

Georgia Standards of Excellence Curriculum Map

Mathematics

GSE Algebra I



Richard Woods, Georgia's School Superintendent "Educating Georgia's Future"

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1 st Semester		ce Algebra I Curriculum Map 2 nd Semester			
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
(4 – 5 weeks)	(4 – 5 weeks)	(6 – 7 weeks)	(5 – 6 weeks)	(4 – 5 weeks)	(4 – 5 weeks)
Relationships Between	Reasoning with Linear	Modeling and	Modeling and	Comparing and	Describing Data
Quantities and	Equations and	Analyzing Quadratic	Analyzing Exponential	Contrasting Functions	
Expressions	Inequalities	Functions	Functions		
MCC9-12.N.RN.2	MCC9-12.A.CED.1	MCC9-12.A.SSE.2	MCC9-12.A.CED.1	MCC9-12.F.LE.1	MCC9-12.S.ID.1
MCC9-12.N.RN.3	MCC9-12.A.CED.2	MCC9-12.A.SSE.3	MCC9-12.A.CED.2	MCC9-12.F.LE.1a	MCC9-12.S.ID.2
MCC9-12.N.Q.1	MCC9-12.A.CED.3	MCC9-12.A.SSE.3a	MCC9-12.A.REI.1	MCC9-12.F.LE.1b	MCC9-12.S.ID.3
MCC9-12.N.Q.2	MCC9-12.A.CED.4	MCC9-12.A.SSE.3b	MCC9-12.F.BF.1	MCC9-12.F.LE.1c	MCC9-12.S.ID.5
MCC9-12.N.Q.3	MCC9-12.A.REI.1	MCC9-12.A.CED.1	MCC9-12.F.BF.1a	MCC9-12.F.LE.2	MCC9-12.S.ID.6
MCC9-12.A.SSE.1	MCC9-12.A.REI.3	MCC9-12.A.CED.2	MCC9-12.F.BF.2	MCC9-12.F.LE.3	MCC9-12.S.ID.6a
MCC9-12.A.SSE.1a	MCC9-12.A.REI.5	MCC9-12.A.CED.4	MCC9-12.F.BF.3	MCC9-12.F.LE.5	MCC9-12.S.ID.6c
MCC9-12.A.SSE.1b	MCC9-12.A.REI.6	MCC9-12.A.REI.1	MCC9-12.F.IF.1	MCC9-12.F.BF.3	MCC9-12.S.ID.7
MCC9-12.A.APR.1	MCC9-12.A.REI.10	MCC9-12.A.REI.4	MCC9-12.F.IF.2	MCC9-12.F.IF.1	MCC9-12.S.ID.8
	MCC9-12.A.REI.11	MCC9-12.A.REI.4a	MCC9-12.F.IF.3	MCC9-12.F.IF.2	MCC9-12.S.ID.9
	MCC9-12.A.REI.12	MCC9-12.A.REI.4b	MCC9-12.F.IF.4	MCC9-12.F.IF.4	
	MCC9-12.F.BF.1	MCC9-12.F.BF.1	MCC9-12.F.IF.5	MCC9-12.F.IF.5	
	MCC9-12.F.BF.1a	MCC9-12.F.BF.3	MCC9-12.F.IF.6	MCC9-12.F.IF.6	
	MCC9-12.F.BF.2	MCC9-12.F.IF.1	MCC9-12.F.IF.7	MCC9-12.F.IF.7	
	MCC9-12.F.IF.1	MCC9-12.F.IF.2	MCC9-12.F.IF.7e	MCC9-12.F.IF.9	
	MCC9-12.F.IF.2	MCC9-12.F.IF.4	MCC9-12.F.IF.9		
	MCC9-12.F.IF.3	MCC9-12.F.IF.5			
	MCC9-12.F.IF.4	MCC9-12.F.IF.6			
	MCC9-12.F.IF.5	MCC9-12.F.IF.7			
	MCC9-12.F.IF.6	MCC9-12.F.IF.7a			
	MCC9-12.F.IF.7	MCC9-12.F.IF.8			
	MCC9-12.F.IF.7a	MCC9-12.F.IF.8a			
	MCC9-12.F.IF.9	MCC9-12.F.IF.9			

These units were written to build upon concepts from prior units, so later units contain tasks that depend upon the concepts addressed in earlier units.

