra 2** 6-5 Solving Square Root and Other Radical Equations
9.2.4.8 Assess the reasonableness of a solution in its given context and compare the solution to appropriate graphical or numerical estimates; interpret a solution in the original context.	For related content, please see: **Algebra 1** 2-2: Conditional Statements 2-3: Biconditionals and Definitions 2-4: Deductive Reasoning, 2-5: Literal Equations and Formulas 6-4: Properties of Rhombuses, Rectangles, and Squares 6-5: Conditions for Rhombuses, Rectangles, and Squares 9-8: Systems of Linear and Quadratic Equations **Algebra 2** 3-1: Solving Systems Using Tables and Graphs 3-2: Solving Systems Algebraically 3-3: Systems of Inequalities 3-4: Linear Programming 4-9: Quadratic Systems

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Geometry & Measurement	
Calculate measurements of plane and solid geometric figures; know that physical measurements depend on the choice of a unit and that they are approximations.	
9.3.1.1 Determine the surface area and volume of pyramids, cones and spheres. Use measuring devices or formulas as appropriate. *For example*: Measure the height and radius of a cone and then use a formula to find its volume.	**Geometry** 11-3: Surface Areas of Pyramids and Cones 11-4: Volumes of Prisms and Cylinders 11-5: Volumes of Pyramids and Cones 11-6: Surface Areas and Volumes of Spheres
9.3.1.2 Compose and decompose two- and three-dimensional figures; use decomposition to determine the perimeter, area, surface area and volume of various figures. *For example*: Find the volume of a regular hexagonal prism by decomposing it into six equal triangular prisms.	**Geometry** 1-2: Points, Lines, and Planes 1-8: Perimeter, Circumference, and Area 10-3: Areas of Regular Polygons 11-1: Space Figures and Cross Sections 11-2: Surface Areas of Prisms and Cylinders 11-3: Surface Areas of Pyramids and Cones 11-4: Volumes of Prisms and Cylinders 11-5: Volumes of Pyramids and Cones For related content, please see: **Algebra 1** 2-9: Percents 2-10: Change Expressed as a Percent 6-4: Applications of Linear Systems
9.3.1.3 Understand that quantities associated with physical measurements must be assigned units; apply such units correctly in expressions, equations and problem solutions that involve measurements; and convert between measurement systems. *For example*: 60 miles/hour = 60 miles/hour × 5280 feet/mile × 1 hour/3600 seconds = 88 feet/second.	**Algebra 1** 2-5: Literal Equations and Formulas 2-6: Ratios, Rates, and Conversions
9.3.1.4 Understand and apply the fact that the effect of a scale factor k on length, area and volume is to multiply each by k, k^2 and k^3, respectively.	**Geometry** 9-6: Dilations 9-7: Similarity Transformations

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9.3.1.5 Make reasonable estimates and judgments about the accuracy of values resulting from calculations involving measurements. *For example*: Suppose the sides of a rectangle are measured to the nearest tenth of a centimeter at 2.6 cm and 9.8 cm. Because of measurement errors, the width could be as small as 2.55 cm or as large as 2.65 cm, with similar errors for the height. These errors affect calculations. For instance, the actual area of the rectangle could be smaller than 25 cm^2 or larger than 26 cm^2, even though $2.6 \times 9.8 = 25.48$.	For related content, please see: **Algebra 1** 2-9: Percents 2-10: Change Expressed as a Percent 6-4: Applications of Linear Systems
Construct logical arguments, based on axioms, definitions and theorems, to prove theorems and other results in .	
9.3.2.1 Understand the roles of axioms, definitions, undefined terms and theorems in logical arguments.	**Geometry** 2-3: Biconditionals and Definitions
9.3.2.2 Accurately interpret and use words and phrases such as "if…then," "if and only if," "all," and "not." Recognize the logical relationships between an "if…then" statement and its inverse, converse and contrapositive. *For example*: The statement "If you don't do your homework, you can't go to the dance" is not logically equivalent to its inverse "If you do your homework, you can go to the dance."	For related content, please see: **Geometry** 2-2: Conditional Statements 2-3: Biconditionals and Definitions
9.3.2.3 Assess the validity of a logical argument and give counterexamples to disprove a statement.	**Geometry** 6-9: Proofs Using Coordinate Geometry

