Richmond Public Schools

Curriculum Framework

Algebra 1

Strand: Measurement and Geometry
A.7 The student will investigate and analyze linear and quadratic function families and their characteristics both algebraically and graphically, including **a. determining whether a relation is a function;** **b. domain and range;** **c. zeros;** **d. intercepts;** **e. values of a function for elements in its domain; and** **f. connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs.**  EOC Algebra I assessments will include a Desmos Calculator
Suggested Pacing
Third Nine Weeks - Functions A.7 5 blocks Fourth Nine Weeks -part of Quadratics A.7cd 5 blocks
Related Standards

	Spiral up **AII.6** For absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic functions, the student will **a)** recognize the general shape of function families; and **b)** use knowledge of transformations to convert between equations and the corresponding graphs of functions.

	AII.7 The student will investigate and analyze linear, quadratic, absolute value, square root, cube root, rational, polynomial, exponential, and logarithmic function families algebraically and graphically. Key concepts include **a)** domain, range, and continuity; **b)** intervals in which a function is increasing or decreasing; **c)** extrema; **d)** zeros; **e)** intercepts; **f)** values of a function for elements in its domain; **g)** connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs; **h)** end behavior; **i)** vertical and horizontal asymptotes; **j)** inverse of a function; and **k)** composition of functions algebraically and graphically.
Essential Questions	**Common Misconceptions**
Essential Questions: **A.7a** ● What is the difference between a relation and a function? *Relation is two sets of input and output where input can repeat. Functions is one input to every one output.* ● What are the different ways functions can be ed represented? *Functions can be represented by equation, mapping, table, and graphing* ● How can you determine whether a relation is a function when given a set of ordered pairs, a table, or a mapping? *Determining whether a relation is a function or not on a set of ordered pairs the x value repeats. Determining whether a relation is*	● The student does not understand the concept of a zeros ● The student is unable to identify the zeros as representing the *x*-intercepts of the graph. ● Student believes that all functions are linear. ● Student believes that relations represented by graphs that are disconnected are not functions. (This difficulty/belief may not appear when the algebraic representation is given.) ● Student fails to realize that all ordered pairs on the graph satisfy the algebraic equation defining the function. ● Students is unable to identify the domain and range of a continuous graph when the domain and range is ALL REAL numbers

a function or on a table by looking at the input or x values and if they repeat it is not a function. Determining whether a relation is a function or not through mapping is if two or more arrow point away from the domain numbers it is not a function. ● How can you determine whether a relation is a function when given a graph? *Determining whether a relation is a function when given a graph by using the vertical line test. If the data on the graph passes through the vertical line more than once it is not a function.* **A.7b** ● How can you identify the domain and range of a function? *Domain is the x values to the ordered pairs and domain is the y value to the order pairs.* **A.7c** ● How can you identify the zeros of a function? *Graphing the function zeros are identified by crossing the x-axis. Setting the function equal to zero and factoring the equation zero will be found.* ● How can you use the x-intercepts from a quadratic function to determine its factors? *The x-intercepts are negative factors to the quadratic function.* **A.7d** ● How can you identify the intercepts of a function? *To find the y-intercept by replacing all x values with 0 and solve. To find the x-intercept set each factor equal to 0 and solve for x.* ● How can you use the x-intercepts from a quadratic function to determine its factors? *Take the x value of the intercepts and set them equal to x and work backwards to create factors. Then FOIL the factors to create your quadratic equation.* **A.7e**	● Students are unable to distinguish between a graph of a continuous function when the points are connected with a continuous line, since every point has meaning to the original problem. Also, a function of a discrete function, where distinct points are plotted, and only these points have meaning to the original problem.

