RELATIONS, FUNCTIONS, & TABLES

Relation- a set of ordered pairs (x, y)

$\{(-7,5), (0,-4), (1,3), (-2,0)\}$

Domain- the set of all possible values of the first variable **(also called the input)**

x-values $\{-7, 0, 1, -2\}$

Range- the set of all possible values of the second variable **(also called the output)**

y-values $\{5, -4, -3, 0\}$

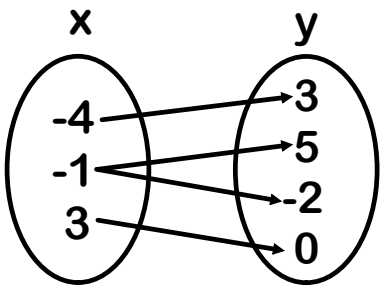
Relations can also be shown using a table, a mapping, or a graph.

Consider the relation {(-4,3), (-1,5), (-1,-2), (3,0)}.

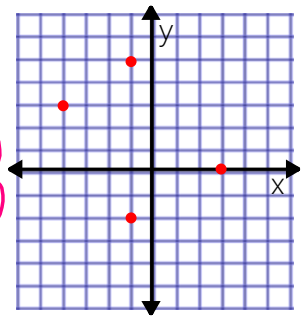
table

x	y
-4	3
-1	5
-1	-2
3	0

mapping



graph



Express each relation below as a set of ordered pairs. Determine the domain and range.

1.

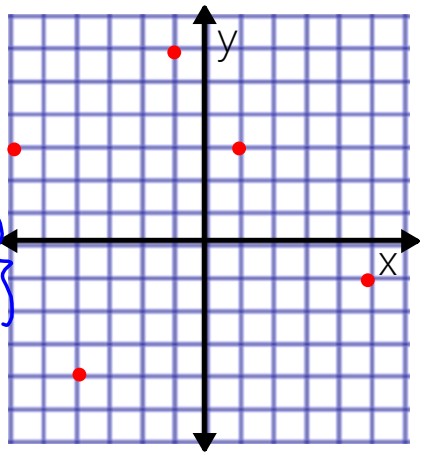
x	y
-3	7
-2	-5
0	6
1	1
4	-2

$\{(-3,7),(-2,-5),(0,6),(1,1),(4,-2)\}$

D: $\{-3,-2,0,1,4\}$

R: $\{7,-5,6,1,-2\}$

2.



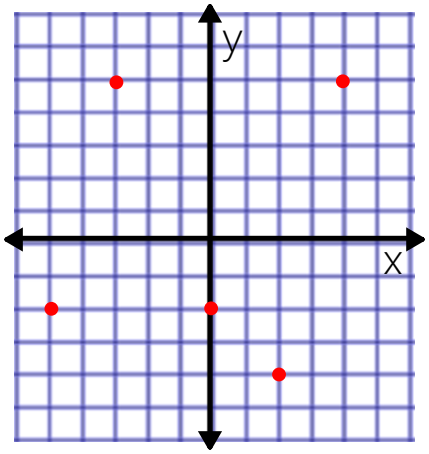
$\{(-6,3),(-4,-4),(-1,6),(1,3),(5,-1)\}$

D: $\{-6,-4,-1,1,5\}$

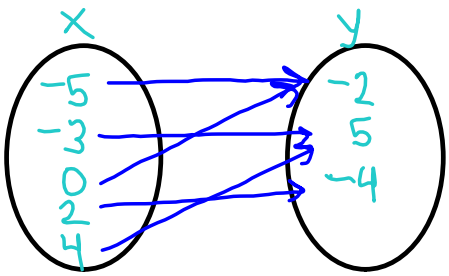
R: $\{3,-4,6,-1\}$

Draw a mapping for each relation below.

3.