All units will include the Mathematical Practices and indicate skills to maintain.

*Revised standards indicated in bold red font.

NOTE: Mathematical standards are interwoven and should be addressed throughout the year in as many different units and tasks as possible in order to stress the natural connections that exist among mathematical topics. Grade 9-12 Key:

Number and Quantity Strand: RN = The Real Number System, Q = Quantities, CN = Complex Number System, VM = Vector and Matrix Quantities

Algebra Strand: SSE = Seeing Structure in Expressions, APR = Arithmetic with Polynomial and Rational Expressions, CED = Creating Equations, REI = Reasoning with Equations and Inequalities

Functions Strand: IF = Interpreting Functions, LE = Linear and Exponential Models, BF = Building Functions, TF = Trigonometric Functions

Geometry Strand: CO = Congruence, SRT = Similarity, Right Triangles, and Trigonometry, C = Circles, GPE = Expressing Geometric Properties with Equations, GMD = Geometric Measurement and Dimension, MG = Modeling with Geometry

Statistics and Probability Strand: ID = Interpreting Categorical and Quantitative Data, IC = Making Inferences and Justifying Conclusions, CP = Conditional Probability and the Rules of Probability, MD = Using Probability to Make Decisions

Georgia Standards of Excellence Algebra I Curriculum Map Rationale

<u>Unit 1:</u> As in Coordinate Algebra, students will interpret the structure of expressions and solve problems related to unit analysis. The properties of rational and irrational numbers and operations with polynomials have been added as a preparation for working with quadratic functions later in the course. This content will provide a solid foundation for all subsequent units.

<u>Unit 2:</u> Students will analyze linear functions only. Students will (1) investigate key features of graphs; (2) create, solve, and model graphically linear equations and inequalities in one and two variables; (3) create, solve, and model graphically systems of linear equations and inequalities in two variables; (4) rearrange formulas to highlight a quantity of interest (5) recognize arithmetic sequences as linear functions. Some standards will be repeated in units 3, 4, and 5 as they apply to quadratics and exponentials. (Recall that many of the standards are extensions of middle school standards.)

<u>Unit 3:</u> Students will analyze quadratic functions only. Students will (1) investigate key features of graphs; (2) solve quadratic equations by taking square roots, factoring $(x^2 + bx + c \text{ AND } ax^2 + bx + c)$, completing the square, and using the quadratic formula; (3) compare and contrast graphs in standard, vertex, and intercept forms. Students will only work with real number solutions.

<u>Unit 4:</u> Students will analyze exponential functions only. Students will (1) investigate key features of graphs; (2) create, solve, and model graphically exponential equations; (3) recognize geometric sequences as exponential functions.

Unit 5: Students will compare and contrast linear, quadratic, and exponential functions in this unit.

<u>Unit 6:</u> Students will summarize, represent, and interpret data on a single count or measurement variable. Students will summarize, represent, and interpret data on two categorical and quantitative variables. Students will interpret linear models.

The pacing suggested above will allow students to gain a foundation in linear, quadratic, and exponential functions before they are brought together to be compared/contrasted in Unit 5. Although units 2, 3, and 4 look lengthy in terms of the number of standards, only their application to one function type per unit will be addressed. As key characteristics of functions are introduced in unit 2 and revisited within units 3, 4, and 5, students will gain a deeper understanding of such concepts as domain and range, intercepts, increasing/decreasing, relative maximum/minimum, symmetry, end behavior, and the effect of function parameters. Unit 5 will provide an excellent opportunity for review of many concepts in preparation for the administration of the Georgia Milestones EOC assessment.

