

Give the domain and range for the following:

$\{(1, 3), (9, 4), (-2, -2), (7, -3), (-1, 10)\}$

$\{(a, 1), (b, 5), (c, 3), (d, 10)\}$

Now that we know what domain and range are we can start to look at what actually determines a function. This will be the basis for the rest of our study for this year.

Let's look at the ridiculous example the book throws at us.

1-6 Relations and Functions

Suppose you are told that a person entered a word into a text message using the numbers 6, 2, 8, and 4 on a cell phone. It would be difficult to determine the word without seeing it because each number can be used to enter three different letters.

1-6 Relations and Functions

Number

{Number, Letter}



→

{(6, M), (6, N), (6, O)}



→

{(2, A), (2, B), (2, C)}



→

{(8, T), (8, U), (8, V)}



→

{(4, G), (4, H), (4, I)}

The numbers 6, 2, 8, and 4 each appear as the first coordinate of three different ordered pairs.

1-6 Relations and Functions

However, if you are told to enter the word *MATH* into a text message, you can easily determine that you use the numbers 6, 2, 8, and 4, because each letter appears on only one numbered key.

$\{(M, 6), (A, 2), (T, 8), (H, 4)\}$ *The first coordinate is different in each ordered pair.*

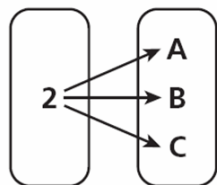
A relation in which the first coordinate is never repeated is called a *function*. In a **function**, there is only one output for each input, so each element of the domain is mapped to exactly one element in the range.

1-6 Relations and Functions

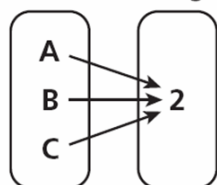
Although a single input in a function cannot be mapped to more than one output, two or more different inputs can be mapped to the same output.

1-6 Relations and Functions

Person Domain Location Range



Domain Range



1-6 Relations and Functions

Example 2: Determining Whether a Relation is a Function

Determine whether each relation is a function.

A. from the items in a store to their prices on a certain date

C.L. Function
 ↓
 3.00

B. from types of fruits to their colors

Apple → Green
 Apple → Red
 Apple → Yellow
 N.F.

1-6 Relations and Functions

Check It Out! Example 2

Determine whether each relation is a function.

A.

Shoe Prices			
Size	7	8	9
Price (\$)	35	35	35

B. from the number of items in a grocery cart to the total cost of the items in the cart

Write two sets of points. Have the first set be a function and have the second set of points not be a function.

x	y
2	4
3	5
4	6

x	y
-1	2
-1	3
0	5
1	6

1-6 Relations and Functions

Every point on a vertical line has the same x -coordinate, so a vertical line cannot represent a function. If a vertical line passes through more than one point on the graph of a relation, the relation must have more than one point with the same x -coordinate. Therefore the relation is not a function.

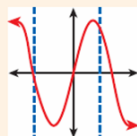
1-6 Relations and Functions

Vertical-Line Test

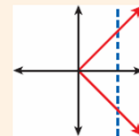
WORDS

If any vertical line passes through more than one point on the graph of a relation, the relation is not a function.

EXAMPLES



Function

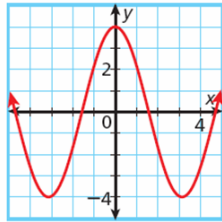


Not a Function

1-6 Relations and Functions

Example 3A: Using the Vertical-Line Test

Use the vertical-line test to determine whether the relation is a function. If not, identify two points a vertical line would pass through.

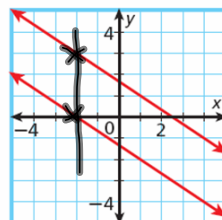


Function

1-6 Relations and Functions

Example 3B: Using the Vertical-Line Test

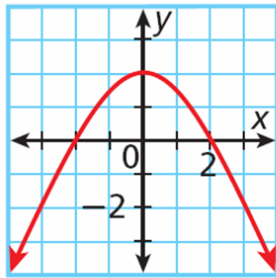
Use the vertical-line test to determine whether the relation is a function. If not, identify two points a vertical line would pass through.



N.F.
 $(-2, 3)$
 $(-2, 0)$

1-6 Relations and Functions**Check It Out! Example 3a**

Use the vertical-line test to determine whether the relation is a function. If not, identify two points a vertical line would pass through.

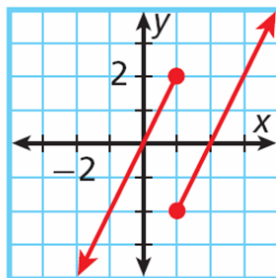


Holt Algebra 2

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1-6 Relations and Functions**Check It Out! Example 3a**

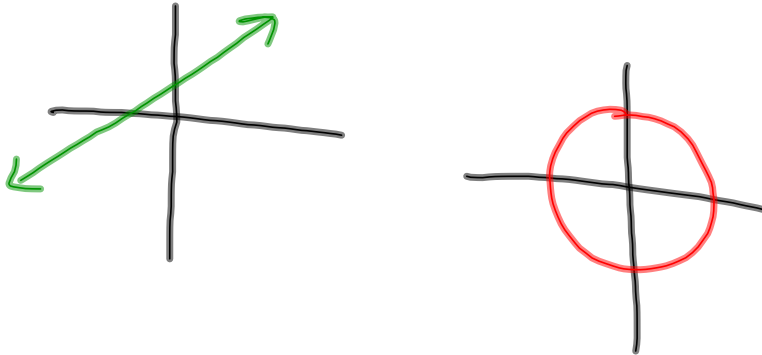
Use the vertical-line test to determine whether the relation is a function. If not, identify two points a vertical line would pass through.



Holt Algebra 2

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Draw two graphs. Let one graph be a function and let the second not be a function.



Homework
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