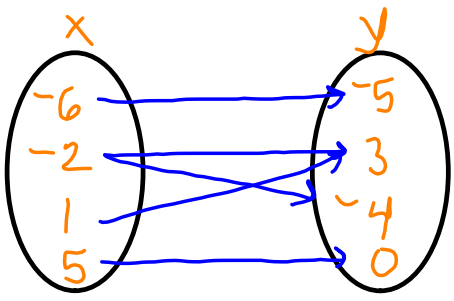


$(-5,-2),(-3,5),(0,-2),(2,-4),(4,5)$



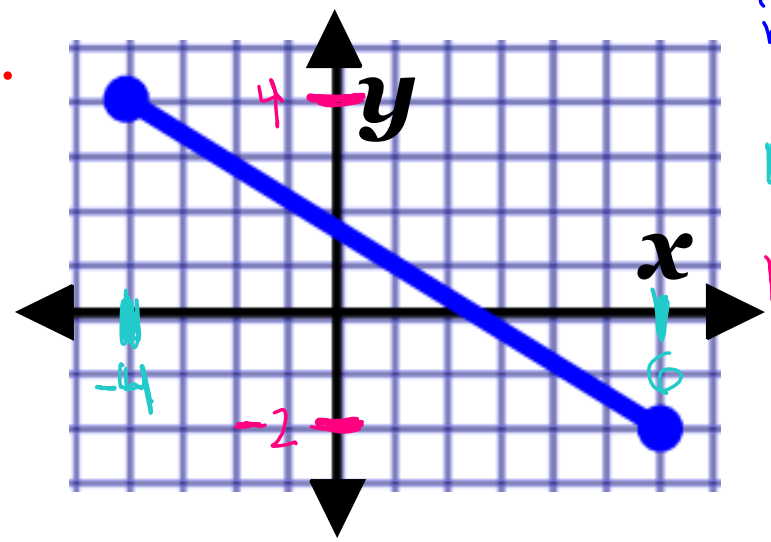
4.

x	y
-6	-5
-2	3
-2	-4
1	3
5	0



Based on the graph below, state the domain and range.

5.



left to right

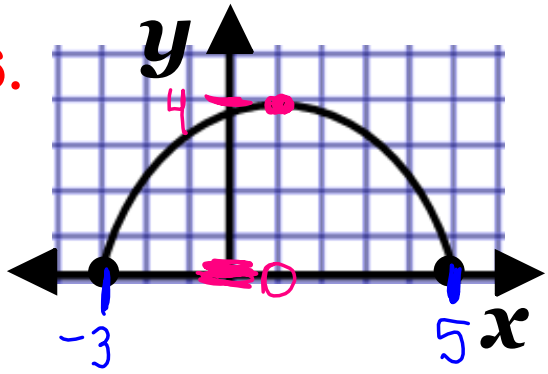
low to high

D: $-4 \leq x \leq 6$

R: $-2 \leq y \leq 4$

Based on the graphs below, state the domain and range.

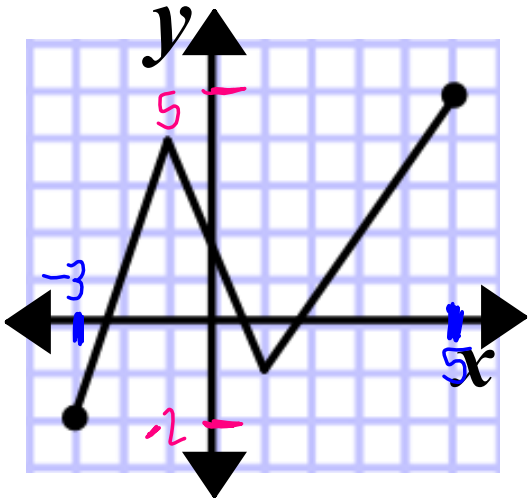
6.



D: $-3 \leq x \leq 5$

R: $0 \leq y \leq 4$

7.



