Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 1	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students become facile with algebraic manipulation, including rearranging and collecting terms, factoring, and identifying equivalent forms of one and common factors in rational expressions?
2. How can students analyze and explain the process of solving an equation and justify the process used in solving an equation?
3. How can students master the solution of linear equations and later apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
4. How can students create and solve equations and inequalities?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 1: **(Aug. – Sept.)** **Number and Quantity, Expressions, and Linear Equations and Inequalities** **(25 days)**	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.	Understanding: • Proper Syntax • Academic Vocabulary • Number Sets • Equivalent Form of zero • Equivalent Form of one • Tile Spacers • Number Lines • Quantity • Area Models • Area Models using Generic Rectangles • Simplifying • Expressions vs. Solving Equations	Course Introduction and Expectations Syntax - Expressions, Equations, and Inequalities (GMR) Warm-Up Template (Word) (GMR) Multiple Methods Mat (GMR) LCM - Bubble Method Language (GMR) 2.2 Add Real Numbers Adding Integers Worksheet (GMR) Adding/Subtracting Integers Worksheet (GMR) 2.3 Subtracting Real Numbers Real Number Line Development & Venn Diagram (CP) 2.4 Multiplying Real Numbers 2.5 Apply the Distributive Property Distributive Property (CP) 2.6 Dividing Real Numbers 1.2 Order of Operations Order of Operations (L) Algebra Tiles (CP) Simplifying Expressions & Solving Equations With Two Column Proofs (CP) (7 days)
	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.		
	N-Q.2	Define appropriate quantities for the purpose of descriptive modeling.		
	N-Q.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.		
	A-SSE.1	Interpret expressions that represent a quantity in terms of its context.		
	A-SSE.1a	Interpret parts of an expression, such as terms, factors, and coefficients.		
	A-SSE.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1 + r)^n$ as the product of P and a factor not depending on P*		

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Essential Questions for this Unit:

