MANCHESTER REGIONAL HIGH SCHOOL

ALGEBRA 1

Adopted: August, 2012

Revised: May, 2016

Manchester Regional High School
District Mission Statement

The mission of Manchester Regional High School is to produce respectful, responsible and well-rounded graduates who possess the knowledge and skills to become contributing members of society and life-long learners.

Highly qualified, collaborative and innovative staff address the needs of a diverse school community in a stimulating and nurturing environment.

TABLE OF CONTENTS

COURSE DESCRIPTION: Algebra 1

Algebra is an elementary course dealing with the use of symbols and signed numbers in mathematics. The fundamental processes of addition, subtraction, multiplication, and division as they are applied algebraically are carefully developed. Some of the topics studied are: the rules of algebra, variables, real numbers, solving equations, exploring data, graphing equations, writing equations to solve problems, solving and graphing inequalities, solving systems of equations, powers, and exponents, polynomials and factoring, proportions, rational expressions, functions, matrices, and radicals. Emphasis is on real-life applications and problem-solving, as well as on developing the connections between algebra and the other branches of mathematics and other areas of study outside the field of mathematics.

COURSE DATA:

Length of course:	Full year
Credits:	Five
Periods per week:	Five
Classification:	Grade 9
Prerequisite:	None

EVALUATION:

The purposes of evaluation are to provide information about student progress and to determine whether students have learned the subject matter, which has been taught. Teachers will evaluate student progress by utilizing standardized tests, teacher-made quizzes and tests, oral questioning, class participation. Other evaluative criteria will include homework, special projects, special exams and other school records.

UNIT GOALS & PACING		
UNIT TITLE	**UNIT GOALS**	**RECOMMENDED DURATION**
Unit 1: Linear Equations and Inequalities	LG1: Students will be able to independently use their learning of linear equations and inequalities, absolute value equations, and piecewise functions to model and solve real world problems. LG2: Students will be able to independently graph linear equations and inequalities, absolute value equations, and piecewise functions to model a relationship between two quantities.	14 – 16 weeks
Unit 2: Systems of Equations and Inequalities	Students will be able to independently use their learning of systems of linear equations and inequalities to analyze real world relationships, make decisions, and justify those decisions mathematically.	2 – 4 weeks
Unit 3: Exponents and Exponential Functions	LG1: Students will be able to independently distinguish between linear and exponential functions given an equation, situation, or graph. LG2: Students will be able to investigate an exponent problem and apply the appropriate properties of exponents to different situations.	2 – 4 weeks
Unit 4: Polynomials and Factoring	Students will be able to independently identify different types of polynomials and determine the appropriate method for simplifying a polynomial expression.	4 – 6 weeks
Unit 5: Quadratics	LG1: Students will be able to independently solve quadratic equations using a method most advantageous to the situation. LG2: Students will be able to independently use their learning of quadratic relationships to model and solve real world problems.	4 – 6 weeks
Unit 6: Data Analysis and Probability	Students will be able to independently use probability and statistics to represent real world situations and interpret and communicate results, using technology when needed.	2 – 3 weeks

ALGEBRA I
UNIT 1: LINEAR EQUATIONS AND INEQUALITIES **SUGGESTED**

UNIT OVERVIEW	
UNIT LEARNING GOALS	
LG1: Students will be able to independently use their learning of linear equations and inequalities, absolute value equations, and piecewise functions to model and solve real world problems. LG2: Students will be able to independently graph linear equations and inequalities, absolute value equations, and piecewise functions to model a relationship between two quantities.	
UNIT LEARNING SCALE – LG 1	
4	In addition to level 3, the student can also interpret mathematical results in the context of the situation.
3	The student can: • interpret parts of an expression (i.e., terms, factors, coefficients); • explain the difference between rational and irrational numbers; • model and solve linear equations and inequalities; • solve linear equations; • model and solve absolute value equations and inequalities, including compound inequalities; • use function notations and evaluate functions; • model and evaluate piecewise functions; • model and solve problems that arise in everyday life situations; • write an equation of a line and an inequality; • construct a viable argument to justify a solution; • construct a linear function for arithmetic sequences.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes, the student can: • interpret parts of an expression (i.e., terms, factors, coefficients) ; • explain the difference between rational and irrational numbers; • solve linear equations and inequalities; • solve simple literal equations; • solve absolute value equations and inequalities; • write an equation of a line in slope-intercept form.
0	Even with help, the student does not exhibit an understanding of their learning of linear equations, absolute value equations, and piecewise functions to model and solve real world problems.