D: $-3 \leq x \leq 5$

R: $-2 \leq y \leq 5$

A function is a relation in which each element of the domain is paired with exactly one element of the range.

every x has exactly one y → x's cannot repeat

8. Are each of the following relations also functions? Why are why not?

a) {(5,-2), (3,2), (4,-1), (-2,2)}

function b/c x's don't repeat

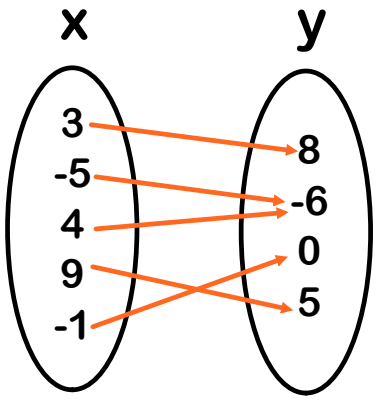
b) {(-1,5), (-9,4), (-1,-4, (3,0)}

not a function b/c -1 repeats

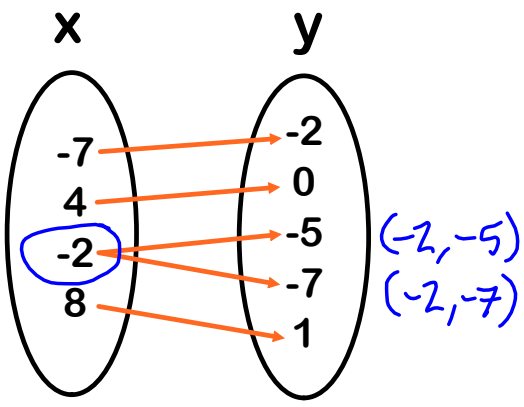
c) {(3,2), (8,-6), (-6,2), (7,4)}

function b/c x's don't repeat

9. Which mapping represents a function?



function

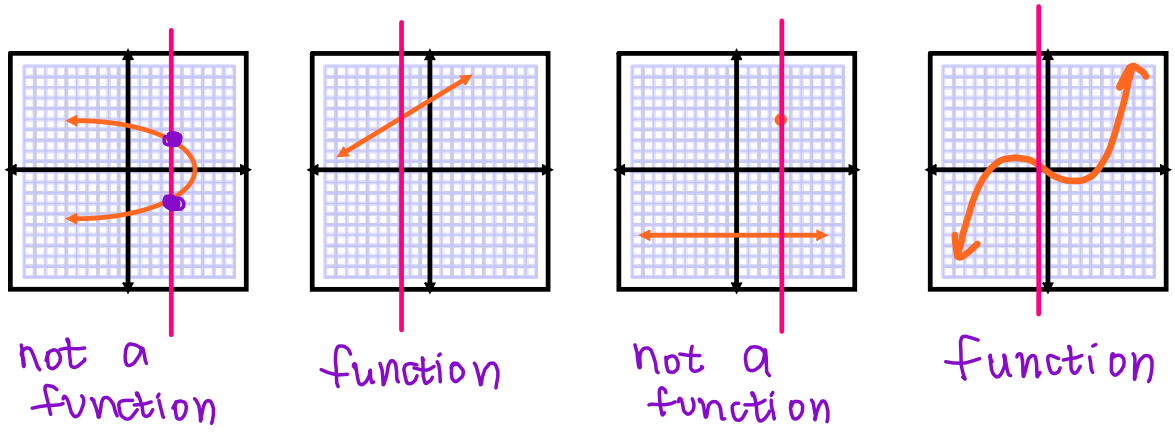


not a function

Vertical Line Test

If any vertical line passes through no more than one point of the graph of a relation, then the relation is a function.

10. Use the vertical line test to determine if each relation is a function.



Equations that represent functions can be written in function notation. The equation y = 2x + 1 can be written f(x) = 2x + 1. The symbol f(x) is read "f of x ".

****f(x) does NOT represent multiplication!****

If you see f(3), that means you are plugging the value 3 in for x.