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9.3.2.4 Construct logical arguments and write proofs of theorems and other results in , including proofs by contradiction. Express proofs in a form that clearly justifies the reasoning, such as two-column proofs, paragraph proofs, flow charts or illustrations. *For example*: Prove that the sum of the interior angles of a pentagon is 540° using the fact that the sum of the interior angles of a triangle is 180°.	**Geometry** 2-4: Deductive Reasoning 5-5: Indirect Proof 6-9: Proofs Using Coordinate
9.3.2.5 Use technology tools to examine theorems, make and test conjectures, perform constructions and develop mathematical reasoning skills in multi-step problems. The tools may include compass and straight edge, dynamic software, design software or Internet applets.	**Geometry** 1-6: Basic Constructions 3-6: Constructing Parallel and Perpendicular Lines
Know and apply properties of geometric figures to solve real-world and mathematical problems and to logically justify results in .	
9.3.3.1 Know and apply properties of parallel and perpendicular lines, including properties of angles formed by a transversal, to solve problems and logically justify results. *For example*: Prove that the perpendicular bisector of a line segment is the set of all points equidistant from the two endpoints, and use this fact to solve problems and justify other results.	**Algebra 1** 5-6: Parallel and Perpendicular Lines **Geometry** 1-4: Measuring Angles 1-5: Exploring Angle Pairs 2-4: Deductive Reasoning 3-1: Lines and Angles 3-2: Properties of Parallel Lines 3-3: Proving Lines Parallel 3-4: Parallel and Perpendicular Lines 3-5: Parallel Lines and Triangles 3-6: Constructing Parallel and Perpendicular Lines 3-8: Slopes of Parallel and Perpendicular Lines 5-2 Perpendicular and Angle Bisectors 5-3 Bisectors in Triangles

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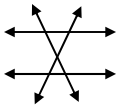
9.3.3.2 Know and apply properties of angles, including corresponding, exterior, interior, vertical, complementary and supplementary angles, to solve problems and logically justify results. *For example*: Prove that two triangles formed by a pair of intersecting lines and a pair of parallel lines (an "X" trapped between two parallel lines) are similar. 	**Geometry** 1-4: Measuring Angles 1-5: Exploring Angle Pairs 2-4: Deductive Reasoning 2-6: Proving Angles Congruent 3-2: Properties of Parallel Lines 3-3: Proving Lines Parallel 3-4: Parallel and Perpendicular Lines 3-5: Parallel Lines and Triangles 3-6: Constructing Parallel and Perpendicular Lines 7-3: Proving Triangles Similar
9.3.3.3 Know and apply properties of equilateral, isosceles and scalene triangles to solve problems and logically justify results. *For example*: Use the triangle inequality to prove that the perimeter of a quadrilateral is larger than the sum of the lengths of its diagonals.	**Geometry** 2-4: Deductive Reasoning 4-5: Isosceles and Equilateral Triangles 5-3 Bisectors in Triangles 5-4: Medians and Altitudes 5-6: Inequalities in One Triangle
9.3.3.4 Apply the Pythagorean Theorem and its converse to solve problems and logically justify results. *For example*: When building a wooden frame that is supposed to have a square corner, ensure that the corner is square by measuring lengths near the corner and applying the Pythagorean Theorem.	**Algebra 1** 10-1: The Pythagorean Theorem **Geometry** 4-6: Congruence in Right Triangles 8-1: The Pythagorean Theorem and Its Converse
9.3.3.5 Know and apply properties of right triangles, including properties of 45-45-90 and 30-60-90 triangles, to solve problems and logically justify results. *For example*: Use 30-60-90 triangles to analyze geometric figures involving equilateral triangles and hexagons. *Another example*: Determine exact values of the trigonometric ratios in these special triangles using relationships among the side lengths.	**Algebra 1** 10-6: Trigonometric Ratios **Geometry** 2-4: Deductive Reasoning 8-2: Special Right Triangles **Algebra 2** 13-2: Angles and the Unit Circle