1. How can students become facile with algebraic manipulation, including rearranging and collecting terms, factoring, and identifying equivalent forms of one and common factors in rational expressions?
2. How can students analyze and explain the process of solving an equation and justify the process used in solving an equation?
3. How can students master the solution of linear equations and later apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
4. How can students create and solve equations and inequalities?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 1: **(Aug. – Sept.)** **Number and Quantity, Expressions, and Linear Equations and Inequalities** **(25 days)**	A-SSE.2	Use the structure of an expression to identify ways to rewrite it.	Understanding: Solving Equations using multiple methods: • Bar Models • Decomposition • Inverse Operations • Algebra Tiles • Number Line • Justifications • Proper Syntax Inequalities: • Sense of an inequality • Multiple-Representations: verbal, symbolic, graph • Build on multiple-methods for equation solving • Proper Syntax	Simplifying Expressions & Solving Equations With Two Column Proofs (L) 3.2 Solve Two-Step Equations 3.3 Solve Multi-Step Equations 3.4 Solve Equations With Variables on Both Sides Solving Equations with Variables on Both Sides (CP) Solving Equations with Variables on Both Sides (L) 3.8 Rewrite Equations & Formulas Include Distribute and collect like terms Include Consecutive Integer and Perimeter Problems Include Distance – Rate – Time Problems Distance = Rate X Time: Focus on Student Talk (L) Motion Problems (L) (10 days) 6.1 Solving Inequalities Using Addition and Subtraction 6.2 Solving Inequalities Using Multiplication and Division 6.3 Solving Multi-Step Inequalities Solving Inequalities (L) (5 days) **Review and Unit #1 Assessment** (3 days)
	A-CED.1	Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*		
	A-CED.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*		
	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*		
	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.		
	A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 1-2	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students build on learning in earlier grades, when students learn to define, evaluate, and compare functions, and use them to model relationships between quantities?
2. How can students learn function notation and develop the concepts of domain and range?
3. How can students focus on linear functions, including sequences, and also explore absolute value functions; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
4. How can students interpret arithmetic sequences as linear functions?
5. How can students focus on the inverse of a linear function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 2: (Sept. – Oct.) Absolute Value: Equations, Inequalities and Functions **Linear Functions: Forms, Graphing, Inverse, and Arithmetic Sequences** **(23 days)**	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.	Understanding: • Sense of an Inequality • Mathematical understanding of absolute value • Solve absolute value equations and inequalities both algebraically and graphically • Build on multiple-methods of equation solving • Function Notation • Academic Vocabulary • Function Values • Label axes on coordinate plane • Proper Syntax	6.4 Solve Compound Inequalities (include set notation) 6.5 Solve Absolute Value Equations Absolute Value Equations and Inequalities (CP) 6.6 Solve Absolute Value Inequalities (4 days) 4.1 Plot Points in a Coordinate Plane Graphing Linear Equations- Linear Family of Functions Graphing Family of Functions (L) 1.6 Represent Functions as Rules & Tables 1.7 Represent Functions as Graphs (5 days)
	A-REI.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.		
	A-REI.3.1	Solve one-variable equations and inequalities involving absolute value, graphing the solutions and interpreting them in context.		
	A-CED.1	Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions*		
	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 $y = f(x)$.		
	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.		
	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).		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 1-2	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students build on learning in earlier grades, when students learn to define, evaluate, and compare functions, and use them to model relationships between quantities?
2. How can students learn function notation and develop the concepts of domain and range?
3. How can students focus on linear functions, including sequences, and also explore absolute value functions; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
4. How can students interpret arithmetic sequences as linear functions?
5. How can students focus on the inverse of a linear function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 2: **(Sept. – Oct.)** **Absolute Value: Equations, Inequalities and Functions** **Linear Functions: Forms, Graphing, Inverse, and Arithmetic Sequence** **(23 days)**	A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	Understanding: • Advantages of the various forms of a linear function when graphing • Concept of Rate of Change • Identify Key features of the graph of a function • Accuracy and scale when graphing • Proper Syntax Understanding: • Interpret rate of change algebraically, from a table, from a graph • Proper Syntax	2 Graphing Linear Equations 3 Graph Using Intercepts 4.4 Find Slope & Rate of Change Discovering Slope (L) 4.5 Graphing Using Slope-Intercept Form Slope-Intercept Sort (L) Standard Form 5.3 Point-Slope Form and Writing Linear Equations Three Forms of an Equation of a Line (L) (6 days on Linear Forms and Graphing Linear Functions in the various forms) Emphasis on Graphing Linear Functions and the advantages of each form.
	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.		
	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.*		
	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 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.*		
	F-IF.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.		
	F-LE.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 1-2	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
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Essential Questions for this Unit:

1. How can students build on learning in earlier grades, when students learn to define, evaluate, and compare functions, and use them to model relationships between quantities?
2. How can students learn function notation and develop the concepts of domain and range?
3. How can students focus on linear functions, including sequences, and also explore absolute value functions; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
4. How can students interpret arithmetic sequences as linear functions?
5. How can students focus on the inverse of a linear function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 2: (Sept. – Oct.) Absolute Value: Equations, Inequalities and Functions **Linear Functions: Forms, Graphing, Inverse, and Arithmetic Sequences** **(23 days)**	F-BF.4a	Find inverse functions. Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. (Linear only)	Understanding: • Basic understanding of an inverse function • Relationship between a linear function and its inverse function • Domain of a linear function vs. the domain of an arithmetic sequence • Graph of a linear function vs. graph an of arithmetic sequence • Explicit formula vs. recursive formula • Proper Syntax • Graphical representations of solutions	Lesson: Inverse of a Linear Function Inverse Functions (L) Lesson: Arithmetic Sequences Sequences – Arithmetic (L) (5 days) **Review and Benchmark/Unit #1 Assessment** (3 days)
	F-IF.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n + 1) = f(n) + f(n – 1) for n ≥ 1.*		
	F-BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 2	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:
1. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create quadratic and exponential expressions.
2. How can students become facile with algebraic manipulation, including rearranging and collecting terms, factoring, and identifying equivalent forms of one and common factors in rational expressions?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 3: (Nov.) **Properties of Exponents and Rational Exponents** **Polynomial Operations** **(26 days)**	N-RN.1	Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*	Understanding: • Equivalent forms of one • Decomposition to simplify • Prime factors to simplify • Area Models • Area models using generic rectangles • Proper Syntax	Properties of Exponents (CP) 8.1 Apply Exponent Properties Involving Products 8.2 Apply Exponent Properties Involving Quotients Quotient of Powers (L) 8.3 Define & Use Zero and Negative Exponents Zero and Negative Exponents (L) Fractional Exponents (L) (3 days on Properties of Exponents) Lesson: Rational Exponents (square root and cube root only) Roots and Fractional Exponents (L) 11.2 Simplify Radical Expressions Simplifying Radicals (L) (3 days on Rational Exponents and Simplifying Radical Expressions) 9.1 Add and Subtract Polynomials 9.2 Multiplying Polynomials Connecting Binomial Multiplication and Factoring Trinomials Using Algebra Tiles (L) 9.3 Find Special Products of Polynomials (4 days)
	N-RN.2	Rewrite expressions involving radicals and rational exponents using the properties of exponents.		
	A-SSE.3c	Use the properties of exponents to transform expressions for exponential functions. *For example, the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%*		
	A-SSE.2	Use the structure of an expression to identify ways to rewrite it.		
	A-APR.1	Perform arithmetic operations on polynomials. 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.		

