Math-3A

Lesson 1-1

Relations and Functions

Relation: A "mapping" or pairing of input values to output values.

Function: A relation where each input has exactly one output.

Describe how a relation is

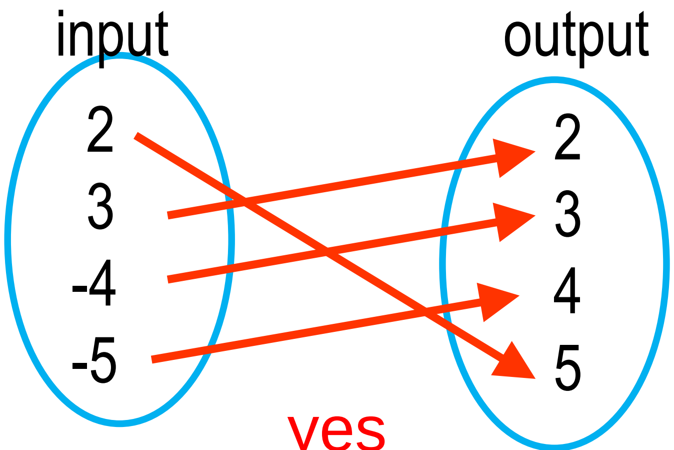
1) Similar to a function.

Both have inputs matched to outputs.

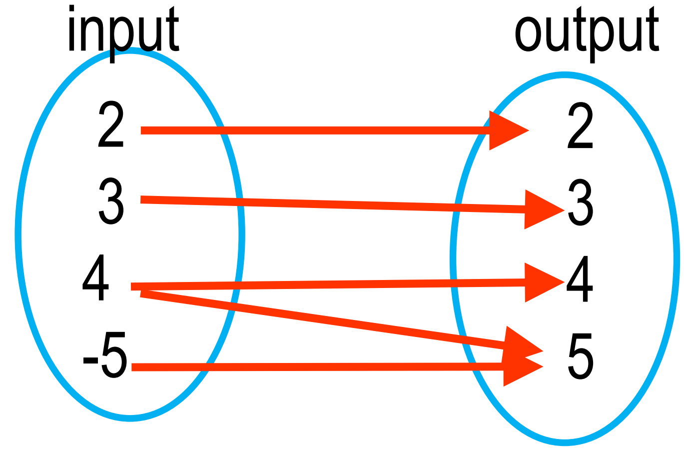
1) Different from a function?

One input to a relation can be matched with two or more outputs but one input to a function can only be matched to one output.

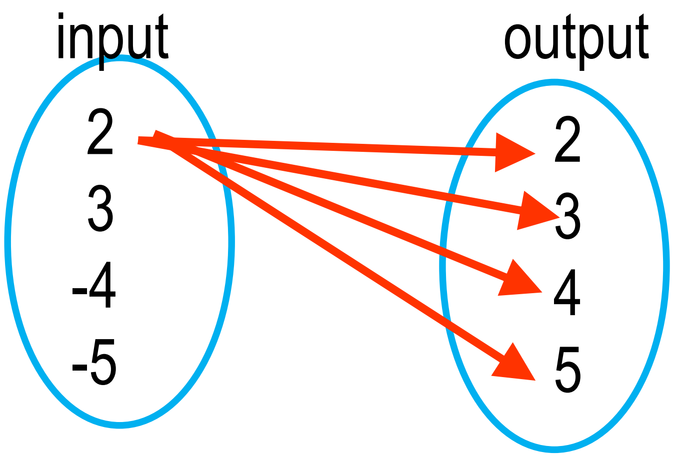
Is it a <u>function</u>?