• How can you find f(x) for a given value or set of given values of x? *Take the given value of x and replace all the x's with said value and solve algebraically.*	
Understanding the Standard	**Essential Knowledge and Skills**
• A relation is a function if and only if each element in the domain is paired with a unique element of the range. • Functions describe the relationship between two variables where each input is paired to a unique output. • Function families consist of a parent function and all transformations of the parent function. • The domain of a function is the set of all possible values of the independent variable. • The range of a function is the set of all possible values of the dependent variable. • For each x in the domain of f, x is a member of the input of the function f, $f(x)$ is a member of the output of f, and the ordered pair $(x, f(x))$ is a member of f. • A value x in the domain of f is an x-intercept or a zero of a function f if and only if $f(x) = 0$. • Given a polynomial function $f(x)$ the following statements are equivalent for any real number, k, such that $f(k) = 0$: k is a zero of the polynomial function $f(x)$, located at $(k, 0)$; $(x - k)$ is a factor of $f(x)$; k is a solution or root of the polynomial equation $f(x) = 0$; and the point $(k, 0)$ is an x-intercept for the graph of $y = f(x)$.	The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to • Determine whether a relation, represented by a set of ordered pairs, a table, a mapping, or a graph is a function. (a) • Identify the domain, range, zeros, and intercepts of a function presented algebraically or graphically. (b, c, d) • Use the x-intercepts from the graphical representation of a quadratic function to determine and confirm its factors. (c, d) • For any value, x, in the domain of f, determine $f(x)$. (e) • Represent relations and functions using verbal descriptions, tables, equations, and graph. Given one representation, represent the relation in another form. (f) • Investigate and analyze characteristics and multiple representations of functions with a graphing utility. (a, b, c, d, e, f)

- The *x*-intercept is the point at which the graph of a relation or function intersects with the *x*-axis. It can be expressed as a value or a coordinate.
- The *y*-intercept is the point at which the graph of a relation or function intersects with the *y*-axis. It can be expressed as a value or a coordinate.
- The domain of a function may be restricted by the practical situation modeled by a function.
- Solutions and intervals may be expressed in different formats, including set notation or using equations and inequalities.

Examples may include:

Equation/ Inequality	Set Notation
$x = 3$	$\{3\}$
$x = 3$ or $x = 5$	$\{3, 5\}$
$y \geq 3$	$\{y: y \geq 3\}$
Empty (null) set $\varnothing$	$\{\ \}$

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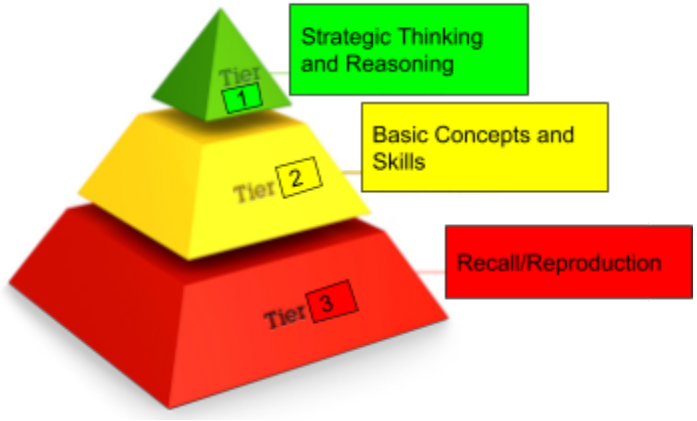
Algebra 1

Vocabulary	Instructional Activities Organized by Learning Objective
Relation Function Ordered Pairs Table Mapping Graph Vertical Line Test Domain Range Set Builder Notation Zeros Elements of a set	• **Eureka** **Eureka - (Insert Lesson Title)** **Eureka Grade** | **Module** | **Topic** | **Lesson(s)** **Textbook** Virginia Glencoe, Algebra I, ©2012, Carter, et al, McGraw-Hill School Education Group, page(s) 45 – 53(A.7a), 38 – 44(A.7b), 161 – 165(A.7c), 48 – 49(A.7e), A.7f included throughout A.7a-c and e **Print** Coach book, Virginia edition, page(s) 154 - 175 **Notes-Powerpoints** x and y intercepts Functions Domain and Range **Domain and Range** **Resources-Technology-based** • Quizizz - A.7 review • Domain and Range Quizizz • Determining a Function Quizizz • Zeros and Intercepts Quizizz
Assessment	
Mastery Check Functions A Functions B Zeros A Zeros B X and Y intercepts A X and Y intercepts B Student Performance Analysis	

	Station Activities Functions Functions Matching Domain and Range
Cross-Curricular Connections	Tiered Differentiations
History Supply and demand, votes for presidential elections, etc. can be represented as graphs and tables. **English** Have students write everything they know about a given function (for example y=2x – 3) using vocabulary from the unit. **Science** Topics such as velocity, distance and time can be represented using tables and graphs.	 **Tier 3** Students can determine whether a relation is a function by looking at a set of ordered pairs, a table, a mapping, or a graph. **Tier 2** Students can identify the domain and range of a function presented

	algebraically or graphically. Students can identify the zeros of a function presented algebraically or graphically. **Tier 1** Students can investigate and analyze characteristics and multiple representations of functions with a graphing utility.