

Algebra 1
Lesson 3.2 – Relations and Functions

A **relation** is a way to represent a relationship with a set of ordered pairs.

There are **four** ways to represent a relation:

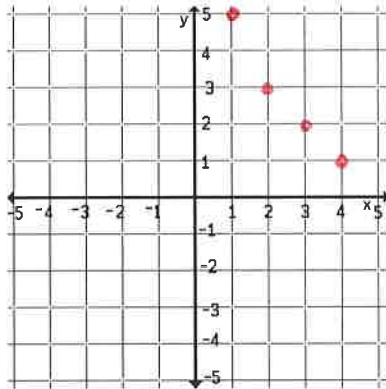
(x, y)

ORDERED PAIRS
 $\{(1, 5), (2, 3), (3, 2), (4, 1)\}$

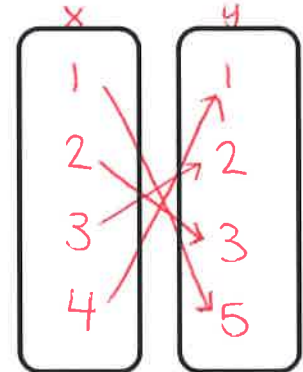
TABLE OF VALUES

x	y
1	5
2	3
3	2
4	1

GRAPH



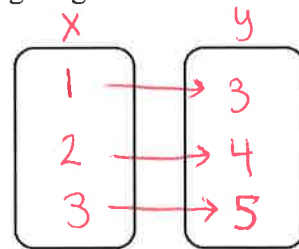
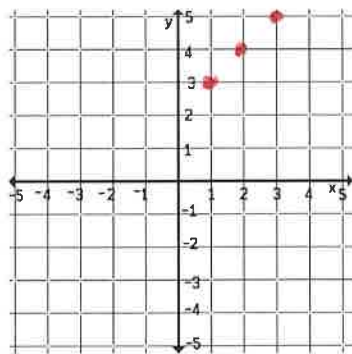
smallest \rightarrow biggest
MAPPING DIAGRAM



Examples

1. Express the relation $\{(1, 3), (2, 4), (3, 5)\}$ as a table, graph, and mapping diagram.

x	y
1	3
2	4
3	5

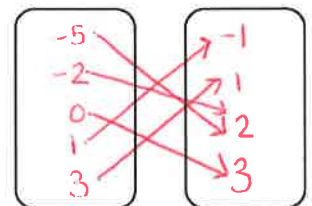
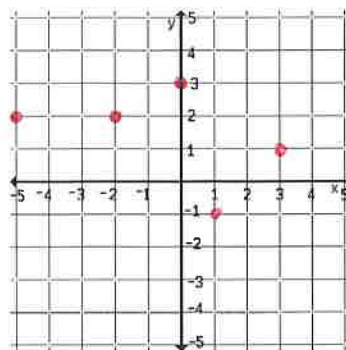


2. Express the relation

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

as a set of ordered pairs, a graph, and a mapping diagram.

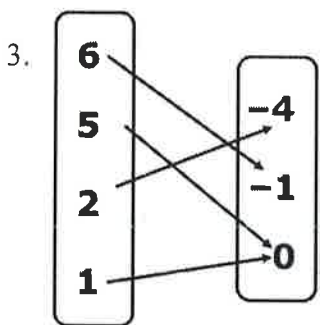
ordered pairs:
 $\{(-5, 2), (1, -1), (0, 3), (-2, 2), (3, 1)\}$



The **domain** of a relation is the set of first coordinates (x-values) of the ordered pairs

The **range** of a relation is the set of second coordinates (y-values) of the ordered pairs

Examples x y
 Determine the domain and range for each relation. ** No repeats!*

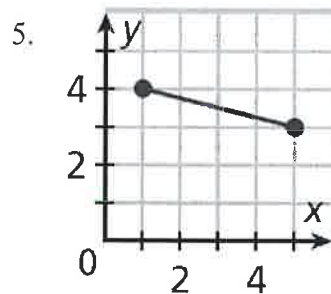


D: {1, 2, 5, 6}
 R: {-4, -1, 0}

4.

x	y
1	1
4	4
8	1

D: {1, 4, 8}
 R: {1, 4}



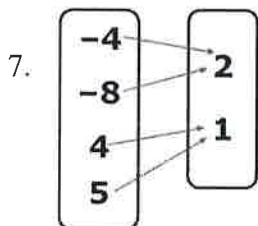
D: {1 ≤ x ≤ 5}
 R: {3 ≤ y ≤ 4}

A **function** is a special type of relation that pairs each domain value with exactly one range value (no repeating x's)

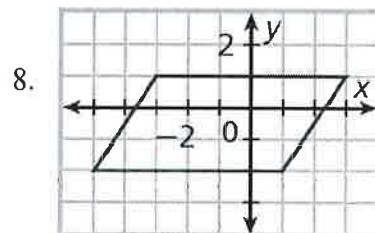
Examples
 Determine the domain and range for each relation. Then determine whether the relation is a function.

