Benchmark Results

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Benchmark#	Description	Remarks/Example	Idea/Standard	Subject	Grade	Body Of Knowledge/ Strand	Cognitive Complexity Rating	D A R
MA.912.A.1.1	Know equivalent forms of real numbers (including integer exponents and radicals, percents, scientific notation, absolute value, rational numbers, irrational numbers).	Example: Express 5^{-2} without an exponent.	Real and Complex Number Systems	1	912	Algebra	Level 1: Recall	0
MA.912.A.1.2	Compare real number expressions.	Example 1: Which is greater: 2^3 or $\sqrt{49}$? Example 2: Order the following numbers from the smallest to the largest: 3.2, 2.1×10^{-3}, $\sqrt{15}$, -1.	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.1.3	Simplify real number expressions using the laws of exponents.	Example 1: Simplify $5^3 * 5^{11}$. Example 2: Simplify $(5^3)^2$	Real and Complex Number Systems	1	912	Algebra	Level 1: Recall	0
MA.912.A.1.4	Perform operations on real numbers (including integer exponents, radicals, percents, scientific	Example 1: If the length of one leg of a right triangle is 6 inches and the length of the hypotenuse is 10 inches, what is the length of the other leg?	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	notation, absolute value, rational numbers, irrational numbers) using multi-step and real-world problems.	Example 2: Earth's volume is approximately 1.08×10^{12} km³. Sun's volume is approximately 1.41×10^{18} km³. How many times is the Sun larger than the Earth?						
MA.912.A.1.5	Use dimensional (unit) analysis to perform conversions between units of measure, including rates.	Example 1: Convert 5 miles per hour to feet per second. Example 2: A sink is leaking 20 milliliters of water per second. How many gallons of water does it leak per day? Example 3: You bought an old car with a 442 cubic inch engine. Your friend has a 7.0 liter engine. Determine which engine is larger by converting 442 cubic inches to liters.	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.1.6	Identify the real and imaginary parts of complex numbers and perform basic operations.	Example: Multiply (7-4i)(10+6i).	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.1.7	Represent complex numbers geometrically.	Example: Plot the point corresponding to 3 - 2i in the complex plane and determine the absolute value of this number.	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

MA.912.A.1.8	Use the zero product property of real numbers in a variety of contexts to identify solutions to equations.	Example 1: Solve for x. $(x + 5) (x - 1) = 0$ Example 2: Solve for x. $x^3 - x^2 - 2x + 2 = 0$ Example 3: A ball is kicked and flies through the air according to the following function: h(t)= -16t^2+47t+3, where h is the height of the ball (in feet) and t is the number of seconds after the ball is kicked. At what time, t, does the ball hit the ground after being kicked?	Real and Complex Number Systems	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.10.1	Use a variety of problem-solving strategies, such as drawing a diagram, making a chart, guessing- and-checking, solving a simpler problem, writing an equation, working backwards, and creating a table.	Students should work problems where they are required to distinguish relevant from irrelevant information, identify missing information, and either find missing data or make appropriate estimates. Example 1: Fran has scored 16, 23, and 30 points in her last three games. At least how many points must she score in the next game so that her four-game average	Mathematical Reasoning and Problem Solving	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

		does not fall below 20 points? Example 2: The swimming pool at Roanoke Park is 24 feet long and 18 feet wide. The park district has determined that they have enough money to put a walkway of uniform width, with a maximum area of 288 square feet, around the pool. How could you find the maximum width of a new walkway?						
MA.912.A.10.2	Decide whether a solution is reasonable in the context of the original situation.	Example 1: A student solving the equation $x=\sqrt{x+6}$ comes up with the solution set $\{x \mid x=-2,3\}$. Explain why $\{x \mid x=-2,3\}$ is not the solution set to this equation, and why the "check" step is essential in solving the equation. Example 2: A ball is kicked and flies through the air according to the following function: h(t)= -16t^2+47t+3, where h is the height of the ball (in feet) and t is the number of seconds	Mathematical Reasoning and Problem Solving	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		after the ball is kicked. At what time, t, does the ball hit the ground after being kicked?						
MA.912.A.10.3	Decide whether a given statement is always, sometimes, or never true (statements involving linear or quadratic expressions, equations, or inequalities, rational or radical expressions, or logarithmic or exponential functions).	Example 1: Alex says x= -1 is the solution to the following system of inequalities. Explain to Alex when x=-1 is a solution and when it is not a solution. $y \geq -1/2x-3$ $y<3x+1$  Example 2: Is the statement $(a^x)^y = a^{xy}$ true for all x, for some x, or for no x? Example 3: Let c be any constant number different than 5. Which of the following lines will always be parallel to y=2x+5? Explain your answer. a. y= -2x + c b. y= ½ x + c c. y= 2x + c d. y= -½ x + c	Mathematical Reasoning and Problem Solving	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0
MA.912.A.10.4	Use counterexamples to show that statements are false.	Example 1: Show by an example that the following statement is false: "The product of two complex numbers is never a real	Mathematical Reasoning and Problem Solving	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