UNIT LEARNING SCALE – LG2	
4	In addition to level 3, the student can analyze those relationships mathematically to draw conclusions.
3	The student can: • graph linear equations and inequalities and show key features of the graph (i.e., slope, domain and range) ; • construct a linear function given a graph, description of a relationship, or input-output table; • graph absolute value equations and inequalities, including compound inequalities; • graph piecewise and step functions; • compare properties of two functions each represented in a different way (algebraically, graphically, and numerically in tables).
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	With help and/or mistakes, the student can: • graph linear equations and inequalities and show key features of the graph (i.e., slope, domain and range) ; • construct a linear function given a graph, description of a relationship, or input-output table; • graph absolute value equations and inequalities.
0	Even with help, the student does not exhibit understanding of graphing linear equations, absolute value equations, and piecewise functions to model a relationship between two quantities.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: Real world scenarios and understandings can be modeled by graphs, equations, and inequalities. Each representation of a give function is simply a different way of expressing the same idea.	EQ1a: How can change be represented mathematically? EQ1b: Can equations/inequalities that appear to be different be equivalent?
EU2: Linear relationships are algebraic functions that allow us to organize data and make predictions.	EQ2: How can you use mathematical models to describe change or change over time?
EU3: Graphs and equations are alternative (and often equivalent) ways for depicting and analyzing patterns of change.	EQ3: How can you determine the best method for graphing?
EU4: Some methods of graphing are better for a given situation than others.	EQ4: How do you represent relationships between quantities that are not equal?

COMMON CORE STANDARDS

MA.HS.N.RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

MA.HS.A.SSE.1 Interpret expressions that represent a quantity in terms of its context (Modeling standard)

a. Interpret parts of an expression, such as terms, factors, and coefficients.

b. Interpret complicated expressions by viewing one or more of their parts as a single entity.

MA.HS.N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MA.HS.A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

MA.HS.F.IF.7a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

a. Graph linear and quadratic functions and show intercepts, maxima, and minima

COMMON CORE STANDARDS
MA.HS.F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval Estimate the rate of change from a graph. MA.HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. MA.HS.F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). MA.HS.A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. MA.HS.A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. MA.HS.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. MA.HS.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. MA.HS.N.Q.2 Define appropriate quantities for the purpose of descriptive modeling. MA.HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. MA.HS.A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method. MA.HS.A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). MA.HS.F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x The graph of f is the graph of the equation y = f(x). MA.HS.F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. MA.HS.F.IF.3 Understand the concept of a function and use function notation. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n + 1) = f(n) + f(- 1) for n ≥ 1. MA.HS.F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function. MA.HS.F.IF.7b Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.\ MA.HS.F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. MA.HS.F.BF.1 Write a function that describes a relationship between two quantities. Determine an explicit expression, a recursive process, or steps for calculation from a context. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model. Compose functions. For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time. MA.HS.F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context. MA.HS.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential function. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

COMMON ASSESSMENT	
ALIGNMENT	DESCRIPTION
LG2 EU3, EQ3 N.Q.1, A.SSE.1, F.LE.1, F.IF.6, S.ID.7, A.REI.10, F.IF.1, F.IF.2, F.IF.3, F.IF.9	Students will be given multiple representations of linear functions. They will then be asked to analyze, compare and contrast, and evaluate these linear functions (i.e., students will be given a graph, table of values and equation of a line).
LG2 EU2, EQ2 A.REI.3, A.REI.1	Students will develop a logical argument for determining the common errors in solving linear equations. Students will justify their argument by solving linear equations and revising other students' solutions.
LG 1 EU1, EQ1a EU2, EQ2 A.CED.2, A.CED.1, A.CED.3, F.BF.1, F.LE.5, N.Q.2	Students will synthesize a real life situation using linear equations (e.g., d = rt, Fahrenheit to Celsius, perimeter, area, volume, I = PRT).
LG1 , LG2 EU1, EQ1 EU2, EQ2 EU3, EQ3 F.IF.7a, A.CED.2, F.LE.2, A.CED.1, A.REI.10, F.IF.5, F.IF.7b	Students will model a real world situation by creating an equation and graphing it (e.g., selling long sleeve and short sleeve t- shirts with a budget of $$x$).
LG1, LG2 EU1, EQ1a, EQ1b EU2, EQ2 A.CED.4, A.REI.12, A.REI.3, A.CED.1, A.CED.3	Students will create, graph, and solve an inequality based on a real world scenario asking them to determine how many items (e.g., how many pants and shirts) they can buy.