Standards for Mathematical Practice I Make sense of problems and presevere in solving dem. \$ Use appropriate look strategically. 6 Attend to precision. 2 Construct viable arguments and critique the reasoning of others. 8 Look for and make use of structure. 7 Look for and make use of structure. 4 Model with mathematics. 8 Look for and make use of structure. 8 Look for and make use of structure. 9 Unit 1 Unit 2 Unit 3 Reasoning with Linear Equations and Incould the scribe numbers or relationships. Model with mathematics. Create equations that describe numbers or relationships. Model in the structure of expressions. Model in the structure of expression. Model in the structure of expression. <th colspan="4">Georgia Standards of Excellence Algebra I Expanded Curriculum Map – 1st Semester</th>	Georgia Standards of Excellence Algebra I Expanded Curriculum Map – 1 st Semester			
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rational numbers is rational, why the sum of a rational number and an irrational number is irrational; and why the product of a nonzero rational number and an irrational number is irrational. Reason quantitatively and use units to solve problems. MCC9-12A,Q.1 Use units of measure (linear, quantities; graph equations a. Identify, use, and record appropriate units of measure within context, within data displays, and on graphs; b. Convert units and record appropriate mints of measures; (English-to-English and Metric-to-Metric without conversion factor provided and between English and Metric with conversion factor; c. Use units within multi-step problems and formulas; interpret units of negresenting the situation. MCC9-12A,Q.2 Define appropriate quantities for the purpose of descriptive modeling. Given a situation, mCC9-12A,Q.3 Choose a level of accuracy appropriate initiations on measurement when reporting quantities. MCC9-12A,ASEL1 Interpret texpressions that represent MCC9-12A,ASEL1 Interpret expressions that represent MCC9-12A,ASEL1 Interpret expressions that represent multive in terms of its context. MCC9-12A,ASEL1 Interpret expressions that represent auditive, in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditions in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditions in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditive in terms of its context. MCC9-12A,ASEL1 Interpret persons that represent auditis in	and rational exponents using the properties of exponents.	one variable and use them to solve problems. Include	rewrite it in different equivalent forms. For example, see x ⁴	
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MCC9-12.N.Q.1Use units of measure (linear, area, capacity, rates, and time) as a way to understand problems: a. Identify, use, and record appropriate units of measure within context, within data displays, and on graphs; b. Convert units and rates using dimensional analysis (English-to-English and Metric-to-Metric without conversion factor); c. Use units within multi-step problems and formulas, interpret nuits of input and resulting units of output. MCC9-12.N.Q.2. Define appropriate quantities for the purpose of descriptive modeling. Given a situation, context, or problem, students will determine, identify, and use therpret duations on measurement when reporting quantities. For example, more situations or generally reported to the resultions on measurement when reporting quantities. For example, more situations or generally reported to limitations on measurement when reporting quantities. For example, more situations or generally reported to limitations on measurement when reporting quantities. For example, more situations or generally reported to the properties of real numbers, justify the step of a equation, state repression. MCC9-12.A.SES.1 Interpret expressions that represent a quantity of interest task of the precision of the data given. Interpret the structure of expressions. MCC9-12.A.SES.1 Interpret expressions that represent a quantity of interest and measurement when reporting quantities. For example, more situations or generally reported to the properties of real numbers, justify the step of a equation, equations and inequalities in one variable. MCC9-12.A.SES.1 Interpret expressions that repression is to repression from one expression sud inequalities in one variable. MCC9-12.A.SES.1 Interpret parts of an expression sud inequalities in one variable. MCC9-12.A.SES.1 Interpret parts of an expression sud inequalities in one variable. MCC9-12.A.SES.1 In				
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MCC9-12.A.SSE.1a Interpret parts of an expression, such in one variable including equations with coefficients <u>Understand solving equations as a process of reasoning and</u>			$A = \pi r^2$ to highlight the radius r	
as terms, factors, and coefficients, in context. represented by letters. For example, given $ax + 3 = 7$, solve explain the reasoning.	as terms, factors, and coefficients, in context.	represented by letters. For example, given $ax + 3 = 7$, solve	explain the reasoning.	
			MCC9-12.A.REI.1 Using algebraic properties and the	
			properties of real numbers, justify the steps of a simple,	