		number." Example 2: "All quadratic equations have exactly two distinct real roots." Provide a counter example to show that the statement in quotation marks is false.						
MA.912.A.2.1	Create a graph to represent a real-world situation.	Example 1: Conduct an experiment as follows. Take a beverage out of a refrigerator and place it in a warm room. Measure its temperature every two minutes. Plot the temperature of the beverage as a function of time. What does the graph show about the temperature change of this beverage? Example 2: A child walks to school at a steady pace. Plot her distance from home as a function of time. Now plot her distance to the school as a function of time.	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.2	Interpret a graph representing a real-world situation.	Example: Jessica is riding a bicycle in a straight line. The graph below shows her speed as it relates to the time she has spent riding.	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		Assign appropriate units to the labels of the axes and insert numbers to the axes. Describe what might have happened to account for this graph. 						
MA.912.A.2.3	Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions.	Example 1: Given the relation {(-3, -1), (2, -1), (1, 0), (2, 5)}, determine if the relation can be a function. Example 2: for f(x)=2x+6, find f(3) and find x such that f(x)=10 Example 3: Given the graph of the relation below, decide if this relation is a function. Explain your reasoning. 	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.4	Determine the domain and range of a relation.	Example: Determine the domain and range of $f(x)=\sqrt{x}$ so that f(x) is a function.	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.5	Graph absolute value equations and inequalities in two variables.	Example: Draw the graph of y = |2x - 5| and compare it with the graph of y = 2x - 5.	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.6	Identify and	Example: Graph	Relations and	1	912	Algebra	Level 2:	0

	graph common functions (including but not limited to linear, rational, quadratic, cubic, radical, absolute value).	$f(x)=x^2$, $g(x)=\frac{1}{x}$, and $h(x)=\sqrt{x}$	Functions				Basic Application of Skills & Concepts	
MA.912.A.2.7	Perform operations (addition, subtraction, division, and multiplication) of functions algebraically, numerically, and graphically.	Example: Let $f(x)=7x+2$ and $g(x)=x^2$. Find $f(x)*g(x)$	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.8	Determine the composition of functions.	Example: Let $f(x)=x^3$ and $g(x)=x-2$. Find $f(g(5))$ and $g(f(x))$	Relations and Functions	1	912	Algebra	Level 1: Recall	0
MA.912.A.2.9	Recognize, interpret, and graph functions defined piece-wise with and without technology.	Example: Sketch the graph of $f(x)=\begin{cases} x+2 & x\geq 0 \\ -x^2 & x<0 \end{cases}$	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.10	Describe and graph transformations of functions	Example: Describe how you would graph $f(x)=-2(x-3)^2-1$ from the graph of $g(x)=x^2$.	Relations and Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.2.11	Solve problems involving functions and their inverses.	Example: Find the inverse of the $f(x)=x^3-1$ function. Sketch the graph of the function and its inverse	Relations and Functions	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0
MA.912.A.2.12	Solve problems using direct, inverse, and joint variations.	Example 1: According to Hooke's Law, the force needed to	Relations and Functions	1	912	Algebra	Level 3: Strategic Thinking & Complex	0

