

Richmond Public Schools

Curriculum Framework

Grade 8

Strand: Patterns, Functions, and Algebra	
8.15 The student will a) determine whether a given relation is a function; and b) determine the domain and range of a function.	
Suggested Pacing	
First Nine Weeks – 6 Instructional Days (including common assessment)	
Related Standards	
Spiral Down 7.10 The student will e) make connections between and among representations of a proportional or additive relationship between two quantities using verbal description, tables, equations, and graphs. 6.12 The student will d) make connections between and among representations of a proportional relationship between two quantities using verbal descriptions, ratio tables, and graphs.	Spiral Up 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 f) connections between and among multiple representations of functions using verbal descriptions, tables, equations, and graphs.
Essential Questions	Common Misconceptions
What is the relationship among tables, graphs, rules and words in modeling a given situation? <i>Any given relationship can be represented by all four.</i> What is a relation? <i>A relation is any set of ordered pairs. For each first member, there may be many second members.</i>	<ul style="list-style-type: none"> ● Students need to practice when given an equation identifying the related graph. ● Students need additional practice determining the domain or range when given an equation and an identified set of values. ● Students need additional practice identifying the dependent variable and independent variable when given a practical problem. (VDOE – Spring 2014 Student Performance Analysis comment)

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What is a function?

A function is a relation between a set of inputs, called the domain, and a set of outputs, called the range, with the property that each input is related to exactly one output.

What is the relationship between relations and functions?

Some relations are functions; all functions are relations.

What is the difference between discrete and continuous functions?

In a discrete function graph there are separate, distinct points. You would not use a line to connect these points on a graph. The points between the plotted points have no meaning and cannot be interpreted. For example, the number of pets per household represents a discrete function because you cannot have a fraction of a pet.

What are terms used to represent the x-value?

Independent variable, input, and domain.

What are terms used to represent the y-value?

Dependent variable, output and range.

Understanding the Standard

- A relation is any set of ordered pairs. For each first member, there may be many second members.

Essential Knowledge and Skills

The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

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- A function is a relation between a set of inputs, called the domain, and a set of outputs, called the range, with the property that each input is related to exactly one output.
- As a table of values, a function has a unique value assigned to the second variable for each value of the first variable. In the “not a function” example, the input value “1” has two different output values, 5 and -3, assigned to it, so the example is not a function.

function		not a function	
<i>x</i>	<i>y</i>	<i>x</i>	<i>y</i>
2	3	2	3
1	5	1	5
0	3	0	4
-1	-3	1	-3

- As a set of ordered pairs, a function has a unique or different *y*-value assigned to each *x*-value. For example, the set of ordered pairs, $\{(1, 2), (2, 4), (3, 2), (4, 8)\}$ is a function. This set of ordered pairs, $\{(1, 2), (2, 4), (3, 2), (2, 3)\}$, is not a function because the *x*-value of “2” has two different *y*-values.
- As a graph of discrete points, a relation is a function when, for any value of *x*, a vertical line passes through no more than one point on the graph.
- Some relations are functions; all functions are relations.
- Graphs of functions can be discrete or continuous.
- In a discrete function graph there are separate, distinct points. You would not use a line to connect these points on a graph. The points between the plotted points have no meaning and cannot be interpreted. For example, the number of pets per household

- Determine whether a relation, represented by a set of ordered pairs, a table, or a graph of discrete points is a function. Sets are limited to no more than 10 ordered pairs. (a)
- Identify the domain and range of a function represented as a set of ordered pairs, a table, or a graph of discrete points. (b)

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represents a discrete function because you cannot have a fraction of a pet.

- Functions may be represented as ordered pairs, tables, graphs, equations, physical models, or in words. Any given relationship can be represented using multiple representations.
- A discussion about determining whether a continuous graph of a relation is a function using the vertical line test may occur in grade eight, but will be explored further in Algebra I.