11. If $f(x) = 3x - 7$, find each of the following.

a) $f(2)$

$f(2) = 3(2) - 7$

$f(2) = 6 - 7$

$f(2) = -1$

$(2, -1)$

b) $f(-4)$

$f(-4) = 3(-4) - 7$

$f(-4) = -12 - 7$

$f(-4) = -19$

c) $2[f(\frac{3}{4})] = -\frac{19}{2}$

$f(\frac{3}{4}) = 3(\frac{3}{4}) - 7$

$f(\frac{3}{4}) = \frac{9}{4} - \frac{7}{1} \cdot \frac{4}{4}$

$f(\frac{3}{4}) = \frac{9}{4} - \frac{28}{4}$

$f(\frac{3}{4}) = \frac{-19}{4}$

$2[f(\frac{3}{4})] = 2[-\frac{19}{4}] = \frac{-38}{4} = \frac{-19}{2}$

12. If $h(x) = -x + 8$, find each of the following.

a) $h(-9)$

$h(-9) = -(-9) + 8$

$h(-9) = 9 + 8$

$h(-9) = 17$

b) $h(\frac{2}{3})$

$h(\frac{2}{3}) = -(\frac{2}{3}) + \frac{8}{1} \cdot \frac{3}{3}$

$h(\frac{2}{3}) = -\frac{2}{3} + \frac{24}{3}$

$h(\frac{2}{3}) = \frac{22}{3}$

c) $3[h(6)] = 6$

$h(6) = -(6) + 8$

$h(6) = -6 + 8$

$h(6) = 2$

$3[h(6)] = 3[2] = 6$

13. The domain of the function $y = x + 4$ is 0, 2, 5, 7, & 8. Make an input-output table for the function. Write your answer as a set of ordered pairs.

x		y
0	0 + 4	4
2	2 + 4	6
5	5 + 4	9
7	7 + 4	11
8	8 + 4	12

$\{(0,4), (2,6), (5,9), (7,11), (8,12)\}$

14. The domain of the function $y = \frac{2}{3}x + \frac{1}{3}$ is 4, 6, 8, & 12. Make an input-output table for the function. Write your answer as a set of ordered pairs.

x		y
4	$\frac{2}{3}\left(\frac{4}{1}\right) + \frac{1}{3} = \frac{8}{3} + \frac{1}{3}$	$\frac{9}{3} = 3$
6	$\frac{2}{3}\left(\frac{6}{1}\right) + \frac{1}{3} = \frac{12}{3} + \frac{1}{3}$	$\frac{13}{3}$
8	$\frac{2}{3}\left(\frac{8}{1}\right) + \frac{1}{3} = \frac{16}{3} + \frac{1}{3}$	$\frac{17}{3}$
12	$\frac{2}{3}\left(\frac{12}{1}\right) + \frac{1}{3} = \frac{24}{3} + \frac{1}{3}$	$\frac{25}{3}$

$\left\{(4,3), \left(6, \frac{13}{3}\right), \left(8, \frac{17}{3}\right), \left(12, \frac{25}{3}\right)\right\}$

15. The domain of the function $y = \frac{7}{4}x - 2$ is 2, 5, & 8. Make an input-output table for the function. Write your answer as a set of ordered pairs.

x		y
2	$\frac{7}{4}\left(\frac{2}{1}\right) - 2 = \frac{14}{4} - \frac{2 \cdot 4}{1 \cdot 4}$	$\frac{6}{4} = \frac{3}{2}$
5	$\frac{14}{4} - \frac{8}{4}$ $\frac{7}{4}\left(\frac{5}{1}\right) - 2 = \frac{35}{4} - \frac{8}{4}$	$\frac{27}{4}$
8	$\frac{7}{4}\left(\frac{8}{1}\right) - 2 = \frac{56}{4} - \frac{8}{4}$	$\frac{48}{4} = 12$

$\left\{(2, \frac{3}{2}), \left(5, \frac{27}{4}\right), (8, 12)\right\}$