		stretch a spring is directly proportional to the net spring stretch (stretched spring length minus original spring length). If 20 Newtons (N) force results in a net spring stretch of 5 centimeters, what is the net spring stretch achieved when a force of 80N is applied (assuming 80N force does not exceed the spring's stretch limit)? Example 2: On Monday, your drive to work takes 10 minutes and your average speed is 30 mph. On Tuesday, your drive on the same route takes 15 minutes. What is your average speed on Tuesday?					Reasoning	
MA.912.A.2.13	Solve real-world problems involving relations and functions.	Example 1: You and your parents are going to Boston. You will rent a car at Boston's Logan International Airport on a Monday morning and drop the car off in downtown Providence, RI, on the following Wednesday afternoon. Find the	Relations and Functions	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

		rates from two national car companies and plot the costs on a graph. You may choose limited or unlimited mileage plans. Decide which company offers the best deal. Explain your answer. Example 2: A cab company charges a fixed flag rate of $20 and $1.40 for every mile covered. Write an expression for the total cab fare as a function of distance driven. Then solve for the total fare after the cab traveled for 36 miles.						
MA.912.A.3.1	Solve linear equations in one variable that include simplifying algebraic expressions.	Example 1: Solve the following equation for x: 3(2x+5) = 10x-3+2x Example 2: Solve the following equation for m: ½m + 2(¾m-1)=¼m+6	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.2	Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality.	Example 1: Simplify the following expresion and identify the properities used in each step: 	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		Example 2: Given the following solution identify the properties used to justify each step: 3x+7=2x+1+3x 3x+7=2x + 3x+1 3x+7=5x+1 -2x=-6 x=3						
MA.912.A.3.3	Solve literal equations for a specified variable.	Example 1: Solve the following equation for p: q=4p-11. Example 2: Solve the following equation for c: ac=2b + 2c Example 3: The area formula for a circle is: $A = p\ r^2$. Solve for *r*.. Solve for . Example 4: The following formula tells you how to convert degrees in Celsius to degrees in Fahrenheit: F=(1.8 x C) +32 Write a formula that will tell how to convert degrees in Fahrenheit to degrees in Celsius.	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.4	Solve and graph simple and compound inequalities in one variable and be able to justify each step in a	Example 1: Solve the following inequality for *x* and then graph the solution set on a number line: 7<3x+5<11	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	solution.	Example 2: Solve the following inequality for x in the set {0, 1, 2, 3, 4}: 6x-3>10 Show your work. Example 3: Solve the following inequality for x, explaining each step in your solution: 8x-7≤2x+5						
MA.912.A.3.5	Symbolically represent and solve multi-step and real-world applications that involve linear equations and inequalities.	Example 1: You are selling tickets for a play that cost $3 each. You want to sell at least $50 worth. Write and solve an inequality for the minimum number of tickets you must sell. Example 2: An alloy is a metal that contains combinations of different types of metal. A manufacturing company needs to make an alloy that has nickel content between 43% and 47% (based on mass). The company already has an alloy with 50% nickel and another alloy with 40% nickel. They plan to mix them to make the alloy they need. Find the least	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		and greatest mass (in kg) of a 50% nickel alloy that should be mixed with a 40% nickel alloy to end up with 100 kilograms of an alloy containing the required percentage of nickel.						
MA.912.A.3.6	Solve and graph the solutions of absolute value equations and inequalities with one variable.	Example 1: Given the following equation, solve for x and graph the solution on a number line: $\|2x=5\|=7$ Example 2: Given the following inequality, solve for x and graph the solution on a number line: $\|3x-2\|\geq 5$	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.7	Rewrite equations of a line into slope-intercept form and standard form.	Example 1: Write the following linear equation in standard form 6y = 12 - 5x. Example 2: Write the equation of the line 4x + 3y = 12 in slope-intercept form.	Linear Equations and Inequalities	1	912	Algebra	Level 1: Recall	0
MA.912.A.3.8	Graph a line given any of the following information: a table of values, the x- and y-intercepts, two points, the slope and a point, the equation of the line in slope-intercept form,	Example 1: Graph the equation 3x - y = 2. Example 2: Graph the equation y = ½ x + 2 Example 3: Graph the line that contains (3,0) and has a slope of -3/2.	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	standard form, or point-slope form .							
MA.912.A.3.9	Determine the slope, x-intercept, and y-intercept of a line given its graph, its equation, or two points on the line.	Example: Find the slope and y-intercept of the line described by the equation 4x + 6y = 9.	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.10	Write an equation of a line given any of the following information: two points on the line, its slope and one point on the line, or its graph. Also, find an equation of a new line parallel to a given line, or perpendicular to a given line, through a given point on the new line.	Example 1: Find an equation of the line through the points (1, 4) and (3, 10). Example 2: Find an equation of the line that goes through the point (5, -2) with a slope of -2 Example 3: Find an equation of the line through the point (1, 4) and perpendicular to y = 3x + 1. Example 4: Find an equation of the line parallel to y = 3x + 2 that passes through the origin.	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.11	Write an equation of a line that models a data set, and use the equation or the graph to make predictions. Describe the slope of the line in terms of the	Example 1: As your family is traveling along an interstate, record the odometer reading every 5 minutes. See if a graph of time and distance shows that the relation is approximately linear. If so, write	Linear Equations and Inequalities	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