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the meaning (in context) of individual terms or factors.	Solve systems of equations.	one-solution equation. Students should justify their own
Perform arithmetic operations on polynomials.	MCC9-12.A.REI.5 Show and explain why the elimination	steps, or if given two or more steps of an equation, explain
MCC9-12.A.APR.1 Add, subtract, and multiply	method works to solve a system of two-variable equations.	the progression from one step to the next using properties.
polynomials; understand that polynomials form a system	MCC9-12.A.REI.6 Solve systems of linear equations exactly	Solve equations and inequalities in one variable.
analogous to the integers in that they are closed under these	and approximately (e.g., with graphs), focusing on pairs of	MCC9-12.A.REI.4 Solve quadratic equations in one variable.
operations.	linear equations in two variables.	MCC9-12.A.REI.4a Use the method of completing the
	Represent and solve equations and inequalities graphically.	square to transform any quadratic equation in x into an
	MCC9-12.A.REI.10 Understand that the graph of an	equation of the form $(x - p)^2 = q$ that has the same
	equation in two variables is the set of all its solutions	solutions. Derive the quadratic formula from
	plotted in the coordinate plane.	$ax^2 + bx + c = 0.$
	MCC9-12.A.REI.11 Using graphs, tables, or successive	MCC9-12.A.REI.4b Solve quadratic equations by
	approximations, show that the solution to the equation $f(x)$	inspection (e.g., for $x^2 = 49$), taking square roots, factoring,
		completing the square, and the quadratic formula, as
	= g(x) is the x-value where the y-values of f(x) and g(x) are	
	the same.	appropriate to the initial form of the equation (limit to real
	MCC9-12.A.REI.12 Graph the solution set to a linear	number solutions).
	inequality in two variables.	Build a function that models a relationship between two
	Build a function that models a relationship between two	<u>quantities.</u>
	<u>quantities.</u>	MCC9-12.F.BF.1 Write a function that describes a
	MCC9-12.F.BF.1 Write a function that describes	relationship between two quantities.
	a relationship between two quantities.	Build new functions from existing functions.
	MCC9-12.F.BF.1a Determine an explicit expression and	MCC9-12.F.BF.3 Identify the effect on the graph of replacing
	the recursive process (steps for calculation) from context.	f(x) by $f(x) + k$, k $f(x)$, $f(kx)$, and $f(x + k)$ for specific values of
	For example, if Jimmy starts out with \$15 and earns \$2 a	k (both positive and negative); find the value of k given the
	day, the explicit expression "2x+15" can be described	graphs. Experiment with cases and illustrate an explanation of
	recursively (either in writing or verbally) as "to find out how	the effects on the graph using technology. Include recognizing
	much money Jimmy will have tomorrow, you add \$2 to his	even and odd functions from their graphs and algebraic
		expressions for them.
	total today." $J_n = J_{n-1} + 2, J_0 = 15$	Understand the concept of a function and use function
	MCC9-12.F.BF.2 Write arithmetic and geometric	notation.
	sequences recursively and explicitly, use them to model	
	situations, and translate between the two forms. Connect	MCC9-12.F.IF.1 Understand that a function from one set
	arithmetic sequences to linear functions and geometric	(the input, called the domain) to another set (the output,
	sequences to exponential functions.	called the range) assigns to each element of the domain
	Understand the concept of a function and use function	exactly one element of the range, i.e. each input value maps
	notation.	to exactly one output value. If f is a function, x is the input
	MCC9-12.F.IF.1 Understand that a function from one set	(an element of the domain), and $f(x)$ is the output (an
	(the input, called the domain) to another set (the output,	element of the range). Graphically, the graph is $y = f(x)$.
		MCC9-12.F.IF.2 Use function notation, evaluate functions for
	called the range) assigns to each element of the domain	inputs in their domains, and interpret statements that use
	exactly one element of the range, i.e. each input value maps	function notation in terms of a context.
	to exactly one output value. If f is a function, x is the input	Interpret functions that arise in applications in terms of the
	(an element of the domain), and $f(x)$ is the output (an	context.
	element of the range). Graphically, the graph is $y = f(x)$.	MCC9-12.F.IF.4 Using tables, graphs, and verbal
	MCC9-12.F.IF.2 Use function notation, evaluate functions for	descriptions, interpret the key characteristics of a function
	inputs in their domains, and interpret statements that use	which models the relationship between two quantities.
	function notation in terms of a context.	Sketch a graph showing key features including: intercepts;
	MCC9-12.F.IF.3 Recognize that sequences are functions,	
	sometimes defined recursively, whose domain is a subset of	interval where the function is increasing, decreasing,
	the integers. (Generally, the scope of high school math	positive, or negative; relative maximums and minimums;
		symmetries; end behavior; and periodicity.