ALGEBRA I
UNIT 2: SYSTEMS OF EQUATIONS AND INEQUALITIES **SUGGESTED**

UNIT OVERVIEW

UNIT LEARNING GOALS

Students will be able to independently use their learning of systems of linear equations and inequalities to analyze real world relationships, make decisions, and justify those decisions mathematically.

UNIT LEARNING SCALE

4	In addition to level 3, the student can explain the meaning of the problem and reflect on whether the results are reasonable.
3	The student can: • solve a system of linear equations using a variety of methods (i.e., substitution, graphing, elimination); • solve and graph linear inequalities with two variables and check for solutions; • determine the number of solutions of a system and understand the reason why; • model and solve problems that arise in everyday situations; • analyze the relationships between two different linear functions to draw conclusions.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes, the student can: • solve a system of linear equations using one method (i.e., substitution, graphing, elimination); • solve linear inequalities with two variables; • determine the number of solutions of a system.
0	Even with help, the student does not exhibit an understanding of systems of linear equations and inequalities.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: Systems of equations or inequalities are used to model and solve real-world problems involving two variables, some of which may have no solution or many solutions.	EQ1: How can equations and inequalities be used to represent situations and solve problems?
EU2: Systems of equations can be solved in a variety of ways; one method may be more advantageous than another depending on the scenario.	EQ2: How can you determine the best method for solving a system of equations or inequalities?

COMMON CORE STANDARDS

MA.HS.A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

MA.HS.A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

MA.HS.A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

MA.HS.A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

COMMON ASSESSMENT	
ALIGNMENT	DESCRIPTION
LG 1 EU1, EQ1a A.REI.6, A.CED.3, A.REI.5	Students will create a system of equations to model and graph a real life situation involving cost of revenue. They will interpret the graph of the system and construct and evaluate an equation for profit (e.g., ticket sales for a school play, movie theatre tickets, two students opening separate business with different restrictions, determining break-even).
LG 1 EU1, EQ1a EU2, EQ2 A.REI.6, A.CED.3, A.REI.5, A.REI.12	Students will create a system of inequalities to represent a real world scenario (e.g., draw conclusions about the size of a garden given specific limitations).

UNIT OVERVIEW	
UNIT LEARNING GOALS	
LG1: Students will be able to independently distinguish between linear and exponential functions given an equation, situation, or graph. LG2: Students will be able to investigate an exponent	
UNIT LEARNING SCALE – LG1	
4	In addition to level 3, the student can use reasoning to create a representation of the quantities.
3	The student can: • interpret and write exponential growth and decay functions; • evaluate and graph exponential functions; • solve exponential equations mathematically and graphically; • apply the mathematics they know to solve the problems that arise in everyday life.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	With help and/or mistakes, the student can: • interpret exponential growth and decay functions; • evaluate exponential functions.
0	Even with help, the student does not exhibit an understanding of distinguishing between linear and exponential functions given an equation, situation, or graph.
UNIT LEARNING SCALE – LG2	
4	In addition to level 3, the student can make sense of quantities and explain their relationships.
3	The student can: • simplify expressions using the properties of exponents; • produce an equivalent form of an expression; • find the nth roots and evaluate expressions with rational exponents; • construct exponential functions given a graph, description or table.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes, the student can: • simplify expressions using the properties of exponents; • find the nth roots and evaluate expressions with rational exponents; • solve exponential equations mathematically.
0	Even with help, the student does not exhibit an understanding of investigating an exponent problem and apply the appropriate properties of exponents to different situations.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: Real world situations involving exponential relationships can be solved using multiple representations.	EQ1a: Why is it necessary to model a real world situation using mathematical relationships? EQ1b: How can one differentiate between models given a real world set of data?
EU2: Properties of exponents make it easier to simplify expressions.	EQ2: How can a single quantity be represented by many different expressions?

COMMON CORE STANDARDS

MA.HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

c. Use the properties of exponents to transform expressions for exponential functions For example the expression 1.15t can be rewritten as (1.151/12)12t ≈ 1 01212t to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

MA.HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

MA.HS.F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential function.

a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

MA.HS.F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.

