NGSSS Mathematics Standards
Algebra 1

BODY OF KNOWLEDGE: ALGEBRA

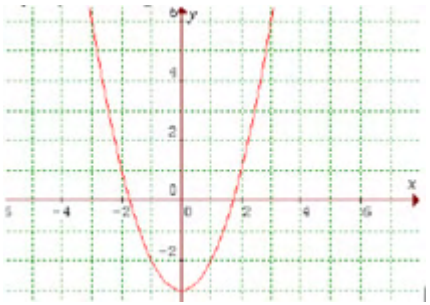
STANDARD 1: Real and Complex Number Systems

Expand and deepen understanding of real and complex numbers by comparing expressions and performing arithmetic computations, especially those involving square roots and exponents. Use the properties of real numbers to simplify algebraic expressions and equations, and convert between different measurement units using dimensional analysis.

Benchmark/DOK/Item Type			
	MA.912.A.1.8 Moderate	**Description**	Use the zero product property of real numbers in a variety of contexts to identify solutions to equations.
		Remarks/ Examples	**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?
		Clarification (EOC)	None – Assessed with **MA.912.A.7.2**
		Content Limits (EOC)	None – Assessed with **MA.912.A.7.2**

STANDARD 2: Relations and Functions

Draw and interpret graphs of relations. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.

Benchmark/DOK/Item Type			
	MA.912.A.2.3 Moderate **MC/FR**	**Description**	Describe the concept of a function, use function notation, determine whether a given relation is a function, and link equations to functions.
		Remarks/ Examples	**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 to the right, decide if this relation is a function. Explain your reasoning. 
		Clarification (EOC)	Students will identify and/or analyze relations and functions given in various forms, including graphs, tables, sets of ordered pairs, and equations. (Also assesses **MA.912.A.2.13**)
		Content Limits (EOC)	▪ Items may ask students to write given functions as equations. ▪ In items that require students to determine the equation of a function, only continuous linear and/or quadratic functions should be used. ▪ Items presenting a relation as a set of ordered pairs may not exceed 6 ordered pairs in the set. ▪ In items presenting relations as graphs for the purpose of determining if the relation is a function, the graph need not be continuous. ▪ Items should utilize function notation as appropriate.

STANDARD 2: Relations and Functions Draw and interpret graphs of relations. Understand the notation and concept of a function, find domains and ranges, and link equations to functions.			
Benchmark/DOK/Item Type	**MA.912.A.2.4** **Moderate** **MC/FR**	**Description**	Determine the domain and range of a relation.
		Remarks/ Examples	**Example:** Determine the domain and range of $f(x) = \sqrt{x}$ so that f(x) is a function.
		Clarification (EOC)	Students will determine the domain and range of relations. (Also assesses **MA.912.A.2.13**)
		Content Limits (EOC)	▪ In items requiring students to determine the domain and/or range from an equation, only linear and quadratic functions may be used. ▪ Domains and ranges may be listed as inequalities (e.g., $0 \leq x \leq 60$ for domain), or written as a sentence. ▪ Items should utilize function notation, as appropriate. ▪ Items may present relations in a variety of formats, including sets of ordered pairs, tables, graphs, and input/output models. ▪ In items requiring students to determine the domain and/or range from a graph, only linear, quadratic, or continuous piecewise functions may be used.
	MA.912.A.2.13 **High**	**Description**	Solve real-world problems involving relations and functions.
		Remarks/ Examples	**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 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.
		Clarification (EOC)	None – Assessed with **MA.912.A.2.3** and **MA.912.A.2.4**
		Content Limits (EOC)	None – Assessed with **MA.912.A.2.3** and **MA.912.A.2.4**

STANDARD 3: Linear Equations and Inequalities Solve linear equations and inequalities.			
Benchmark/DOK/Item Type	**MA.912.A.3.1** **Moderate** **MC/FR**	**Description**	Solve linear equations in one variable that include simplifying algebraic expressions.
		Remarks/ Examples	**Example 1:** Solve the following equation for x: $3(2x + 5) = 10x - 3 + 2x$ **Example 2:** Solve the following equation for m: $\frac{1}{2}m + 2\left(\frac{3}{4}m - 1\right) = \frac{1}{4}m + 6$
		Clarification (EOC)	Students will solve linear equations in one variable. Equations must be presented in all items. (Also assesses **MA.912.A.3.2**)
		Content Limits (EOC)	▪ Items may include equations with the variable on both sides of the equation. ▪ Items may include applications of commutative, associative, distributive, and identity properties.