	data, recognizing that the slope is the rate of change.	the equation of the line that best fits your data. Predict the time for a journey of 50 miles. What does the slope of the line represent?  Example 2: You light a candle and record its height in centimeters every minute. The results recorded as (time, height) are (0, 20), (1, 18), (2, 16), (3, 14), (4, 13), (5, 11), (6, 10), (7, 8), (9, 4), and (10, 3). Find the line of best fit to express the candle's height as a function of the time and state the meaning of the slope in terms of the burning candle.						
MA.912.A.3.12	Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph.	Example: On a coordinate plane, graph of the following inequality: $3x+8y\geq 24$ Example: Use a spreadsheet to create a line graph of the following function: $y = (3/4)x + 7$	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.3.13	Use a graph to approximate the solution of a	Example 1: Graph $3y - x = 0$ and $2x + 4y = 15$ on the same	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application	0

	system of linear equations or inequalities in two variables with and without technology.	coordinate system. Determine whether the lines intersect. If so, find the point of intersection. Example 2: Graph the following inequalities and shade the region (if any) on the coordinate plane where both inequalities are true: $y \leq 4$ and $x + y \leq 5$ Example 3: Approximate the solution, if any, for the following system of linear equations:  Example 4: Explain why (4,-3) is a solution to the following system of inequalities: 						of Skills & Concepts	
MA.912.A.3.14	Solve systems of linear equations and inequalities in two and three variables using graphical, substitution, and elimination methods.	Example 1: Solve the following system of equations by substitution:  Example 2: Graph the solution for the following system of inequalities:	Linear Equations and Inequalities	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

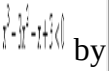
		$\begin{cases} 3x+4y<11 \\ 3x+2y\geq 7 \end{cases}$ Example 3: Solve the following system of equations: $\begin{cases} x-2y+3z=5 \\ x+3z=11 \\ 5y-6z=9 \end{cases}$						
MA.912.A.3.15	Solve real-world problems involving systems of linear equations and inequalities in two and three variables.	Example 1: Each week, you work a total of 20 hours. Some of the 20 hours is spent working at the local bookstore and some spent at the drugstore. You prefer the bookstore and want to work at least 10 more hours at the bookstore relative to the drugstore. Draw a graph to show the possible combinations of hours that you could work. Example 2: Let x = the amount of liquid (in milliliters) of a product sold by some company. The income (I) that the company makes from sales of the liquid can be represented by the equation $I(x)=10.5x$ and the expenses (E) for the production of the liquid can be represented by the	Linear Equations and Inequalities	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

		equation E(x)=5.25x+10,000, where I and E are in dollars. What is the minimum amount of the liquid (in milliliters) that the company must sell to reach the break-even point (the point where income in dollars is equal to expenses in dollars)? Example 3: You need to rent a car to drive from Pensacola to Key West. You will need the car for 7 days. One car rental agency charges $55 per day and $0.06 per mile. Another rental agency charges $65 per day with unlimited mileage. Which rental offer will cost you less? Create a situation where the rental offer in this situation will cost more than the other offer. Explain.						
MA.912.A.4.1	Simplify monomials and monomial expressions using the laws of integral exponents.	Example 1: Simplify $(3a^{3})(12a^{-3})$ Example 2: Simplify: $\frac{15x^{7}}{3x^{5}}\ x \neq 0$ Example 3:	Polynomials	1	912	Algebra	Level 1: Recall	0