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Essential Questions for this Unit:

1. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create quadratic expressions.
2. How can students focus on quadratic functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions, and in particular, identify the real solutions of a quadratic equation as the zeros of a related quadratic function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 4: (Nov. – Jan.) **Quadratics: Expressions, Equations, Functions and Graphs Average Rate Of Change** **(26 days)**	A-SSE.2	Use the structure of an expression to identify ways to rewrite it.	Understanding: ● Greatest Common Factor ● Generic Rectangle ● Guess and check ● Grouping ● Graphing using function value tables – look for symmetry ● Graphing using intercepts and symmetry ● Graphing in vertex form and using symmetry ● Introduce Family of Functions and graphing using transformations ● Build flexibility in graphing ● Identify Key Features of the graph of a function ● Proper Syntax	Factoring Quadratics – Class Notes (GMR) Factoring: GCF, Multiple Methods for Factoring Trinomials, Difference of Squares (CP) Factoring Quadratics – Class Notes (GMR) 9.5 Factor x^2+bx+c 9.6 Factor ax^2+bx+c (3 days on factoring trinomials) 9.7 Factor Special Products 9.8 Factor Polynomials Completely (3 days on Special Cases and Grouping) 10.1 Graph $y=x^2+c$ 10.2 Graph $y=ax^2+bx+c$ Functions – Family of Quadratic Functions (CP) Family of Functions – Graphing Calculator Lesson (GMR) Graphing Family of Functions (L) Family of Functions Graphing Worksheet (GMR) Exploring Quadratic Graphs (L) (4 days)
	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-SSE.3a	Factor a quadratic expression to reveal the zeros of the function it defines.		
	A-CED.1	Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*		
	A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		
	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.*		
	F-IF.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.		
	A-SSE.3b	Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.		
	F-IF.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.		

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Grade Level/Course Title: Algebra I	**Quarter** 2	**Academic Year:** 2014-2015

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Essential Questions for this Unit:
1. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create quadratic expressions.
2. How can students focus on quadratic functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions, and in particular, identify the real solutions of a quadratic equation as the zeros of a related quadratic function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 4: **(Nov. – Jan.)** **Quadratics: Expressions, Equations, Functions and Graphs Average Rate Of Change** **(26 days)**	F-IF.8a	Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.	Understanding: • Build flexibility in solving quadratic equations • Recognize forms of quadratic equations • Solve quadratic equations using multiple methods • Derive the Quadratic Formula • Proper Syntax	Quadratics: Completing the Square, Factoring, Quadratic Formulas, and Standard Form (CP) 10.4 Use Square Roots to Solve Quadratic Equations 9.4 Solve Polynomial Equations In Factored Form 9.5 Factoring to Solve Quadratic Equations Only 10.5 Solve Quadratic Equations by Completing the Square Derivation of Quadratic Formula (L) Quadratics – Matching Game (L) (6 days)
	F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*		
	A-REI.4a	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.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 2-3	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
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Essential Questions for this Unit:

1. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create quadratic expressions.
2. How can students focus on quadratic functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students learn to anticipate the graph of a quadratic function by interpreting various forms of quadratic expressions, and in particular, identify the real solutions of a quadratic equation as the zeros of a related quadratic function?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 4: **(Nov. – Jan.)** **Quadratics: Expressions, Equations, Functions and Graphs Average Rate Of Change** **(26 days)**	A-REI.4b	Solve quadratic equations by inspection (e.g., for $x^2 = 49$), 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 $a \pm bi$ for real numbers a and b. *(Alg. 1 Real Solutions Only)*	Understanding: • Interpret the discriminant and draw conclusions about the solutions of a quadratic equation • Interpret the discriminant and draw conclusions about the graph of a quadratic function • Vertical Motion Formula • Find and interpret Average Rate of Change • Proper Syntax	10.6 Solve Quadratic Equations by the Quadratic Formula 10.7 Interpret the Discriminant Investigating the Discriminant (L) Supplement: Motion of an Object using the Vertical Motion Formula $h(t) = -16t^2 + vt + c$ Lesson: Average Rate of Change *Lesson under development* Average Rate of Change [CP] (7 days) **Review and Benchmark 2/Unit #4 Assessment** (3 days) **End of Semester 1**
	F-LE.6	Apply quadratic functions to physical problems, such as the motion of an object under the force of gravity.		
	F-BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.		
	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.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 3	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:
1. How can students build on their previous learning about how to solve linear equations in one variable and apply graphical and algebraic methods to analyze and solve systems of linear equations in two variables?
2. How can students analyze and explain the process of solving an equation and justify the process used in solving a system of equations?
3. How can students explore systems of equations and inequalities, and find and interpret their solutions?
4. How can students create and solve equations, inequalities, and systems of equations involving quadratic expressions?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 5: **(Jan. – Feb.)** **Systems: Solve and Graph** **(19 days)**	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.	Understanding: • Connection between the solution to a system and the graph of the system • Accuracy and mastery when graphing • Infinitely Many Solutions vs. No Solution vs. One Solution • Solve systems using multiple methods • Build flexibility in solving systems • Apply systems to real world context • Proper Syntax Understanding: • Accuracy in graphing linear inequalities • Solution to a linear inequality is a shaded region that contains infinite solutions in that region • Possible outcomes for Linear-Quadratic Systems: One Solution, Two Solutions, No Solution • Proper Syntax	7.1 Solve Linear Systems by Graphing Graphing Systems (L) 7.2 Solving Linear Systems Using Substitution Solving a System by Substitution (L) 7.3 Solving Systems by Adding or Subtracting 7.4 Solve Linear Systems By Multiplying First Pg. 446-456 (embedded) Applications of Linear Systems (8 days) 6.7 Graphing Linear Inequalities in Two Variables Graphing Linear Inequalities Sort (L) 7.5 Solve Special Types of Linear Systems 7.6 Solve Systems of Linear Inequalities Solving Systems of Inequalities (L) Supplement: Solve Linear-Quadratic Systems both Graphically and Algebraically *Lessons under development* Solving System of Equations: Visually, Substitution, Addition/Elimination, Graphing & Gaussian Elimination [CP] (8 days) **Review and Unit #5 Assessment** (3 days)
	A-REI.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.		
	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, polynomial, rational, absolute value, exponential, and logarithmic functions.		
	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.		
	A-REI.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 3	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
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Essential Questions for this Unit:

1. How can students master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
2. How can students focus on exponential functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students build on and extend their understanding of integer exponents to consider exponential functions, and compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change?
4. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create exponential expressions.