STANDARD 3: Linear Equations and Inequalities Solve linear equations and inequalities.			
Benchmark/DOK/Item Type	**MA.912.A.3.2** **Moderate**	**Description**	Identify and apply the distributive, associative, and commutative properties of real numbers and the properties of equality.
		Remarks/ Examples	**Example 1:** Simplify the following expression and identify the properties used in each step: $(6x^2 - 5x + 1) - 2(x^2 + 3x - 4)$ **Example 2:** Given the following solution identify the properties used to justify each step: $3x + 7 = 2x + 1 + 3x$ $3x + 7 = 2x + 3x + 1$ $3x + 7 = 5x + 1$ $-2x = -6$ $x = 3$
		Clarification (EOC)	None – Assessed with **MA.912.A.3.1**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.1**
	MA.912.A.3.3 **Moderate** **MC**	**Description**	Solve literal equations for a specified variable.
		Remarks/ Examples	**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: $A = \pi r^2$. Solve for *r*. **Example 4:** The following formula tells you how to convert degrees in Celsius to degrees in Fahrenheit: $F = (1.8 \text{ x } C) + 32$ Write a formula that will tell how to convert degrees in Fahrenheit to degrees in Celsius.
		Clarification (EOC)	Students will manipulate an equation in order to isolate a specified variable.
		Content Limits (EOC)	▪ Items must contain more than two variables and require two or more procedural steps to complete.
	MA.912.A.3.4 **Moderate** **MC**	**Description**	Solve and graph simple and compound inequalities in one variable and be able to justify each step in a solution.
		Remarks/ Examples	**Example 1:** Solve the following inequality for *x* and then graph the solution set on a number line: $7 < 3x + 5 < 11$ **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: $8x - 7 \leq 2x + 5$
		Clarification (EOC)	Students will solve simple and compound inequalities and graph solutions on a number line.
		Content Limits (EOC)	▪ Items will not include inequalities without a solution.

STANDARD 3: Linear Equations and Inequalities Solve linear equations and inequalities.			
Benchmark/DOK/Item Type	**MA.912.A.3.5** **Moderate** **MC/FR**	**Description**	Symbolically represent and solve multi-step and real-world applications that involve linear equations and inequalities.
		Remarks/ Examples	**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 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.
		Clarification (EOC)	Students will interpret and/or solve real-world problems involving linear equations or linear inequalities.
		Content Limits (EOC)	▪ Items may require students to express inequalities on a number line, or to use an inequality for a response. ▪ Items may include compound inequalities presented in written format, graphically, and/or algebraically. ▪ Items will not include the use of interval notation, e.g. $(3,\infty)$, or set notation, e.g. $\{x \mid x > 3\}$.
	MA.912.A.3.7 **Low**	**Description**	Rewrite equations of a line into slope-intercept form and standard form.
		Remarks/ Examples	**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.
		Clarification (EOC)	None – Assessed with **MA.912.A.3.10**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.10**
	MA.912.A.3.8 **Moderate** **MC**	**Description**	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, standard form, or point-slope form.
		Remarks/ Examples	**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.
		Clarification (EOC)	Students will identify graphs given: ∗ a table of values; ∗ the x- and y-intercepts; ∗ two points; ∗ the slope and a point; or ∗ the equation of the line in slope-intercept form, standard form, or point-slope form. (Also assesses **MA.912.A.3.12**)
		Content Limits (EOC)	▪ Items may include lines that have zero slope or undefined slope.

STANDARD 3: Linear Equations and Inequalities

Solve linear equations and inequalities.

Benchmark/DOK/Item Type

MA.912.A.3.9 Moderate MC/FR

Description	Determine the slope, x-intercept, and y-intercept of a line given its graph, its equation, or two points on the line.
Remarks/ Examples	**Example:** Find the slope and y-intercept of the line described by the equation $4x + 6y = 9$.
Clarification (EOC)	Students will determine the slope, x-intercept, and/or y-intercept of a line given its graph, its equation, or two points on the line. (Also assesses **MA.912.A.3.12**)
Content Limits (EOC)	▪ Items may include lines that have zero slope or undefined slope.

MA.912.A.3.10 Moderate MC/FR

Description	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.
Remarks/ Examples	**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.
Clarification (EOC)	Students will write linear equations, including lines parallel or perpendicular to a given line. (Also assesses **MA.912.A.3.7**, **MA.912.A.3.12**, and **MA.912.G.1.4**)
Content Limits (EOC)	▪ Information given to determine equations of lines may include a table of values, the x- and y-intercepts, two points, the slope and a point, a graph, or an equation. ▪ Items may include lines that have zero slope or undefined slope. ▪ Given coordinates will be limited to rational numbers.