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defines this subset as the set of natural numbers 1,2,3,4)	MCC9-12.F.IF.5 Relate the domain of a function to its graph
By graphing or calculating terms, students should be able	and, where applicable, to the quantitative relationship it
to show how the recursive sequence $a_1=7$, $a_n=a_{n-1}+2$; the	describes. For example, if the function $h(n)$ gives the number of
sequence $s_n = 2(n-1) + 7$; and the function $f(x) = 2x + 5$	person-hours it takes to assemble n engines in a factory, then
(when x is a natural number) all define the same sequence.	the positive integers would be an appropriate domain for the
Interpret functions that arise in applications in terms of the	function.
<u>context.</u>	MCC9-12.F.IF.6 Calculate and interpret the average rate of
MCC9-12.F.IF.4 Using tables, graphs, and verbal	change of a function (presented symbolically or as a table) over
descriptions, interpret the key characteristics of a function	a specified interval. Estimate the rate of change from a graph.
which models the relationship between two quantities.	Analyze functions using different representations.
Sketch a graph showing key features including: intercepts;	MCC9-12.F.IF.7 Graph functions expressed algebraically
interval where the function is increasing, decreasing,	and show key features of the graph both by hand and by
positive, or negative; relative maximums and minimums;	using technology.
symmetries; end behavior; and periodicity.	MCC9-12.F.IF.7a Graph linear and quadratic functions
MCC9-12.F.IF.5 Relate the domain of a function to its graph	and show intercepts, maxima, and minima (as determined
and, where applicable, to the quantitative relationship it	by the function or by context).
describes. For example, if the function $h(n)$ gives the number of	MCC9-12.F.IF.8 Write a function defined by an expression in
person-hours it takes to assemble n engines in a factory, then	different but equivalent forms to reveal and explain different
the positive integers would be an appropriate domain for the	properties of the function.
function.	MCC9-12.F.IF.8a Use the process of factoring and
MCC9-12.F.IF.6 Calculate and interpret the average rate of	completing the square in a quadratic function to show
change of a function (presented symbolically or as a table) over	zeros, extreme values, and symmetry of the graph, and
a specified interval. Estimate the rate of change from a graph.	interpret these in terms of a context. For example, compare
Analyze functions using different representations.	and contrast quadratic functions in standard, vertex, and
MCC9-12.F.IF.7 Graph functions expressed algebraically	
	intercept forms.
and show key features of the graph both by hand and by	MCC9-12.F.IF.9 Compare properties of two functions each
using technology.	represented in a different way (algebraically, graphically,
MCC9-12.F.IF.7a Graph linear and quadratic functions	numerically in tables, or by verbal descriptions). For
and show intercepts, maxima, and minima (as determined	example, given a graph of one function and an algebraic
by the function or by context).	expression for another, say which has the larger maximum.
MCC9-12.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 function and an algebraic	
expression for another, say which has the larger maximum.	