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9.3.3.6 Know and apply properties of congruent and similar figures to solve problems and logically justify results. *For example*: Analyze lengths and areas in a figure formed by drawing a line segment from one side of a triangle to a second side, parallel to the third side. *Another example*: Determine the height of a pine tree by comparing the length of its shadow to the length of the shadow of a person of known height. *Another example*: When attempting to build two identical 4-sided frames, a person measured the lengths of corresponding sides and found that they matched. Can the person conclude that the shapes of the frames are congruent?	**Algebra 1** 2-7: Solving Proportions 2-8: Proportions and Similar Figures **Geometry** 2-4: Deductive Reasoning 4-1: Congruent Figures 4-2: Triangle Congruence by SSS and SAS 4-3: Triangle Congruence by ASA and AAS 4-4: Using Corresponding Parts of Congruent Triangles 4-6: Congruence in Right Triangles 4-7: Congruence in Overlapping Triangles 5-1: Midsegments of a Triangle 7-2: Similar Polygons 7-4: Similarity in Right Triangles 10-4: Perimeters and Areas of Similar Figures 11-7: Areas and Volumes of Similar Solids
9.3.3.7 Use properties of polygons—including quadrilaterals and regular polygons—to define them, classify them, solve problems and logically justify results. *For example*: Recognize that a rectangle is a special case of a trapezoid. *Another example*: Give a concise and clear definition of a kite.	**Geometry** 2-4: Deductive Reasoning 6-1: The Polygon Angle-Sum Theorems 6-2: Properties of Parallelograms 6-3: Proving That a Quadrilateral Is a Parallelogram 6-4: Properties of Rhombuses, Rectangles, and Squares 6-5: Conditions for Rhombuses, Rectangles, and Squares 6-6: Trapezoids and Kites
9.3.3.8 Know and apply properties of a circle to solve problems and logically justify results. *For example*: Show that opposite angles of a quadrilateral inscribed in a circle are supplementary.	**Geometry** 2-4: Deductive Reasoning

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Solve real-world and mathematical geometric problems using algebraic methods.	
9.3.4.1 Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine and tangent of an acute angle in a right triangle.	**Algebra 1** 10-6: Trigonometric Ratios **Geometry** 8-3: Trigonometry **Algebra 2** 13-4: The Sine Function 13-5: The Cosine Function 13-6: The Tangent Function 14-3: Right Triangles and Trigonometric Ratios
9.3.4.2 Apply the trigonometric ratios sine, cosine and tangent to solve problems, such as determining lengths and areas in right triangles and in figures that can be decomposed into right triangles. Know how to use calculators, tables or other technology to evaluate trigonometric ratios. *For example*: Find the area of a triangle, given the measure of one of its acute angles and the lengths of the two sides that form that angle.	**Algebra 1** 10-6: Trigonometric Ratios **Geometry** 8-3: Trigonometry 8-4: Angles of Elevation and Depression 10-5: Trigonometry and Area **Algebra 2** 13-4: The Sine Function 13-5: The Cosine Function 13-6: The Tangent Function 14-3: Right Triangles and Trigonometric Ratios 14-4: Area and the Law of Sines
9.3.4.3 Use calculators, tables or other technologies in connection with the trigonometric ratios to find angle measures in right triangles in various contexts.	**Algebra 1** 10-6: Trigonometric Ratios **Geometry** 8-3: Trigonometry 8-4: Angles of Elevation and Depression **Algebra 2** 14-2: Solving Trigonometric Equations Using Inverses 14-3: Right Triangles and Trigonometric Ratios

