

Algebra I: Functions

Stage 1 Desired Results		
ESTABLISHED GOALS: Competencies: - Students will demonstrate perseverance and strategic thinking by identifying the underlying meaning of a problem, planning a logical solution pathway, working through challenges, and verifying the reasonableness of their answers. - Students will demonstrate the ability to decontextualize (represent symbols) and contextualize (understand the meaning of quantities) by converting real-world situations into mathematical symbols for manipulation, and interpreting symbolic results back into practical contexts. - Students will demonstrate logical thinking and communication skills by building justified mathematical arguments, comprehending the justification of others, and critiquing their reasoning. - Students will demonstrate application skills by using mathematical concepts and symbols to represent, analyze, and solve problems arising in everyday life, society, and the workplace. - Students will demonstrate resourcefulness by evaluating and selecting the most effective tools to solve mathematical problems and deepen their understanding of concepts. - Students will demonstrate accuracy and clarity using correct mathematical terminology, specifying units of measure, and calculating with the degree of precision appropriate for the problem context. - Students will demonstrate the ability to analyze and summarize text and integrate knowledge to make meaning of discipline-specific materials. - Students will demonstrate the ability to produce coherent and supported writing in order to communicate effectively for a range of discipline-specific tasks, purposes, and audiences. - Students will demonstrate the ability to speak purposefully and effectively by strategically making decisions about content, language use, and discourse style. Content Standards: - 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.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. - 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. - A.REI.6 Solve systems of linear equations exactly and approximately, focusing on pairs of linear equations in two variables. - 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.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). - 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	Transfer	
	<i>Students will be able to independently use their learning to summarize information in order to answer questions and make predictions.</i>	
	Meaning	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> - information can be represented in a variety of ways and is dependent upon the information you are given and/or the information you are seeking. - a constant rate of change always results in a direct correlation between quantities. - there are many factors to consider when selecting a method for representing information.	ESSENTIAL QUESTIONS When presented with multiple methods of solving a problem, how does one select the best method?
	Acquisition	
	<i>Students will know...</i> - that a function is a special type of relation in which each value in the domain is paired with exactly one value in the range. - that the vertical line test can determine if a relation is a function. - graphs can be used to visually represent the relationship between two variable quantities as they both change. - that functions can be represented using tables, words, equations, sets of ordered pairs, mappings, and graphs. - that, if both the x-values and the y-values in a table have a common difference, then the table represents a linear function. - that the set of all solutions of an equation forms the equation's graph. - that a rate of change can be represented with slope. - that a horizontal line has zero slope, and a vertical line has undefined slope. - that, if the ratio of two variables is constant, then	<i>Students will be skilled at...</i> - writing the equation of function from a table or graph. - creating the graph of a function from an equation or table. - mapping functions. - building new functions by combining functions using arithmetic operations. - writing recursive formulas for arithmetic sequences. - writing explicit formulas for arithmetic sequences. - understand the concept of a function and use function notation. - calculating the slope of a line. - writing and graphing an equation of a direct variation. - writing linear equations in standard, slopeintercept, and point-slope forms. - graphing linear equations in standard, slopeintercept, and point-slope forms. - rewriting linear equations in the various forms. - identifying/Interpreting key features of a graph,

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. - F-IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. - 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. - 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.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. - F-IF.C.7a Graph linear functions and show intercepts. - F-IF.C.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. - F-IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). - 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. - F-BF.A.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-BF.B.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. - F.BF.4 Find inverse functions. a. 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 - F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. - Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals. - Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.	<i>they vary directly.</i> <i>the various forms of the equations for linear and absolute value functions.</i> <i>the parent functions for linear and absolute value functions.</i> <i>that parallel lines have equal slopes.</i> <i>that the slopes of perpendicular lines are opposite reciprocals of each other.</i> <i>that piecewise functions have different rules for different parts of the domain.</i> <i>that the solution to a system of equations or of inequalities is the point(s) that they have in common.</i> <i>that a system of equations can have one, no, or infinite solutions.</i> <i>the graph of a linear inequality in two variable consists of all points in the coordinate plane that represent solutions.</i> <i>that the solution of a system of linear inequalities is the region where the graphs of the inequalities overlap.</i> <u>vocabulary:</u> function, dependent variable, independent variable, linear, continuous, discrete, domain, range, arithmetic sequence, recursive, explicit, slope, rate of change, direct variation, constant of variation, parent function, translation, y-intercept, x-intercept, inverse function, parallel, perpendicular, absolute value, piecewise function, step function, system of equations, substitution, elimination, consistent, inconsistent, independent, dependent, vertex, maximum, minimum, increasing, decreasing, axis of symmetry	<i>such as intercepts and slope</i> <i>finding the inverse of a linear function.</i> <i>graphing and transforming linear and absolute functions.</i> <i>graphing vertical and horizontal translations for linear and absolute value functions.</i> <i>identifying/Interpreting key characteristics of absolute value graphs, including vertex, axis of symmetry, decreasing/increasing rate of change.</i> <i>graphing step functions.</i> <i>solving systems of equations by graphing, substitution, and elimination.</i> <i>linear programming.</i> <i>writing and graphing linear inequalities in two variables.</i>
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• 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). • F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context. • MP2 Reason abstractly and quantitatively. • MP4 Model with mathematics. • MP5 Use appropriate tools strategically. • MP7 Look for and make use of structure. • MP8 Look for and express regularity in repeated reasoning.		
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Content Area Literacy Standards	21st Century Skills
• RST.9-10.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. • RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to <i>grades 9-10 texts and topics</i>. • RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	• <i>reason effectively</i> • <i>use systems thinking</i> • <i>solve problems</i> • <i>access and evaluate information</i> • <i>use and manage information</i> • <i>be self-directed learners</i>

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	PERFORMANCE TASK(S):
	OTHER EVIDENCE:

Stage 3 – Learning Plan
<i>Summary of Key Learning Events and Instruction</i>

<i>Science Integration</i>	<i>College, Career, and Civic Life Integration</i>	<i>Technology Integration</i>
<i>District Materials</i>	<i>Distance Learning/Field Trips</i>	<i>Technology Resources</i>