6. {(3, -2), (5, -1), (4, 0), (3, 1)}

D: {3, 4, 5}
 R: {-2, -1, 0, 1}
 Function? No
x-value of 3 repeats!



D: {-8, -4, 4, 5}
 R: {1, 2}
 Function? yes

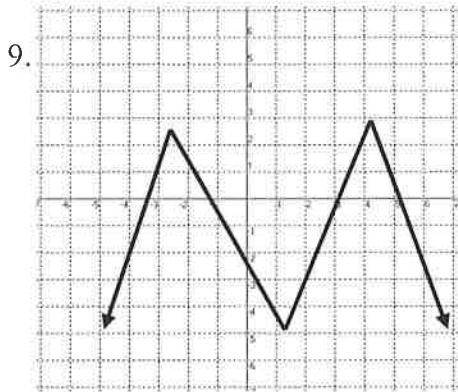


D: {-5 ≤ x ≤ 3}
 R: {-2 ≤ y ≤ 1}
 Function? No
*x-values repeat!
 Fails vertical line test!*

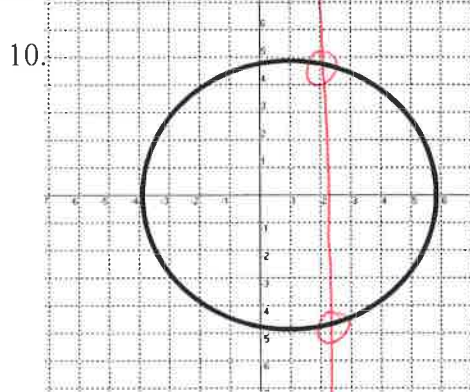
The vertical line test is if there are no vertical lines that intersect the graph at more than one point, then the graph is a function.

Examples

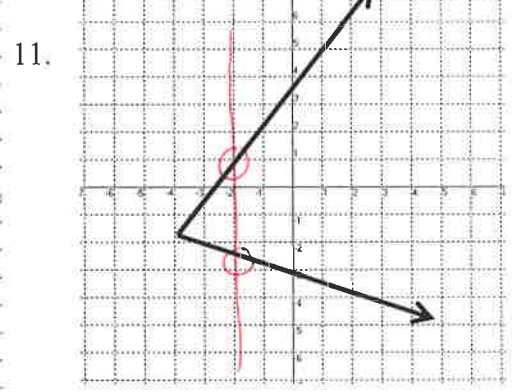
Use the vertical line test to determine whether the graph shows a function.



Yes → passes vertical line test!



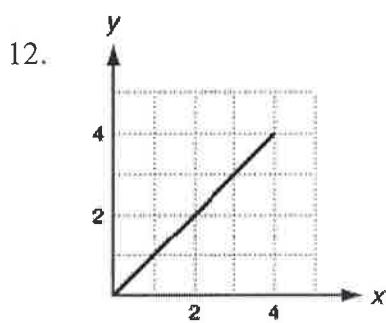
No → fails vertical line test!



No → fails vertical line test!

Putting It All Together

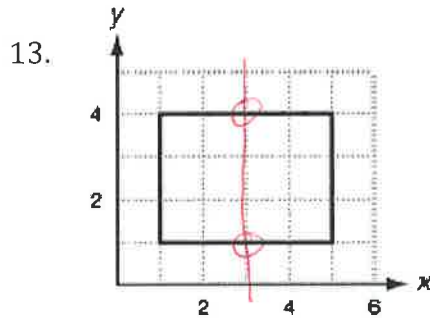
Determine the domain and range of each relation. Then determine whether the relation is a function.



D: $\{0 \leq x \leq 4\}$

R: $\{0 \leq y \leq 4\}$

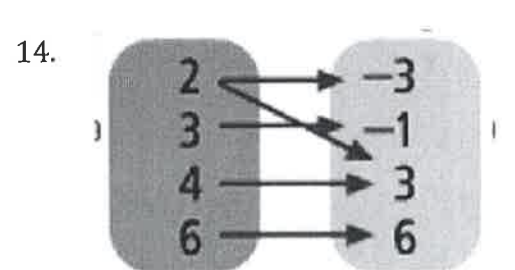
Function? yes
passes vertical line test



D: $\{1 \leq x \leq 5\}$

R: $\{1 \leq y \leq 4\}$

Function? No
fails vertical line test



D: $\{2, 3, 4, 6\}$

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

Function? No
the x-value of 2 repeats with two different y-values

Last Question...

Which of the displays (mapping diagram, table, or graph) is easiest for determining if a relation is a function? Why?