MA.912.A.3.11 High MC/FR

Description	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 data, recognizing that the slope is the rate of change.
Remarks/ Examples	**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 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?

Time	Odometer Reading (OR)	Previous Odometer Reading (POR)	Distance Traveled (OR – POR)
0	0	--------	0
5 min			
10 min			
15 min			

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.

Clarification (EOC)	Students will use linear equations to make predictions and/or find and use the rate of change (slope). (Also assesses **MA.912.A.3.12**)
Content Limits (EOC)	▪ Graphs may be located in any of the quadrants. ▪ Items may include linear equations in various forms, including standard, point-intercept, and point-slope forms. ▪ In items assessing slope as a rate of change, the slope should be presented as a ratio.

STANDARD 3: Linear Equations and Inequalities Solve linear equations and inequalities.			
Benchmark/DOK/Item Type	**MA.912.A.3.12** **Moderate**	**Description**	Graph a linear equation or inequality in two variables with and without graphing technology. Write an equation or inequality represented by a given graph.
		Remarks/ Examples	**Example 1:** On a coordinate plane, graph of the following inequality: $3x + 8y \geq 24$ **Example 2:** Use a spreadsheet to create a line graph of the following function: $y = (3/4)x + 7$
		Clarification (EOC)	None – Assessed with **MA.912.A.3.8**, **MA.912.A.3.9**, **MA.912.A.3.10**, and **MA.912.A.3.11**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.8**, **MA.912.A.3.9**, **MA.912.A.3.10**, and **MA.912.A.3.11**
	MA.912.A.3.13 **Moderate**	**Description**	Use a graph to approximate the solution of a system of linear equations or inequalities in two variables with and without technology.
		Remarks/ Examples	**Example 1:** Graph $3y - x = 0$ and $2x + 4y = 15$ on the same 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: $\begin{cases} y = -\frac{1}{4}x + 9 \\ y = 8 \end{cases}$ **Example 4:** Explain why (4,-3) is a solution to the following system of inequalities: $\begin{cases} y < 3x + 1 \\ x > 2 \end{cases}$
		Clarification (EOC)	None – Assessed with **MA.912.A.3.14**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.14**
	MA.912.A.3.14 **Moderate** **MC/FR**	**Description**	Solve systems of linear equations ~~and inequalities~~ in **two** ~~and three~~ variables using graphical, substitution, and elimination methods.
		Remarks/ Examples	**Example 1:** Solve the following system of equations by substitution: $\begin{cases} y = 2x \\ 2x + 3y = 12 \end{cases}$
		Clarification (EOC)	Students will solve systems of linear equations in two variables. (Also assesses **MA.912.A.3.13** and **MA.912.A.3.15**)
		Content Limits (EOC)	▪ Items will not specify a method for solving systems of linear equations, such as substitution or elimination. ▪ Items will not assess systems of linear inequalities. ▪ Items will not assess systems of linear equations in three variables. ▪ Items may ask students to write and/or solve systems of linear equations in two variables. ▪ Items may ask students to solve systems of linear equations given a graph of the system. ▪ In items with equations given, equations may be in the stem or options.

STANDARD 3: Linear Equations and Inequalities Solve linear equations and inequalities.			
Benchmark/DOK/Item Type	**MA.912.A.3.15** **High**	**Description**	Solve real-world problems involving systems of linear equations and inequalities in **two** ~~and three~~ variables.
		Remarks/ Examples	**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 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.
		Clarification (EOC)	None – Assessed with **MA.912.A.3.14**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.14**

STANDARD 4: Polynomials Perform operations on polynomials. Find factors of polynomials, learning special techniques for factoring quadratics. Understand the relationships among the solutions of polynomial equations, the zeros of a polynomial function, the x-intercepts of a graph, and the factors of a polynomial.					
Benchmark/DOK/Item Type	**MA.912.A.4.1** **Low** **MC/FR**	**Description**	Simplify monomials and monomial expressions using the laws of integral exponents.		
		Remarks/ Examples	**Example 1:** Simplify $\left(3a^3\right)\left(12a^2\right)$ **Example 2:** Simplify: $\frac{15x^7}{3x^5},\ x\neq 0$	**Example 3:** Simplify: $\left(3z^4\right)^3$ **Example 4:** Simplify: $\left(a^0\right),\ a\neq 0$ **Example 5:** Simplify: $\left(3xy\right)^3$	**Example 6:** Simplify: $\frac{10}{x^{-4}}$ **Example 7:** Simplify: $\left(\frac{a^2b^5}{ab^2}\right),\ a\neq 0,\ b\neq 0$
		Clarification (EOC)	Students will apply the laws of exponents to simplify monomials and monomial expressions with integral exponents.		
		Content Limits (EOC)	▪ Exponents should adhere to the general content limits. ▪ Items must have a variable base and may include a numerical base. ▪ Monomials may have no more than three variables. ▪ Items may use negative exponents.		