- The domain is the set of all the input values for the independent variable or x -values (first number in an ordered pair).
- The range is the set of all the output values for the dependent variable or y -values (second number in an ordered pair)
- If a function is comprised of a discrete set of ordered pairs, then the domain is the set of all the x -coordinates, and the range is the set of all the y -coordinates. These sets of values can be determined given different representations of the function.

- Example: The domain of a function is $\{-1, 1, 2, 3\}$ and the range is $\{-3, 3, 5\}$. The following are representations of this function:

- o The function represented as a table of values:

x	y
-1	5

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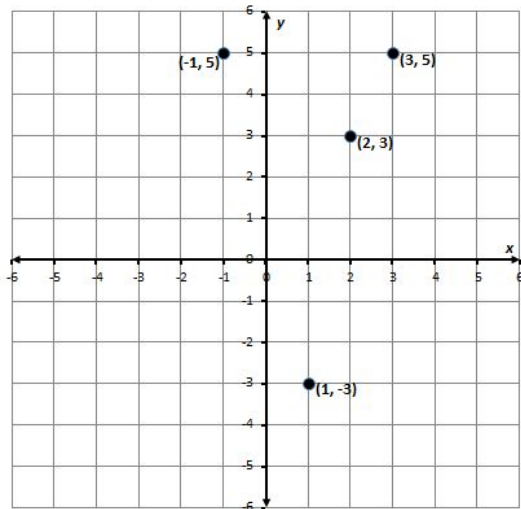
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- o The function represented as a set of ordered pairs:

$$\{(-1, 5), (1, -3), (2, 3), (3, 5)\}$$

- o The function represented as a graph on a coordinate plane:



Vocabulary

Relation
Member
Function
Domain
Range
Inputs
Outputs
Independent Variable
Dependent Variable

Instructional Activities Organized by Learning Objective

Virginia Department of Education

Textbook

Virginia Pre-Algebra, ©2012, Glencoe/McGraw-Hill

- Ordered Pairs and Relations, page(s) 25 – 30
- Functions, page(s) 399 – 404 (**in part**)

Notes

- [Relations & Functions](#)

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<p>Vertical Line Test Table Ordered Pairs Graph Discrete Continuous X-Value Y-Value</p>	<p>Resources</p> <ul style="list-style-type: none"> ● Print <ul style="list-style-type: none"> <i>Virginia Coach</i>, NEW SOL Edition, Grade 8, Mathematics Lesson 19 – page 143 (Relations and Functions)(in part) Lesson 20 – page 151 (Describe Functions)(in part) ● Technology-based <ul style="list-style-type: none"> ○ <i>ExploreLearning.com (Gizmos)</i> – Introduction to Functions – Interactive Instructional Resource(exclude mapping)
Assessment	
<p>RPS PowerSchool Unit Test – RPS 8.15 Common Assessment Test ID #:</p> <p>Formative Assessments White Board Checks Kahoot.it Plickers Exit Tickets Graphic Organizers Venn Diagrams</p>	<p>Station Activities</p> <ul style="list-style-type: none"> ● Function/Not A Function Sort - Have students sort cards based on function and not functions. Students should be able to use the vertical line test. ● Plotting Points on Whiteboards - Have students plot points on whiteboard and determine if a function or not a function. ● Domain & Range Foldable ● Function Test Foldable ● Functions Domain and Range ● Relations Graphic Organizer(change mapping to ordered pairs) ● Functions Graphic Organizer(exclude mapping section)
Cross-Curricular Connections	Differentiations
<p>English Have students explain the difference between domain, range, IV, and DV.</p> <p>History Discuss the causes and effects of a war.</p> <p>Science</p>	<ul style="list-style-type: none"> ● Have students make a table when given an equation using the given input values. ● Have students list ordered pairs when given a function table or after creating a function table. ● Have students use the ordered pairs to graph the function. ● Have students match equations, function tables, ordered pairs, and graphs.

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Give examples of science fair projects that students have done. Have students identify the IV and DV of a given scenario.

- Have students determine the independent and dependent variables from a graph and a practical problems.
- Have students highlight independent and dependent variables from a practical problem and connect that to its graph.