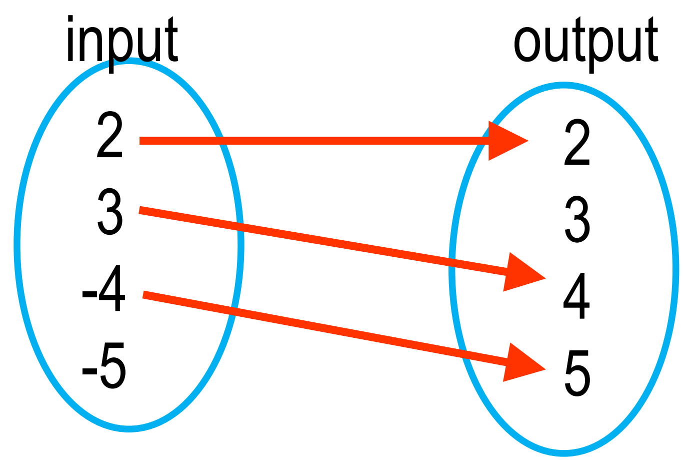
yes



Relation but NOT a function since input value ‘4’ has 2 outputs.

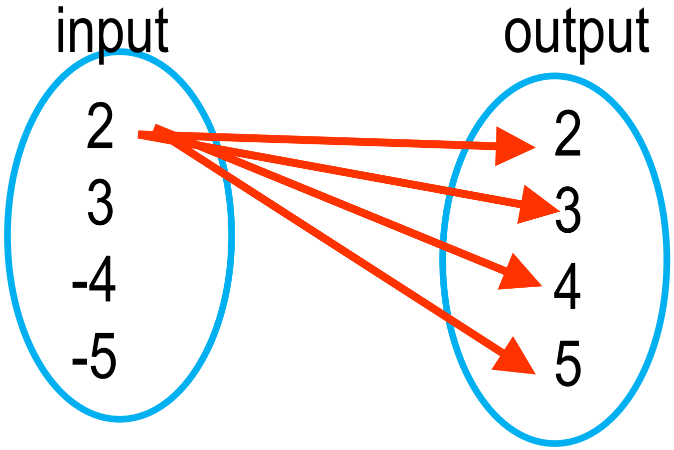


<u>No</u>: input value ‘2’ has more than one output

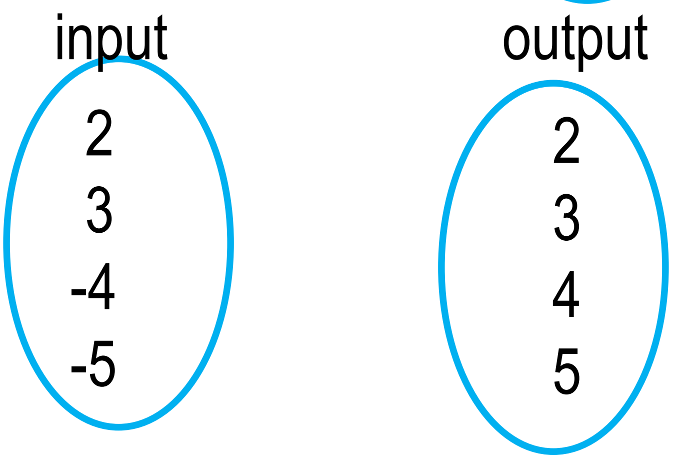


yes

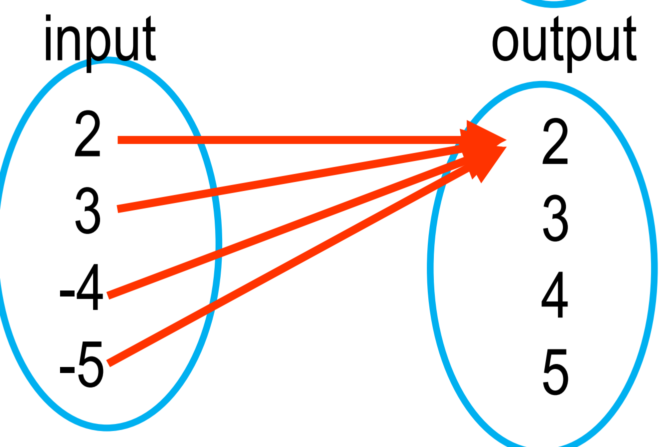
Is it a function?