STANDARD 4: Polynomials

Perform operations on polynomials. Find factors of polynomials, learning special techniques for factoring quadratics. Understand the relationships among the solutions of polynomial equations, the zeros of a polynomial function, the x-intercepts of a graph, and the factors of a polynomial.

Benchmark/DOK/Item Type			
	MA.912.A.4.2 **Low** **MC/FR**	**Description**	Add, subtract, and multiply polynomials.
		Remarks/ Examples	**Example 1:** $(4x^2 - 7x + 2) - (x^2 + 4x - 5) = ?$ **Example 2:** $(n + 2)(4n - 5) = ?$
		Clarification (EOC)	Students will simplify (add, subtract, and multiply) polynomial expressions.
		Content Limits (EOC)	▪ Items requiring multiplication of polynomials are limited to a product of: two monomials, a monomial and a binomial, a monomial and a trinomial, or two binomials. ▪ Items requiring addition and subtraction are limited to combining monomials, binomials, and/or trinomials. The simplified sum or difference should contain no more than five terms.
	MA.912.A.4.3 **Moderate** **MC**	**Description**	Factor polynomial expressions.
		Remarks/ Examples	**Example 1:** Factor $36xy^2 + 18xy^4 - 12x^2y^4$ **Example 2:** Factor $2x^2 - 7x + 3$ **Example 3:** Factor $4x^2 - 25$
		Clarification (EOC)	Students will completely factor polynomial expressions, which may include a greatest common factor, difference of two squares, and trinomials. Students will use factoring methods to simplify rational expressions. (Also assesses **MA.912.A.5.1**)
		Content Limits (EOC)	▪ All monomials in items will have, at most, two variables. ▪ Coefficients must be integers. ▪ In items requiring first factoring the greatest common factor and then factoring the remaining polynomial, the remaining polynomial must have a maximum degree of two.
	MA.912.A.4.4 **Moderate** **MC**	**Description**	Divide polynomials by **monomials** ~~and polynomials with various techniques, including synthetic division~~.
		Remarks/ Examples	**Example:** Simplify $\frac{4x^3y^2 + 8xy^4 - 6x^2y^5}{2xy^2}$
		Clarification (EOC)	Students will divide polynomials by monomials.
		Content Limits (EOC)	▪ Items will be limited to dividing a polynomial by a monomial. ▪ Synthetic division will not be assessed.

STANDARD 5: Rational Expressions and Equations

Simplify rational expressions and solve rational equations using what has been learned about factoring polynomials.

Benchmark/DOK/Item Type			
	MA.912.A.5.1 Moderate	**Description**	Simplify algebraic ratios.
		Remarks/ Examples	**Example:** Simplify $\frac{x^2-16}{x^2+4x}$
		Clarification (EOC)	None – Assessed with **MA.912.A.4.3**
		Content Limits (EOC)	None – Assessed with **MA.912.A.4.3**
	MA.912.A.5.4 Low **MC/FR**	**Description**	Solve algebraic proportions.
		Remarks/ Examples	**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.
		Clarification (EOC)	Students will solve algebraic proportions.
		Content Limits (EOC)	Products of the means and extremes of proportions cannot exceed degree 1.

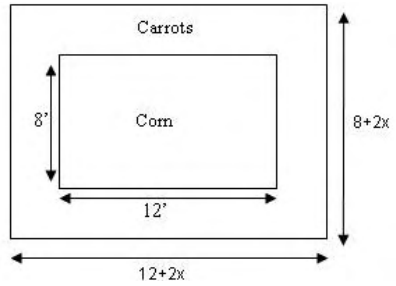
STANDARD 6: Radical Expressions and Equations

Simplify and perform operations on radical expressions and equations. Rationalize square root expressions and understand and use the concepts of negative and rational exponents. Add, subtract, multiply, divide, and simplify radical expressions and expressions with rational exponents. Solve radical equations and equations with terms that have rational exponents.