Georgia Standards of Excellence Algebra I Expanded Curriculum Map – 2 nd Semester			
Standards for Mathematical Practice			
 Make sense of problems and persevere in solving them. Reason abstractly and quantitatively. Construct viable arguments and critique the reasoning of other Model with mathematics. 	 5 Use appropriate tools strategically. 6 Attend to precision. 7 Look for and make use of structure. 8 Look for and express regularity in repeated reasoning. 		
	2 nd Semester		
Unit 4	Unit 5	Unit 6	
Modeling and Analyzing Exponential Functions	Comparing and Contrasting Functions	Describing Data	
Create equations that describe numbers or relationships.	Comparing and Contrasting Functions Construct and compare linear, quadratic, and exponential	Summarize, represent, and interpret data on a single count	
MCC9-12.A.CED.1 Create equations and inequalities in	<u>models and solve problems.</u>	or measurement variable.	
one variable and use them to solve problems. Include	MCC9-12.F.LE.1 Distinguish between situations that can be	MCC9-12.S.ID.1 Represent data with plots on the real number	
equations arising from linear, quadratic, simple rational,	modeled with linear functions and with exponential functions.	line (dot plots, histograms, and box plots).	
and exponential functions (integer inputs only).	MCC9-12.F.LE.1a Show that linear functions grow by	MCC9-12.S.ID.2 Use statistics appropriate to the shape of	
MCC9-12.A.CED.2 Create linear, quadratic, and	equal differences over equal intervals and that exponential	the data distribution to compare center (median, mean)	
exponential equations in two or more variables to represent	functions grow by equal factors over equal intervals. (This	and spread (interquartile range, mean absolute deviation,	
relationships between quantities; graph equations on	can be shown by algebraic proof, with a table showing	standard deviation) of two or more different data sets.	
coordinate axes with labels and scales. (The phrase "in two	differences, or by calculating average rates of change over	MCC9-12.S.ID.3 Interpret differences in shape, center, and	
or more variables" refers to formulas like the compound	equal intervals).	spread in the context of the data sets, accounting for possible	
interest formula, in which	MCC9-12.F.LE.1b. Recognize situations in which one	effects of extreme data points (outliers).	
$A = P(1 + r/n)^{nt}$ has multiple variables.)	quantity changes at a constant rate per unit interval relative to	Summarize, represent, and interpret data on two	
Understand solving equations as a process of reasoning and	another.	categorical and quantitative variables.	
explain the reasoning.	MCC9-12.F.LE.1c Recognize situations in which a quantity	MCC9-12.S.ID.5 Summarize categorical data for two	
MCC9-12.A.REI.1 Using algebraic properties and the	grows or decays by a constant percent rate per unit interval	categories in two-way frequency tables. Interpret relative	
properties of real numbers, justify the steps of a simple,	relative to another.	frequencies in the context of the data (including joint,	
one-solution equation. Students should justify their own	MCC9-12.F.LE.2 Construct linear and exponential functions,	marginal, and conditional relative frequencies). Recognize	
steps, or if given two or more steps of an equation, explain	including arithmetic and geometric sequences, given a graph, a	possible associations and trends in the data.	
the progression from one step to the next using properties.	description of a relationship, or two input-output pairs (include	MCC9-12.S.ID.6 Represent data on two quantitative variables	
Build a function that models a relationship between two	reading these from a table).	on a scatter plot, and describe how the variables are related.	
<u>quantities.</u>	MCC9-12.F.LE.3 Observe using graphs and tables that a		
MCC9-12.F.BF.1 Write a function that describes a	quantity increasing exponentially eventually exceeds a quantity	MCC9-12.S.ID.6a Decide which type of function is most	
relationship between two quantities.	increasing linearly, quadratically, or (more generally) as a	appropriate by observing graphed data, charted data, or by	
MCC9-12.F.BF.1a Determine an explicit expression and	polynomial function.	analysis of context to generate a viable (rough) function of	
the recursive process (steps for calculation) from context.	Interpret expressions for functions in terms of the situation	best fit. Use this function to solve problems in context.	
For example, if Jimmy starts out with \$15 and earns \$2 a	they model.	Emphasize linear, quadratic and exponential models.	
day, the explicit expression " $2x+15$ " can be described	MCC9-12.F.LE.5 Interpret the parameters in a linear (f(x)	MCC9-12.S.ID.6c Using given or collected bivariate data,	
recursively (either in writing or verbally) as "to find out how	= mx + b) and exponential $(f(x) = a \cdot d^x)$ function in terms of	fit a linear function for a scatter plot that suggests a linear	
much money Jimmy will have tomorrow, you add \$2 to his	context. (In the functions above, "m" and "b" are the	association.	
<i>total today.</i> " $J_n = J_{n-1} + 2, J_0 = 15$	parameters of the linear function, and "a" and "d" are the	Interpret linear models.	
MCC9-12.F.BF.2 Write arithmetic and geometric	parameters of the exponential function.) In context,	MCC9-12.S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the	
sequences recursively and explicitly, use them to model	students should describe what these parameters mean in		
situations, and translate between the two forms. Connect	terms of change and starting value. Build new functions from existing functions.	data. MCC9-12.S.ID.8 Compute (using technology) and interpret	
arithmetic sequences to linear functions and geometric	MCC9-12.F.BF.3 Identify the effect on the graph of replacing	the correlation coefficient "r" of a linear fit. (For instance,	
sequences to exponential functions.	f(x) by $f(x) + k$, k $f(x)$, $f(kx)$, and $f(x + k)$ for specific values of	by looking at a scatterplot, students should be able to tell if	
	$(x_j \cup y_j)(x_j + k, k)(x_j, i(k_j), and i(x + k) ior specific values of$	by rooking at a scatter plot, students should be able to tell li	
	Richard Woods, State School Superintendent		