No: input value '2' has more than one output



No (There aren't any pairings of inputs to outputs.)



Yes Each input has exactly one output (even though it's the same output)

Is it a relation?

There are at least 6 ways to show a relation between input and output values.

Ordered Pairs: (2, 4), (3, 2), (-4, 3)

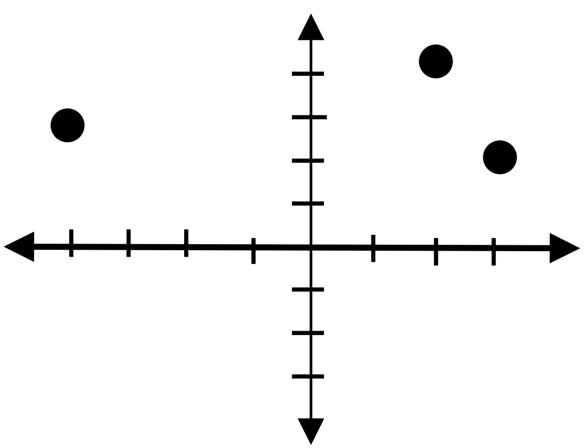
Data table:

x	2	3	-4
y	4	2	3

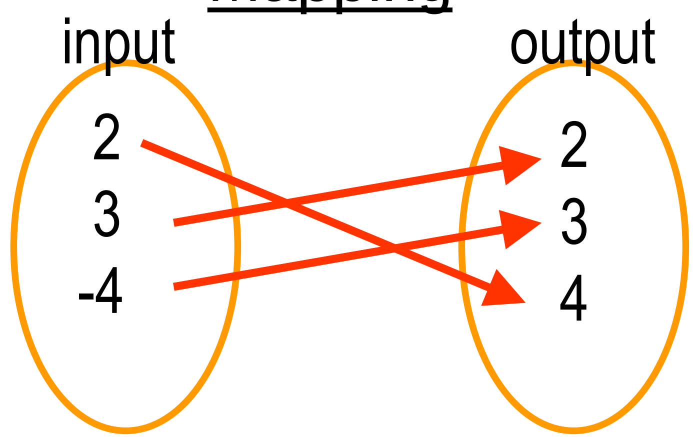
Equation: $y = 2x + 1$

Function notation: $f(2) = 4$

Graph:



Mapping



Are all of these representations the same?

Vocabulary

Domain: the set made up of all of the input values that have corresponding output values.

Range: the set made up of all of the corresponding output values.

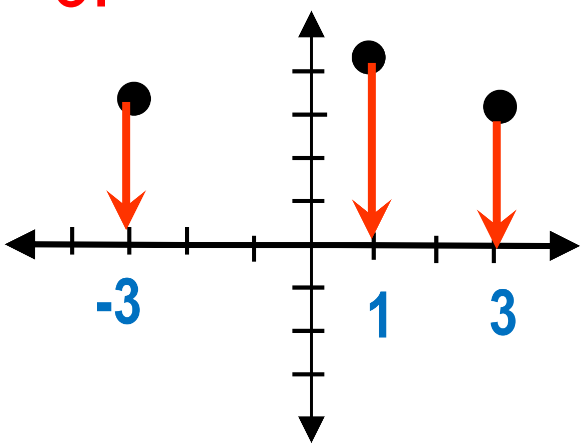
Identify the Domain

1. (2, 4), (3, 5), (-4, 2)