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9.3.4.4 Use coordinate to represent and analyze line segments and polygons, including determining lengths, midpoints and slopes of line segments.	**Algebra 1** 5-1: Rate of Change and Slope 5-6: Parallel and Perpendicular Lines **Geometry** 1-3: Measuring Segments 1-7: Midpoint and Distance in the Coordinate Plane 3-8: Slopes of Parallel and Perpendicular Lines 6-7: Polygons in the Coordinate Plane 6-8: Applying Coordinate Geometry
9.3.4.5 Know the equation for the graph of a circle with radius r and center (h, k), $(x - h)^2 + (y - k)^2 = r^2$, and justify this equation using the Pythagorean Theorem and properties of translations.	**Geometry** 12-5: Circles in the Coordinate Plane **Algebra 2** 10-1: Exploring Conic Sections 10-3: Circles 10-6: Translating Conic Sections
9.3.4.6 Use numeric, graphic and symbolic representations of transformations in two dimensions, such as reflections, translations, scale changes and rotations about the origin by multiples of 90°, to solve problems involving figures on a coordinate grid. *For example*: If the point (3,-2) is rotated 90° counterclockwise about the origin, it becomes the point (2, 3).	**Geometry** 6-8: Applying Coordinate Geometry 9-1: Translations 9-2: Reflections 9-3: Rotations 9-6: Dilations 9-7: Similarity Transformations **Algebra 2** 12-5: Geometric Transformations

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Data Analysis & Probability	
Display and analyze data; use various measures associated with data to draw conclusions, identify trends and describe relationships.	
9.4.1.1 Describe a data set using data displays, including box-and-whisker plots; describe and compare data sets using summary statistics, including measures of center, location and spread. Measures of center and location include mean, median, quartile and percentile. Measures of spread include standard deviation, range and inter-quartile range. Know how to use calculators, spreadsheets or other technology to display data and calculate summary statistics.	**Algebra 1** 12-3: Measures of Central Tendency and Dispersion 12-4: Box-and-Whisker Plots **Algebra 2** 11-6: Analyzing Data 11-7: Standard Deviation
9.4.1.2 Analyze the effects on summary statistics of changes in data sets. *For example*: Understand how inserting or deleting a data point may affect the mean and standard deviation. *Another example*: Understand how the median and interquartile range are affected when the entire data set is transformed by adding a constant to each data value or multiplying each data value by a constant.	**Algebra 1** 12-3: Measures of Central Tendency and Dispersion **Algebra 2** 11-6: Analyzing Data 11-7: Standard Deviation
9.4.1.3 Use scatterplots to analyze patterns and describe relationships between two variables. Using technology, determine regression lines (line of best fit) and correlation coefficients; use regression lines to make predictions and correlation coefficients to assess the reliability of those predictions.	**Algebra 1** 5-7: Scatter Plots and Trend Lines **Geometry** 2-1: Patterns and Inductive Reasoning

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9.4.1.4 Use the mean and standard deviation of a data set to fit it to a normal distribution (bell-shaped curve) 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. *For example*: After performing several measurements of some attribute of an irregular physical object, it is appropriate to fit the data to a normal distribution and draw conclusions about measurement error. *Another example*: When data involving two very different populations is combined, the resulting histogram may show two distinct peaks, and fitting the data to a normal distribution is not appropriate.	**Algebra 2** 11-10: Normal Distributions
Explain the uses of data and statistical thinking to draw inferences, make predictions and justify conclusions.	
9.4.2.1 Evaluate reports based on data published in the media by identifying the source of the data, the design of the study, and the way the data are analyzed and displayed. Show how graphs and data can be distorted to support different points of view. Know how to use spreadsheet tables and graphs or graphing technology to recognize and analyze distortions in data displays. *For example*: Displaying only part of a vertical axis can make differences in data appear deceptively large.	**Algebra 2** 11-6: Analyzing Data
9.4.2.2 Identify and explain misleading uses of data; recognize when arguments based on data confuse correlation and causation.	**Algebra 2** 11-6: Analyzing Data
9.4.2.3 Design simple experiments and explain the impact of sampling methods, bias and the phrasing of questions asked during data collection.	**Algebra 1** 12-5: Samples and Surveys **Algebra 2** 11-8 Samples and Surveys