MA.HS.F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

MA.HS.A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

COMMON ASSESSMENT

ALIGNMENT	DESCRIPTION
LG1 EU1, EQ1a, EQ1b A.CED.2, F.LE.1, F.LE.5, F.LE.2, A.CED.1	Given real world scenarios, students will create models for exponential functions. They will then create a graph for each function and compare values after a certain number of years. Students will justify their answers mathematically.
LG2 EU2, EQ2 A.SSE.3c	Students will analyze two different methods for evaluating an exponential expression. They will develop a logical argument for which method seems more advantageous and use that method to evaluate another exponential expression (e.g., rewriting from rational exponent form to radical form and vice-versa).

ALGEBRA I
UNIT 4: POLYNOMIALS AND FACTORING **SUGGESTED**

UNIT OVERVIEW

UNIT LEARNING GOALS

Students will be able to independently identify different types of polynomials and determine the appropriate method for simplifying a polynomial expression.

UNIT LEARNING SCALE

4	In addition to level 3, the student can critique the work of others by either justifying their methods or identifying and correcting their mistakes.
3	The student can: • classify polynomials and find their degree; • simplify polynomial expressions; • multiply polynomial expressions; • factor polynomial expressions using the gcf, $x^2 + bx + c$, $ax^2 + bx + c$, difference of two squares, and perfect square trinomials; • choose the most efficient method to simplify a polynomial expression; • justify their choice mathematically.
2	The student sometimes needs assist ance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes, the student can: • classify polynomials and find their degree; • simplify polynomial expressions; • multiply polynomial expressions with a coefficient of 1.
0	Even with help, the student does not exhibit understanding of identifying different types of polynomials and determining the appropriate method for simplifying a polynomial expression.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: Students will be able to manipulate polynomials using addition, subtraction, multiplication, and factoring using a variety of methods.	EQ1: Why is it necessary to manipulate expressions in mathematics?
EU2: Students will apply their knowledge of simplifying polynomials to real-life situations.	EQ2: How can you use expressions to model real-life situations?

COMMON CORE STANDARDS

MA.HS.A.APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

MA.HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeroes of the function it defines.

MA.HS.A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2).

COMMON ASSESSMENT

ALIGNMENT	DESCRIPTION
LG1 EU1, EQ1 EU2, EQ2 APR.1, A.SSE.3a, A.SSE.2	Students will classify, simplify, and factor polynomial expressions based on real world situations (e.g., write an investment problem to identify the growth factor by the degree, represent the height of an object projectile, find the width of the opening of an arch, or find a missing dimension of a rectangular area).

UNIT OVERVIEW	
UNIT LEARNING GOALS	
LG1: Students will be able to independently solve quadratic equations using a method most advantageous to the situation. LG2: Students will be able to independently use their learning of quadratic relationships to model and solve real world problems.	
UNIT LEARNING SCALE – LG1	
4	In addition to level 3, the student can make sense of quantities and their relationships in problem situations.
3	The student can: • factor polynomials; • solve quadratic equations using the zero product property; • solve quadratic equations by graphing; • solve quadratics equations by using square roots; • solve quadratic equations by completing the square; • solve quadratic equations by using the quadratic formula; • choose the most efficient method to solve the quadratic equation and justify their choice mathematically.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes the student can: • solve quadratic equations using the zero product property; • solve quadratics equations by using square roots; • solve quadratic equations by using the quadratic formula.
0	Even with help, no understanding of solving quadratic equations using a method most advantageous to the situation.
UNIT LEARNING SCALE – LG2	
4	In addition to level 3, the student can interpret their mathematical results in the context of the situation.
3	The student can: • perform transformations on a quadratic; • solve real-life problems involving functions of the form $f(x) = ax^2 + bx + c$ (e.g., projectile motion); • explain the maximum and minimum value and the axis of symmetry; • model real-life problems using $f(x) = a(x-h)^2 + k$;
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of score 3 performances.
1	With help and/or mistakes, the student can: • graph the quadratic equation; • solve real-life problems involving functions of the form $f(x) = ax^2 + bx + c$ (e.g., projectile motion); • find the maximum and minimum value and the axis of symmetry, but have difficulty explaining their meaning.
0	Even with help, students have no understanding of quadratic relationship to model and solve real world problems.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: The characteristics of quadratic functions and their representations are useful in solving real-world problems.	EQ1: Why is it necessary to use mathematical relationships to model a real world situation?
EU2: The graph of any quadratic function is a transformation of the basic quadratic function.	EQ2: Why can it be said that all quadratics are just transformations?
EU3: There are multiple methods to solving a quadratic, each of which is suitable to certain situations.	EQ3: How can you determine the best method for solving quadratic equations?
EU4: It is important to be able to graph a quadratic in order to compare solutions.	EQ4: Why should we compare a quadratic solution to its graph?