		Simplify: $(3z^4)^3$ Example 4: Simplify: $(a^{-1})\ a \neq 0$ Example 5: Simplify: $(3xy)^3$ Example 6: Simplify: $\frac{10}{x^{-4}}$ Example 7: Simplify: $\frac{s^{-3}}{s^{-5}}\ s \neq 0,\ s \neq 1$						
MA.912.A.4.2	Add, subtract, and multiply polynomials.	Example 1: Example 2: (n+2)(4n-5)=?	Polynomials	1	912	Algebra	Level 1: Recall	0
MA.912.A.4.3	Factor polynomial expressions.	Example 1: Factor Example 2: Factor $2x^2-7x+3$ Example 3: Factor $4x^2-25$	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.4.4	Divide polynomials by monomials and polynomials with various	Example 1: Simplify	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	techniques, including synthetic division.	Example 2:  Example 3: Use synthetic division to divide  by x+3.						
MA.912.A.4.5	Graph polynomial functions with and without technology and describe end behavior.	End behavior may be interpreted as behavior of the function for very large positive or negative(absolutely) independent variables. Example 1: Graph the following equation:  Example 2: Describe the end behavior for the graph of the following equation 	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.4.6	Use theorems of polynomial behavior (including but not limited to the Fundamental Theorem of Algebra, Remainder Theorem, the Rational Root Theorem, Descartes' Rule of Signs, and the	Example 1: Given that 4 is a zero of the polynomial  , use synthetic divison to find the remaining zeros of the polynomial. Example 2: Use the Remainder Theorem to evaluate  at	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	Conjugate Root Theorem) to find the zeros of a polynomial function.	x=3. Explain your solution method. Example 3: Use the Rational Root Theorem to determine the possible rational roots of the equation . Example 4: Use Descartes' Rule of Signs to determine the possible number of positive real zeros and negative real zeros of the following polynomial function:						
MA.912.A.4.7	Write a polynomial equation for a given set of real and/or complex roots.	Example: Find a polynomial equation with the lowest degree possible and with real coefficients that involves the following three roots: • 2+i • 3 with a multiplicity of 2	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.4.8	Describe the relationships among the solutions of an equation, the zeros of a function, the x-	Example: Use technology to find the solutions of the following equation: . Relate your results to the graph	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	intercepts of a graph, and the factors of a polynomial expression with and without technology.	of the function 						
MA.912.A.4.9	Use graphing technology to find approximate solutions for polynomial equations.	Example: Approximate the solution(s) of  to the nearest thousandth.	Polynomials	1	912	Algebra	Level 1: Recall	0
MA.912.A.4.10	Use polynomial equations to solve real-world problems.	Example: You want to make an open-top box with a volume of 500 square inches from a piece of cardboard that is 25 inches by 15 inches by cutting squares from the corners and folding up the sides. Find the possible dimensions of the box.	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.4.11	Solve a polynomial inequality by examining the graph with and without the use of technology.	Example: Find the solution for  by graphing the function  .	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.4.12	Apply the Binomial Theorem.	Pascal's triangle is a relevant and interesting structure for examining the Binomial Theorem. Students are expected to know how to use Pascal's triangle in expanding binomials raised to	Polynomials	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		positive integer powers. Example: Expand $(x+2)^4$						
MA.912.A.5.1	Simplify algebraic ratios.	Example: Simplify $\frac{x^2-16}{x^2+4x}$	Rational Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.5.2	Add, subtract, multiply, and divide rational expressions.	Example: Find the sum of $\frac{x^2-4}{x^3}+\frac{x^3-8}{x^3}$, and tell for what value(s) of x the sum is undefined.	Rational Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.5.3	Simplify complex fractions.	Example: Simplify $\frac{\left(\frac{5}{x}\right)}{\left(\frac{1}{x+2}\right)}$	Rational Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.5.4	Solve algebraic proportions.	Example: Create a tutorial to be posted to the school's Web site to explain how to solve an algebraic proportion for beginning Algebra students. Use $\frac{x+5}{4}=\frac{3x+5}{7}$ as an example.	Rational Expressions and Equations	1	912	Algebra	Level 1: Recall	0
MA.912.A.5.5	Solve rational equations.	Example: Solve the following rational equation for n: $\frac{10}{n}+\frac{5}{n^2-4}=\frac{7}{n-2}$	Rational Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.5.6	Identify removable and non-removable discontinuities, and vertical, horizontal, and oblique	Example: Identify vertical, horizontal, and oblique asymptotes, find the zeros, and graph the following rational functions:	Rational Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	asymptotes of a graph of a rational function, find the zeros, and graph the function.							
MA.912.A.5.7	Solve real-world problems involving rational equations (mixture, distance, work, interest, and ratio).	Example: It takes Bob 3 hours to paint one side of a house. It takes Joe 2 hours to paint the same side of the house. How long will it take them if they work together?	Rational Expressions and Equations	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0
MA.912.A.6.1	Simplify radical expressions	Example 1: Simplify $\sqrt{48x^3}$ Example 2: Simplify $\frac{8}{\sqrt{24}}$	Radical Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.6.2	Add, subtract, multiply, and divide radical expressions (square roots and higher).	Example 1: Simplify  Example 2: Simplify $\sqrt[3]{3x} - \sqrt[4]{x} \cdot \sqrt[5]{3x}$	Radical Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.6.3	Simplify expressions using properties of rational exponents.	Example 1: Simplify  Example 2: Simplify  Example 3:	Radical Expressions and Equations	1	912	Algebra	Level 1: Recall	0