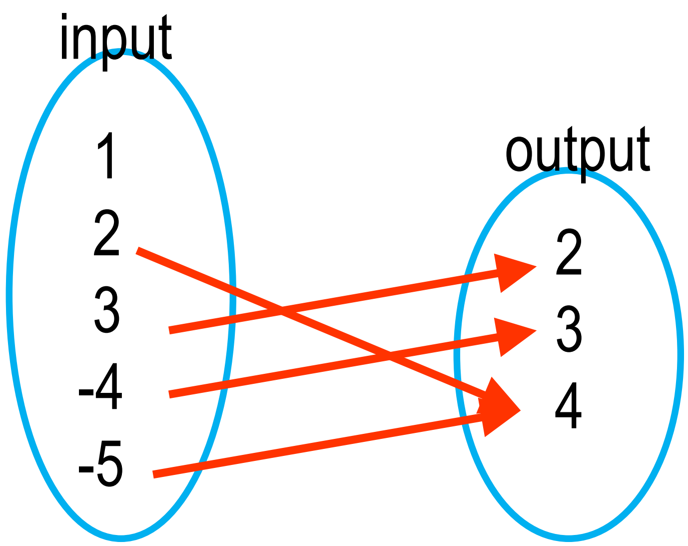
2.

x	6	9	-2
y	4	7	3

3.



4. 2, 3, -4, -5



What are 6 ways you can show a <u>relation</u> between <u>input</u> and <u>output</u> ?

<u>Ordered Pairs</u>

<u>Data table</u>

<u>Equation</u>

<u>Graph</u>

<u>Function notation</u>: $f(2) = 4$

<u>Mapping</u>

$$y = f(x)$$ Function Notation

When we say “y is a function of x” we mean:

We are “doing math” (performing mathematical operations) on the input value ‘x’ to determine the corresponding output value ‘y’.

Which of the following equations is “ ’y’ a function of x”?

$$x = \frac{1}{2}y - 3$$

$$y = 2x + 6$$

We are performing operations on the input value ‘x’ to get the output value ‘y’.

In the equation, “x” is just place holder for the values that we “plug in” (substitute) into the equation in place of “x”.

$$y = 2x - 1$$

We replace ‘x’ (the place-holder) with a parentheses. Then we substitute into the parentheses the input value then simplify.

$$y = 2(\quad) - 1$$

x	0	1	2
y	-1	1	3

$$y = 2(0) - 1$$
$$y = -1$$

$$y = 2(1) - 1$$
$$y = 1$$

$$y = 2(2) - 1$$
$$y = 3$$

Equation → table

Using the equation form of the function, fill in the missing values in the table to <u>convert the equation into a table of values.</u>

$$y = 3x + 4$$

x	0	1	2
y	4	7	10

$$y = 4x - 2$$

x	0	1	2
y	-2	2	6

$$y = 5x + 3$$

x	0	1	2
y	3	8	13

What do you notice when comparing the constant term in the equation to the numbers in the table?

$$y = 3x + 4$$

$$y = 3(0) + 4$$

x	0	1	2
y	4	7	10

$$y = 4x - 2$$

$$y = 4(0) - 2$$

x	0	1	2
y	-2	2	6

$$y = 5x + 3$$

$$y = 5(0) + 3$$

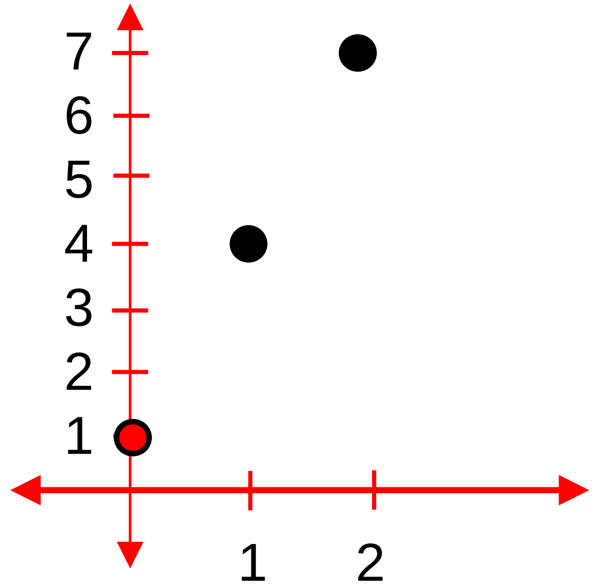
x	0	1	2
y	3	8	13

The constant term of the equation is always mapped from the input value zero.