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 6: **(Feb. – Mar.)** **Exponential Functions, Equations and Graphs** **Geometric Sequences Average Rate of Change** **(29 days)** **CCSS Continued on next page**	A-SSE.1a	Interpret parts of an expression, such as terms, factors, and coefficients.	Understanding: • Basic Understanding of the graph of a simple exponential function • Introduction to the concept of an asymptote • Accuracy when graphing • Key features of the graph • Extend using graphing transformations • Proper Syntax Understanding: • Solve simple exponential equations by finding a common base • Property of Equality for Exponential Equations • Proper Syntax	8.5 Write & Graph Exponential Growth Functions 8.6 Write & Graph Exponential Decay Functions Exponential Functions (CP) Lesson: Graphing Exponential Functions *Lesson under development* Lesson: Graphing Transformations with Exponential Functions *Lesson under development* Lesson: Solving Exponential Equations using a common base *Lesson under development* Lesson: Geometric Sequences Sequences (CP) Geometric Sequences (L) Lesson: Average Rate of Change Average Rate of Change (CP) Average Rate of Change (L) **Review and Unit #6 Assessment** (3 days)
	A-SSE.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret* $P(1 + r)^n$ *as the product of P and a factor not depending on P.*		
	A-SSE.2	Use the structure of an expression to identify ways to rewrite it.		
	A-SSE.3c	Use the properties of exponents to transform expressions for exponential functions. *For example, the expression* 1.15^t *can be rewritten as* $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ *to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*		
	A-CED.1	Create equations and inequalities in one variable **including ones with absolute value** and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*		
	A-CED.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.		
	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).		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter 3**	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
2. How can students focus on exponential functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students build on and extend their understanding of integer exponents to consider exponential functions, and compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change?
4. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create exponential expressions.

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 6: **(Feb. – Mar.)** **Exponential Functions, Equations and Graphs** **Geometric Sequences Average Rate of Change** **(29 days)** **CCSS Continued on next page**	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, polynomial, rational, absolute value, exponential, and logarithmic functions.	Understanding: • Basic Understanding of the graph of a simple exponential function • Key features of the graph • Extend using graphing transformations • Solve simple exponential equations by finding a common base • Property of Equality for Exponential Equations • Proper Syntax	
	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.*		
	F-IF.7e	Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. *(Exponential only in Alg. 1)*		
	F-IF.8b	Use the properties of exponents to interpret expressions for exponential functions. *For example, identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, *and* $y = (1.2)^{t/10}$, *and classify them as representing exponential growth or decay.*		
	F-LE.1	Distinguish between situations that can be modeled with linear functions and with exponential functions.		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 3	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
2. How can students focus on exponential functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students build on and extend their understanding of integer exponents to consider exponential functions, and compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change?
4. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create exponential expressions.

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 6: **(Feb. – Mar.)** **Exponential Functions, Equations and Graphs** **Geometric Sequences Average Rate of Change** **(29 days)** **CCSS Continued on next page**	F-LE.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.	Understanding: • Basic Understanding of the graph of a simple exponential function • Key features of the graph • Extend using graphing transformations • Solve simple exponential equations by finding a common base • Property of Equality for Exponential Equations • Interpret Average Rate of Change • Comparison of Linear vs. Exponential • Proper Syntax	
	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.		
	F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 3	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students master the solution of linear equations and apply related solution techniques and the laws of exponents to the creation and solution of simple exponential equations?
2. How can students focus on exponential functions, including sequences; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students build on and extend their understanding of integer exponents to consider exponential functions, and compare and contrast linear and exponential functions, distinguishing between additive and multiplicative change?
4. How can students extend the laws of exponents to rational exponents involving square and cube roots and apply this new understanding of number; and strengthen their ability to see structure in and create exponential expressions.

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 6: **(Feb. – Mar.)** **Exponential Functions, Equations and Graphs** **Geometric Sequences Average Rate of Change** **(29 days)** **CCSS Continued on next page**	F-BF.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.	Understanding: • Interpret Average Rate of Change • Comparison of Linear vs. Exponential • Domain of an exponential function vs. the domain of a geometric sequence • Graph of an exponential function vs. graph an of a geometric sequence • Explicit formula vs. recursive formula • Proper Syntax	
	F-BF.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.		
	F-LE.1c	Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.		
	F-LE.5	Interpret the parameters in a linear or exponential function in terms of a context. [Linear and exponential of form $f(x)=b^x+k$.]		
	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).		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 4	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:

1. How can students build on learning in earlier grades, when students learn to define, evaluate, and compare functions, and use them to model relationships between quantities?
2. How can students focus on linear, quadratic, and exponential functions, including sequences, and also explore absolute value, step, and piecewise-defined functions; interpret functions given graphically, numerically, symbolically, and verbally; translate between representations; and understand the limitations of various representations?
3. How can students consider quadratic functions, comparing the key characteristics of quadratic functions to those of linear and exponential functions, and select from among these functions to model phenomena?
4. How can students expand their experience with functions to include more specialized functions—absolute value, step, and those that are piecewise-defined?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 7: (Apr.) **Functions: Square Root, Cube Root, Piece-Wise Functions** **Average Rate of Change** **(17 days)**	F-IF.7b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.	Understanding: • Basic understanding of graphing Linear, Quadratic, Exponential, Square Root and Cubic Functions • Graphing Transformations • Key features of graphs • Comparisons between graphs • Interpret average rate of change when comparing functions • Linear Model vs. Exponential Model • Proper Syntax	Functions – Family of Absolute Value Functions CP) Functions – Family of Cubic Functions (CP) Graphing Family of Functions (L) Family of Functions Graphing Worksheet (GMR) Families of Functions Sort (L) Lesson: Graphing Cubic Functions *Lesson under development* 11.1 Graphing Square Root Functions Square Root and Cube Root Functions (L) Lesson: Graphing Piecewise-defined functions Piecewise & Step Functions (CP) Graphing Piecewise Functions (L) Lesson: Comparing Functions using Average Rate of Change Comparing Linear and Quadratic Functions (L) Emphasis on Graphing Transformations **Review and Unit #7 Assessment** (3 days)
	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.*		
	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.		
	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.		
	F-BF.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.*		

Algebra I Mathematics Curriculum Guide Unit Map

Grade Level/Course Title: Algebra I	**Quarter** 4	**Academic Year:** 2014-2015

Mathematics Focus for the Course:
For the Model Algebra I course, instructional time should focus on four critical areas: (1) deepen and extend understanding of linear and exponential relationships; (2) contrast linear and exponential relationships with each other and engage in methods for analyzing, solving, and using quadratic functions; (3) extend the laws of exponents to square and cube roots; and (4) apply linear models to data that exhibit a linear trend.

Essential Questions for this Unit:
1. How can students build upon their prior experiences with data, and explore a more formal means of assessing how a model fits data?
2. How can students use regression techniques to describe approximately linear relationships between quantities?
3. How can students use graphical representations and knowledge of context to make judgments about the appropriateness of linear models, and with linear models, look at residuals to analyze the goodness of fit?

Unit (Time)	CCSS	Standard Description	Content	Resources
Unit 8: **(Apr. – May)** **Statistics and Probability** **(19 days)**	S-ID.1	Represent data with plots on the real number line (dot plots, histograms, and box plots).	Understanding: • Graphical representations of data • Mean • Median • Mode • Range • Distribution • Standard Deviation • Outlier • Measures of Dispersion • Quartiles • Scatter Plot • Correlation • Correlation Coefficient • Best Fitting Line • Regression Model	13.6 Use Measure of Central Tendency & Dispersion Standard Deviation and Variance (CP) 13.7 Interpret Stem-and-Leaf Plots and histograms 13.8 Interpret Box-and-Whisker Plots Lesson: Scatter Plots and Line of Best Fit Correlation and Line of Best Fit (L) Lesson: Nonlinear Models *Lesson under development* **Review, Benchmark3/Unit #8 Assessment** (3 days) **End of Semester 2**
	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.		
	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).		
	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). Recognize possible associations and trends in the data.		
	S-ID.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.		
	S-ID.6a	Fit a function to the data; use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.*		
	S-ID.6b	Informally assess the fit of a function by plotting and analyzing residuals.		
	S-ID.6c	Fit a linear function for a scatter plot that suggests a linear association.		
	S-ID.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.		
	S-ID.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.		
	S-ID.9	Distinguish between correlation and causation.		