		Simplify $\left(a^{\frac{3}{5}}\right)^{\frac{2}{4}}$ Example 4: Simplify $(81)^{-(1/2)}$ Example 5: Simplify $\frac{1}{27^{-(1/3)}}$						
MA.912.A.6.4	Convert between rational exponent and radical forms of expressions.	Example 1: Rewrite $\sqrt[4]{5^6}$ as 5 to a rational power. Example 2: Rewrite $\sqrt[4]{x^3}$ as x to a rational power.	Radical Expressions and Equations	1	912	Algebra	Level 1: Recall	0
MA.912.A.6.5	Solve equations that contain radical expressions.	Example 1: Solve the following equation for x: $\sqrt{x+9}=9$ Example 2: Solve the following equation for y: $\sqrt{y+9}=9-\sqrt{y}$ Example 3: Solve the following equation for z: $z^{\frac{5}{2}}=32$	Radical Expressions and Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.7.1	Graph quadratic equations with and without graphing technology.	Example 1: Draw the graph of $y=x^2-2x-3$ Using a graphing calculator or a spreadsheet (generate a data set), display the graph to check your	Quadratic Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

		work.						
MA.912.A.7.2	Solve quadratic equations over the real numbers by factoring and by using the quadratic formula.	Example 1: Solve the following equation for *x*: $x^2 - 3x + 2=0$ Example 2: Solve the following equation for *x*: $x^2 - 7x + 9=0$	Quadratic Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.7.3	Solve quadratic equations over the real numbers by completing the square.	Example 1: Solve the following equation for x:  Example 2: Solve the following equation for x by completing the square: 	Quadratic Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.7.4	Use the discriminant to determine the nature of the roots of a quadratic equation.	Example: Use the discriminant to determine whether  has distinct real roots.	Quadratic Equations	1	912	Algebra	Level 1: Recall	0
MA.912.A.7.5	Solve quadratic equations over the complex number system.	Example: Solve the following equation for x over the set of complex numbers: 	Quadratic Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.7.6	Identify the axis of symmetry, vertex, domain, range and intercept(s) for a given parabola.	Example: Identify the axis of symmetry, vertex, domain, range, and intercepts for the graph of 	Quadratic Equations	1	912	Algebra	Level 1: Recall	0
MA.912.A.7.7	Solve non-linear systems of	Example: Find the solution for the	Quadratic Equations	1	912	Algebra	Level 3: Strategic	0