Fill in the table then graph
x-y pairs from the table.

$$y = 3x + 1$$

x	0	1	2
y	1	4	7

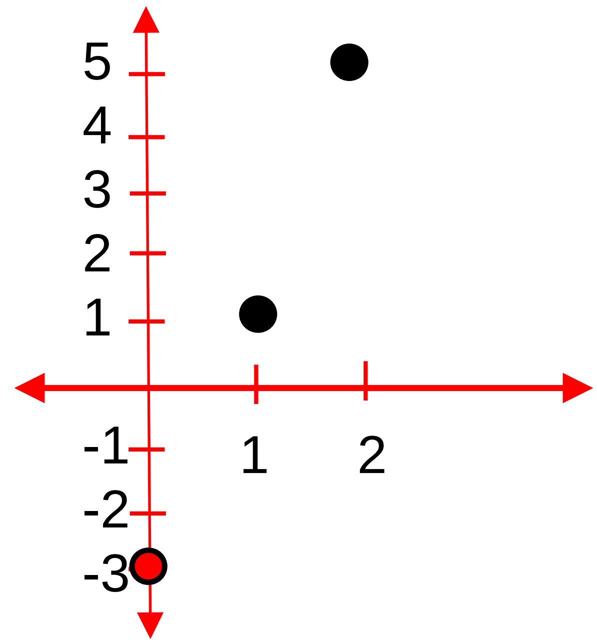


y-intercept: the x-y pair where a graph crosses the y-axis.

Solution of a two-variable equation: all x-y pairs that make the equation true.

$$y = 4x - 3$$

x	0	1	2
y	-3	1	5



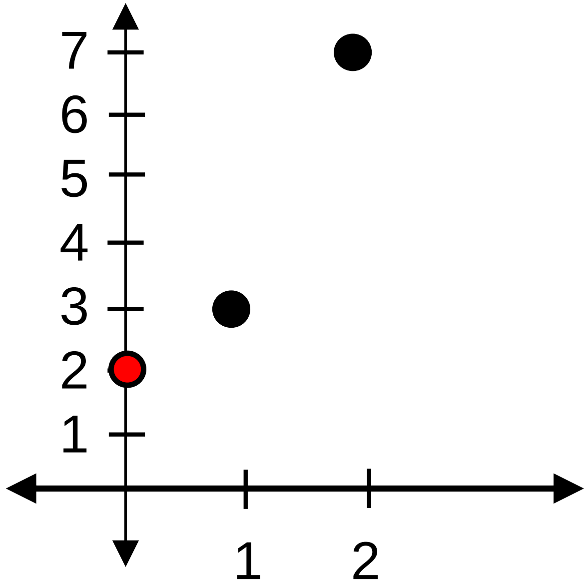
Does the table represent the complete solution? no

Does the graph represent the complete solution? no

Fill in the table then graph
x-y pairs from the table.

$$f(x) = x^2 + 2$$

x	0	1	2
y	2	3	6

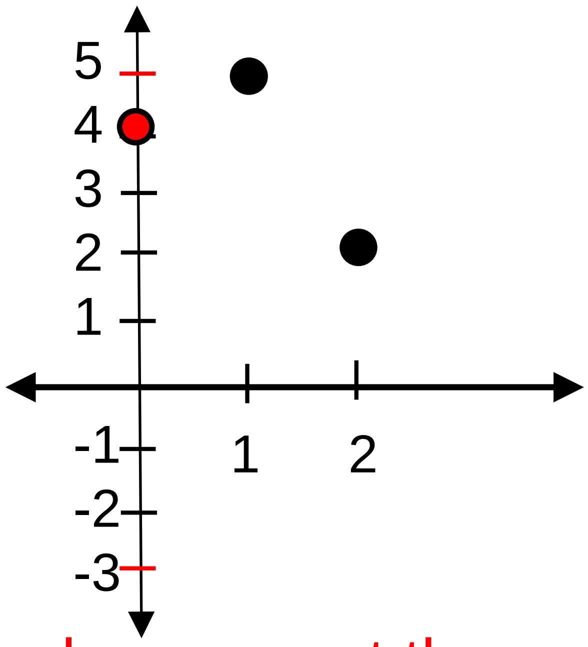


y-intercept: always results from *f(0)*.