Benchmark/DOK/Item Type			
	MA.912.A.6.1 Moderate	**Description**	Simplify radical expressions
		Remarks/ Examples	**Example 1:** Simplify $\sqrt{48x^3}$ **Example 2:** Simplify $\frac{8}{\sqrt{24}}$
		Clarification (EOC)	None – Assessed with **MA.912.A.6.2**
		Content Limits (EOC)	None – Assessed with **MA.912.A.6.2**
	MA.912.A.6.2 Moderate **MC**	**Description**	Add, subtract, multiply, and divide radical expressions (**square roots** ~~and higher~~).
		Remarks/ Examples	**Example:** Simplify $\sqrt{12}+\sqrt{3x}+7\sqrt{3}$
		Clarification (EOC)	Students will add, subtract, multiply and/or divide radical expressions and simplify the results. (Also assesses **MA.912.A.6.1**)
		Content Limits (EOC)	▪ Items will assess square roots only. ▪ Radicands with variables will contain positive integral exponents.

STANDARD 7: Quadratic Equations

Draw graphs of quadratic functions. Solve quadratic equations and solve these equations by factoring, completing the square, and by using the quadratic formula. Use graphing calculators to find approximate solutions of quadratic equations.

Benchmark/DOK/Item Type			
	MA.912.A.7.1 Moderate MC	**Description**	Graph quadratic equations with and without graphing technology.
		Remarks/ Examples	**Example:** Draw the graph of $y = x^2 - 3x + 2$. Using a graphing calculator or a spreadsheet (generate a data set), display the graph to check your work.
		Clarification (EOC)	Students will identify the graph of a quadratic function given its equation. (Also assesses **MA.912.A.7.8**)
		Content Limits (EOC)	▪ Items must use quadratic equations with integral coefficients and roots only. ▪ All intercepts and vertices labeled on a graph must have integral coordinates. ▪ Quadratic equations will be presented in standard form only. ▪ For items requiring students to identify the graph of a quadratic equation, the equation must generate a function.
	MA.912.A.7.2 Moderate MC/FR	**Description**	Solve quadratic equations over the real numbers by factoring and by using the quadratic formula.
		Remarks/ Examples	**Example 1:** Solve the following equation for x: $x^2 - 3x + 2 = 0$ **Example 2:** Solve the following equation for x: $x^2 - 7x + 9 = 0$
		Clarification (EOC)	Students will solve quadratic equations over the set of real numbers. (Also assesses **MA.912.A.1.8** and **MA.912.A.7.8**)
		Content Limits (EOC)	▪ Items must have real solutions only. ▪ Quadratic equations must have integer coefficients only. ▪ Items may assess special forms like the difference of squares and perfect square trinomials. ▪ Items will not require the use of the "completing the square" method of solving quadratic equations.
	MA.912.A.7.8 Moderate	**Description**	Use quadratic equations to solve real-world problems.
		Remarks/ Examples	**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 at right. 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? 
		Clarification (EOC)	None – Assessed with **MA.912.A.7.1** and **MA.912.A.7.2**
		Content Limits (EOC)	None – Assessed with **MA.912.A.7.1** and **MA.912.A.7.2**

STANDARD 7: Quadratic Equations

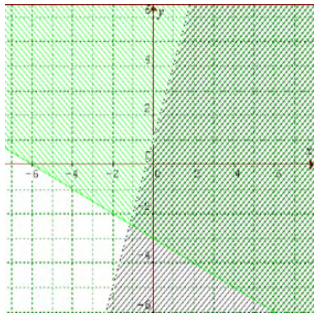
Draw graphs of quadratic functions. Solve quadratic equations and solve these equations by factoring, completing the square, and by using the quadratic formula. Use graphing calculators to find approximate solutions of quadratic equations.

Benchmark/DOK/ Item Type			
	MA.912.A.7.10 Low	**Description**	Use graphing technology to find approximate solutions of quadratic equations.
		Remarks/ Examples	Example: Use a graphing calculator to solve the following equation for x to the nearest tenth: $3x^2 - 5x - 1 = 0$
		Clarification (EOC)	**Not Assessed**
		Content Limits (EOC)	**Not Assessed**

STANDARD 10: Mathematical Reasoning and Problem Solving

In a general sense, all of mathematics is problem solving. In all of mathematics, use problem-solving skills, choose how to approach a problem, explain the reasoning, and check the results.