COMMON CORE STANDARDS

MA.HS.F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

MA.HS.F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

Graph linear and quadratic functions and show intercepts, maxima, and minima MA.HS.A.REI.4 Solve Quadratic equations in one variable.

Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

MA.HS.A.REI.11 Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, and polynomial, rational, absolute value, exponential, and logarithmic functions.

MA.HS.A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

MA.HS.F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

MA.HS.A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

MA.HS.A.APR.3 Identify zeroes of polynomials when suitable factorizations are available, and use the zeroes to construct a rough graph of the function defined by the polynomial.

MA.HS.A.REI.4 Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x - p)2 = q that has the same solutions Derive the quadratic formula from this form.

MA.HS.F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Use the process of factoring and completing the square in a quadratic function to show zeroes, extreme values, and symmetry of the graph, and interpret these in terms of a context.

MA.HS.F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

COMMON ASSESSMENT	
ALIGNMENT	DESCRIPTION
LG1 LG2 EU1 EQ1, EU2, EQ2 EU3, EQ3 EU4, EQ4 F.BF.3, F.IF.7a, F.IF.4, A.REI.4b, A.CED.2, A.SSE.3b, A.REI.4a, F.IF.8a, F.LE.3, A.APR.3	Students will choose the most efficient method to solve a quadratic equation (i.e., choose to solve by graphing, factoring, completing the square, or using the quadratic formula), and justify their choice and solution mathematically.
LG2 EU1, EQ1 A.REI.11	Students will solve real life problems involving quadratic equations and explain the answers in terms of the context (e.g., using a graph to represent the elevation of an object after each second it is released, finding the maximum elevation of an object being thrown, finding the width of an archway, or finding the missing dimension of a plot of land or a structure given the area as a quadratic).

ALGEBRA I
UNIT 6: DATA ANALYSIS & PROBABILITY **SUGGESTED**

UNIT OVERVIEW	
UNIT LEARNING GOALS	
Students will be able to independently use probability and statistics to represent real world situations and interpret and communicate results, using technology when needed.	
UNIT LEARNING SCALE	
4	In addition to level 3, the student can generate and test hypotheses by arriving at conclusions and justifying findings.
3	The student can: • find the theoretical probability; • find the experimental probability and be able to communicate how it differs from theoretical probability; • compare the mean, median, and mode and create a box-and-whisker plot; • apply and interpret the standard deviation; • find the line of best fit and linear regressions; • interpret their mathematical results in the context of the situation.
2	The student sometimes needs assistance from a teacher, makes minor mistakes, and/or can do the majority of level 3 performances.
1	With help and/or mistakes, the student can: • find the theoretical probability; • find the experimental probability; • find mean, median, and mode and create a box-and-whisker plot; • state the linear regressions in a scatter plot.
0	Even with help, the student does not exhibit understanding of the basic tenets of probability and statistical methods.

ENDURING UNDERSTANDINGS	ESSENTIAL QUESTIONS
EU1: Probability describes the likelihood of a given event occurring.	EQ1: How is probability related to real-world events?
EU2: Data can be analyzed both numerically and visually in order to convey meaning.	EQ2: How can collecting and analyzing data help you make decisions or predictions?

COMMON CORE STANDARDS
MA.HS.S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). MA.HS.S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets. MA.HS.S.ID.3 Interpret differences in shape, center and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers). MA.HS.S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies. MA.HS.S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. MA.HS.S.ID.9 Distinguish between correlation and causation. MA.HS.S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function. Emphasize linear and exponential models. b. Informally assess the fit of a function by plotting and analyzing residuals. c. Fit a linear function for a scatter plot that suggests a linear association. MA.HS.N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

COMMON ASSESSMENT	
ALIGNMENT	DESCRIPTION
LG1 EU2, EQ2 S.ID.2, S.ID.5, S.ID.6, N.Q.3	Students will research and collect data on a topic of their choice. They will then create a visual representation and develop a logical argument for the model that best represents their data. They will use the model to predict what will happen if the pattern continues (e.g., arm length and height of basketball players, opening movie sales and the cost of movie production, hours spent studying and grades, the age of academy award winners and the year they won).
LG 1 EU2, EQ2 S.ID.1 S.ID.3	Students will compare two box plots for shape, center and spread. They will then determine which model is appropriate in different scenarios (e.g., average monthly temperature, average rainfall, and average harvested fruit in a year).