Solution of a two-variable equation:
all x-y pairs that make the equation true.

$$g(x) = -2x^2 + 3x + 4$$

x	0	1	2
y	4	5	2



Does the table represent the complete solution? no

Does the graph represent the complete solution? no

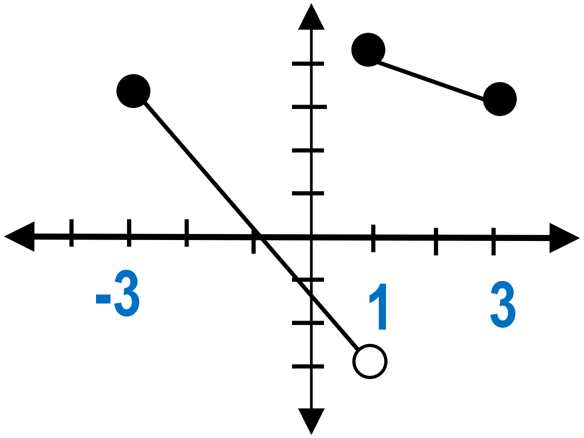
Is it a function?

1. (2, 4), (3, 5), (-4, 5)

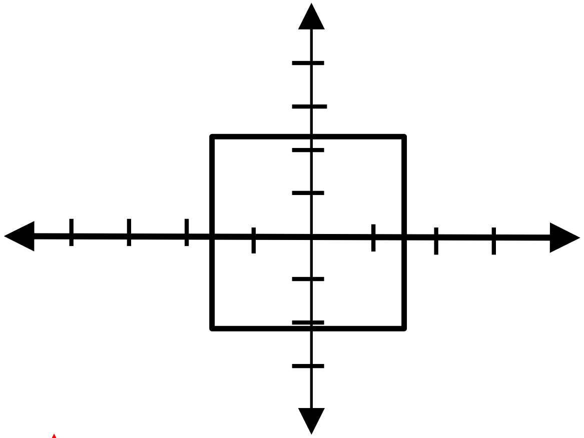
2.

x	6	6	-2
y	4	7	3

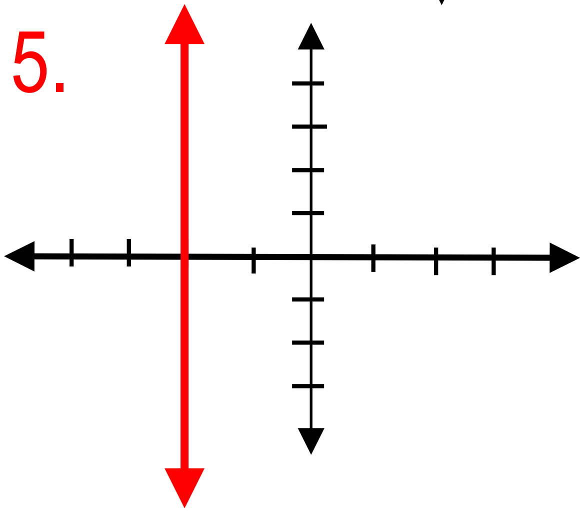
3.



4.



5.



1. Convert (2, 4), (3, 5), (-4, 5) into a table

2. Convert $f(3) = 6$, $f(-2) = 1$, $f(6) = -5$ into a table

3. What special point does $f(0) = 7$ represent?

4. What special point does $f(3) = 0$ represent?