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Calculate probabilities and apply probability concepts to solve real-world and mathematical problems.	
9.4.3.1 Select and apply counting procedures, such as the multiplication and addition principles and tree diagrams, to determine the size of a sample space (the number of possible outcomes) and to calculate probabilities. *For example*: If one girl and one boy are picked at random from a class with 20 girls and 15 boys, there are 20 × 15 = 300 different possibilities, so the probability that a particular girl is chosen together with a particular boy is $\frac{1}{300}$.	**Algebra 1** 12-6: Permutations and Combinations 12-7: Theoretical and Experimental Probability **Geometry** 13-1: Experimental and Theoretical Probability 13-3: Permutations and Combinations **Algebra 2** 11-1: Permutations and Combinations 11-2: Probability
9.4.3.2 Calculate experimental probabilities by performing simulations or experiments involving a probability model and using relative frequencies of outcomes.	**Algebra 1** 12-7: Theoretical and Experimental Probability **Geometry** 13-1: Experimental and Theoretical Probability 13-2: Probability Distributions and Frequency Tables 13-5: Probability Models **Algebra 2** 11-2: Probability 11-5: Probability Models
9.4.3.3 Understand that the Law of Large Numbers expresses a relationship between the probabilities in a probability model and the experimental probabilities found by performing simulations or experiments involving the model.	**Algebra 1** 12-7: Theoretical and Experimental Probability **Geometry** 13-1: Experimental and Theoretical Probability 13-5: Probability Models 13-7: Modeling Randomness **Algebra 2** 11-2: Probability 11-5: Probability Models

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9.4.3.4 Use random numbers generated by a calculator or a spreadsheet, or taken from a table, to perform probability simulations and to introduce fairness into decision making. *For example*: If a group of students needs to fairly select one of its members to lead a discussion, they can use a random number to determine the selection.	**Geometry** 13-5: Probability Models 13-7: Modeling Randomness **Algebra 2** 11-2: Probability 11-5: Probability Models
9.4.3.5 Apply probability concepts such as intersections, unions and complements of events, and conditional probability and independence, to calculate probabilities and solve problems. *For example*: The probability of tossing at least one head when flipping a fair coin three times can be calculated by looking at the complement of this event (flipping three tails in a row).	**Algebra 1** 12-7: Theoretical and Experimental Probability 12-8: Probability of Compound Events **Geometry** 13-1: Experimental and Theoretical Probability 13-4: Compound Probability **Algebra 2** 11-3: Probability of Multiple Events
9.4.3.6 Describe the concepts of intersections, unions and complements using Venn diagrams. Understand the relationships between these concepts and the words AND, OR, NOT, as used in computerized searches and spreadsheets.	**Algebra 1** 3-5: Working with Sets 3-8: Unions and Intersections of Sets **Algebra 2** 11-3: Probability of Multiple Events
9.4.3.7 Understand and use simple probability formulas involving intersections, unions and complements of events. *For example*: If the probability of an event is p, then the probability of the complement of an event is $1 - p$; the probability of the intersection of two independent events is the product of their probabilities. *Another example*: The probability of the union of two events equals the sum of the probabilities of the two individual events minus the probability of the intersection of the events.	**Algebra 1** 12-7: Theoretical and Experimental Probability 12-8: Probability of Compound Events **Geometry** 13-1: Experimental and Theoretical Probability 13-4: Compound Probability **Algebra 2** 11-3: Probability of Multiple Events

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9.4.3.8 Apply probability concepts to real-world situations to make informed decisions. *For example*: Explain why a hockey coach might decide near the end of the game to pull the goalie to add another forward position player if the team is behind. *Another example*: Consider the role that probabilities play in health care decisions, such as deciding between having eye surgery and wearing glasses.	**Geometry** 13-5: Probability Models **Algebra 2** 11-2: Probability 11-5: Probability Models
9.4.3.9 Use the relationship between conditional probabilities and relative frequencies in contingency tables. *For example*: A table that displays percentages relating gender (male or female) and handedness (right-handed or left-handed) can be used to determine the conditional probability of being left-handed, given that the gender is male.	**Geometry** 13-6: Conditional Probability Formulas **Algebra 2** 11-4: Conditional Probability