	equations with and without using technology.	following system of equations: $\begin{cases} y = x^2 - 5x + 1 \\ x + y + 2 = 0 \end{cases}$					Thinking & Complex Reasoning	
MA.912.A.7.8	Use quadratic equations to solve real-world problems.	Example: You have just planted a rectangular garden of corn in a plot near your home. You want to plant a uniform border of carrots around the rows of corn as shown in the figure below. According to the amount of seeds you have, you need an equal amount of area for corn and carrots. What should the width, x, in feet, of the border be? 	Quadratic Equations	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.7.9	Solve optimization problems.	Example: You have 100 feet of fencing to make three sides of a rectangular area using an existing straight fence as the fourth side. Construct a formula in a spreadsheet to determine the area you can enclose. Use the spreadsheet to make a conjecture about the maximum area possible. Prove (or disprove) your conjecture by solving an	Quadratic Equations	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0

		appropriate quadratic equation.						
MA.912.A.7.10	Use graphing technology to find approximate solutions of quadratic equations.	Example: Use a graphing calculator to solve the following equation for x to the nearest tenth: $\frac{1}{2}x^2 - \frac{1}{2}x - 1 = 0$	Quadratic Equations	1	912	Algebra	Level 1: Recall	0
MA.912.A.8.1	Define exponential and logarithmic functions and determine their relationship	Example: Find the inverse of $f(x) = 2^x$. Identify the domain and range of $f(x)$ and $f^{-1}(x)$.	Logarithmic and Exponential Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.8.2	Define and use the properties of logarithms to simplify logarithmic expressions and to find their approximate values.	Example 1: Evaluate the following expression: $\log_3 81$ Example 2: Simplify $2\log_2 x + \log_2 y - \frac{1}{2}\log_2 z$. Example 3: Find the value of $\log_{10}(10^7)$	Logarithmic and Exponential Functions	1	912	Algebra	Level 1: Recall	0
MA.912.A.8.3	Graph exponential and logarithmic functions.	Example 1: Draw the graphs of the functions $f(x) = 2^x$ and $g(x) = 2^{-x}$. Explain their differences and similarities. Example 2: Draw the graphs of the functions $f(x) = \log_2 x$ and $g(x) = 2^x$ and describe their relationship.	Logarithmic and Exponential Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

MA.912.A.8.4	Prove laws of logarithms.	Example: Use the fact that $(a^x)(a^y)=a^{(x+y)}$ to show that $\log_a(pq)=\log_a p+\log_a q$	Logarithmic and Exponential Functions	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0
MA.912.A.8.5	Solve logarithmic and exponential equations.	Example 1: Solve the following equation for *x*: $\log_2 x=5$ Example 2: Solve the following equation for *t*: $e^t=2$	Logarithmic and Exponential Functions	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.8.6	Use the change of base formula.	Example: Write $\log_{10} 75$ as a logarithm of base 2.	Logarithmic and Exponential Functions	1	912	Algebra	Level 1: Recall	0
MA.912.A.8.7	Solve applications of exponential growth and decay.	Example: The population of a certain country can be modeled by the equation $P(t)=50e^{0.02t}$, where P(t) is the population in millions and t is the number of years after 1900. Find when the population is 100 million, 200 million, and 400 million. What do you notice about these time periods?	Logarithmic and Exponential Functions	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0
MA.912.A.9.1	Write the equations of conic sections in standard form and general form, in order to identify the conic section and to find its	Example 1: Write the following equation in standard form: $x^2+y^2-2x+4y-5=0$ Identify the conic and find its foci, asymptotes, and	Conic Sections	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0

	geometric properties (foci, asymptotes, eccentricity, etc.).	eccentricity as appropriate. Example 2: Write the following equation in standard form: 						
MA.912.A.9.2	Graph conic sections with and without using graphing technology.	Example: Graph the following conic sections:  	Conic Sections	1	912	Algebra	Level 2: Basic Application of Skills & Concepts	0
MA.912.A.9.3	Solve real-world problems involving conic sections	Example: The planet Earth orbits the Sun elliptically, with the sun as one of the foci. Given that the length of the major axis of this ellipse is approximately  miles and the eccentricity of the ellipse is about 0.0167, find the smallest distance and the largest distance of Earth from the Sun.	Conic Sections	1	912	Algebra	Level 3: Strategic Thinking & Complex Reasoning	0