Build new functions from existing functions.

MCC9-12.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.

<u>Understand the concept of a function and use function</u> <u>notation.</u>

MCC9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range, i.e. each input value maps to exactly one output value. If f is a function, x is the input (an element of the domain), and f(x) is the output (an element of the range). Graphically, the graph is y = f(x).

MCC9-12.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.

MCC9-12.F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (Generally, the scope of high school math defines this subset as the set of natural numbers 1,2,3,4...) By graphing or calculating terms, students should be able to show how the recursive sequence $a_1=7$, $a_n=a_{n-1}+2$; the sequence $s_n = 2(n-1) + 7$; and the function f(x) = 2x + 5 (when x is a natural number) all define the same sequence. Interpret functions that arise in applications in terms of the context.

MCC9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

MCC9-12.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.

MCC9-12.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.

Analyze functions using different representations.

MCC9-12.F.IF.7 Graph functions expressed algebraically

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.

<u>Understand the concept of a function and use function</u> notation.

MCC9-12.F.IF.1 Understand that a function from one set (the input, called the domain) to another set (the output, called the range) assigns to each element of the domain exactly one element of the range, i.e. each input value maps to exactly one output value. If f is a function, x is the input (an element of the domain), and f(x) is the output (an element of the range). Graphically, the graph is y = f(x).

MCC9-12.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.

Interpret functions that arise in applications in terms of the context.

MCC9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities. Sketch a graph showing key features including: intercepts; interval where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

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MCC9-12.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. Analyze functions using different representations.

MCC9-12.F.IF.7 Graph functions expressed algebraically and show key features of the graph both by hand and by using technology.

MCC9-12.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 function and an algebraic expression for another, say which has the larger maximum.

the correlation coefficient is positive or negative and give a reasonable estimate of the "r" value.) After calculating the line of best fit using technology, students should be able to describe how strong the goodness of fit of the regression is, using "r".

MCC9-12.S.ID.9 Distinguish between correlation and causation.

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and show key features of the graph both by hand and by		
using technology.		
MCC9-12.F.IF.7e Graph exponential and logarithmic		
functions, showing intercepts and end behavior, and		
trigonometric functions, showing period, midline, and		
amplitude.		
MCC9-12.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 function and an algebraic		
expression for another, say which has the larger maximum.		