Benchmark/DOK/Item Type			
	MA.912.A.10.1 High	**Description**	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.
		Remarks/ Examples	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 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?
		Clarification (EOC)	**Assessed throughout**
		Content Limits (EOC)	**Assessed throughout**
	MA.912.A.10.2 Moderate	**Description**	Decide whether a solution is reasonable in the context of the original situation.
		Remarks/ Examples	**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 after the ball is kicked. At what time, t, does the ball hit the ground after being kicked?
		Clarification (EOC)	**Assessed throughout**
		Content Limits (EOC)	**Assessed throughout**

STANDARD 10: Mathematical Reasoning and Problem Solving In a general sense, all of mathematics is problem solving. In all of mathematics, use problem-solving skills, choose how to approach a problem, explain the reasoning, and check the results.			
Benchmark/DOK/Item Type	**MA.912.A.10.3** **High**	**Description**	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~~).
		Remarks/ Examples	**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. $\begin{cases} y \geq -\frac{1}{2}x - 3 \\ y < 3x + 1 \end{cases}$  **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. Which of the following lines will always be parallel to $y = 2x + 5$? Explain your answer. ***a.*** $y = -2x + c$ ***b.*** $y = \frac{1}{2}x + c$ ***c.*** $y = 2x + c$ ***d.*** $y = -\frac{1}{2}x + c$
		Clarification (EOC)	**Not Assessed**
		Content Limits (EOC)	**Not Assessed**

BODY OF KNOWLEDGE: DISCRETE MATHEMATICS

STANDARD 7: Set Theory Operate with sets, and use set theory to solve problems.			
Benchmark/DOK/Item Type	**MA.912.D.7.1** **Low** **MC/FR**	**Description**	Perform set operations such as union and intersection, complement, and cross product.
		Remarks/ Examples	**Example:** Let A={1,2,3} and B={2,4,5} be two sets in universe U={1,2,3,4,5,6}. Find the union of A and B and the complement of B. Find AXB.
		Clarification (EOC)	Students will perform set operations such as union and intersection, complement, and cross product.
		Content Limits (EOC)	▪ Items may include set notation and symbols from set theory. ▪ Finite sets should contain no more than a total of 15 unordered elements and no more than 30 ordered elements. ▪ If an item follows a numerical pattern, data may be represented by infinite sets. Example: Natural numbers {1, 2, 3, 4 . . .} ▪ Notation for the complement of set A will be limited to A' and ~A.

STANDARD 7: Set Theory Operate with sets, and use set theory to solve problems.			
Benchmark/DOK/Item Type	MA.912.D.7.2 Moderate MC/FR	**Description**	Use Venn diagrams to explore relationships and patterns and to make arguments about relationships between sets.
		Remarks/ Examples	**Example:** Use a Venn diagram to give an argument that the intersection of A and B is a subset of the union of A and B.
		Clarification (EOC)	Students will use Venn diagrams to explore relationships and patterns and to make arguments about relationships between sets.
		Content Limits (EOC)	▪ Items may include set notation and symbols from set theory. ▪ Items should contain no more than a total of 15 ordered data points. ▪ Notation for the complement of set A will be limited to A' and ~A.

BODY OF KNOWLEDGE: GEOMETRY

STANDARD 1: Points, Lines, Angles, and Planes Understand geometric concepts, applications, and their representations with coordinate systems. Find lengths and midpoints of line segments, slopes, parallel and perpendicular lines, and equations of lines. Using a compass and straightedge, patty paper, a drawing program or other techniques, construct lines and angles, explaining and justifying the processes used.			
Benchmark/DOK/Item Type	MA.912.G.1.4 Moderate	**Description**	Use coordinate geometry to find slopes, parallel lines, perpendicular lines, and equations of lines.
		Remarks/ Examples	**Example:** Given points P(2,-1), Q(-4, 2), and M(5,3), find the coordinates of a point N such that $\overleftrightarrow{PQ}$ and $\overleftrightarrow{MN}$ are parallel. Find coordinates of a point K such that $\overleftrightarrow{MK}$ is perpendicular to $\overleftrightarrow{PQ}$.
		Clarification (EOC)	None – Assessed with **MA.912.A.3.10**
		Content Limits (EOC)	None – Assessed with **MA.912.A.3.10**

Notes:

*****DOK: Depth of Knowledge Rating**

*****FR: Fill-in Response Questions**

*****Portions of benchmarks that are not applicable in the Algebra 1 Course Description are marked with ~~strikethrough~~ formatting.**