

Formalizing Relations and Functions

Guided Notes

Relation definition

A relation between two sets is a collection of ordered pairs containing one object from each set. If the object x is from the first set and object y is from the second set, then the objects are related if (x,y) is in the relation. It is represented by R .

Domain:

The domain of a relation R is the set of all x -values if the relation is represented as a set of ordered pairs.

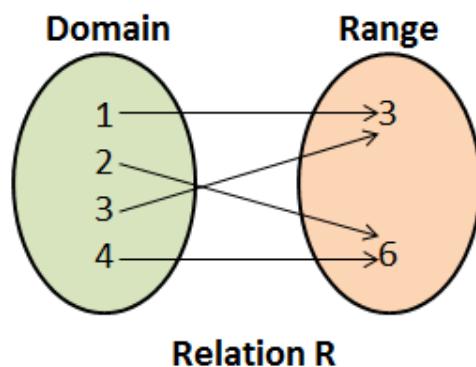
Range:

The range of a relation R is the set of all y -values if the relation is represented as a set of ordered pairs.

Relation as a Function

A relation is function if each value in the domain of the relation is associated/paired with exactly one value in the range of the relation.

Mapping diagram:



$$\text{Relation } R = \{(1,3), (2,6), (3,3), (4,6)\}$$

The relation R is a function since each value in domain is associated with only one value in range.

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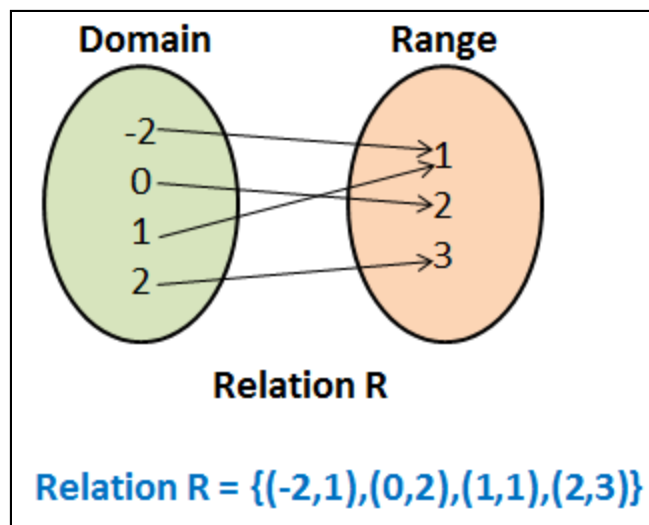
Problem 1: Identify the domain and range of the relation given below. Represent the relation with a mapping diagram. Is the relation a function?

$$R = \{(-2,1), (0,2), (1,1), (2,3)\}$$

Domain: $\{-2, 0, 1, 2\}$

Range: $\{1, 2, 3\}$

Since each value in the domain is associated with only one value in domain, so the relation **R** is a function.

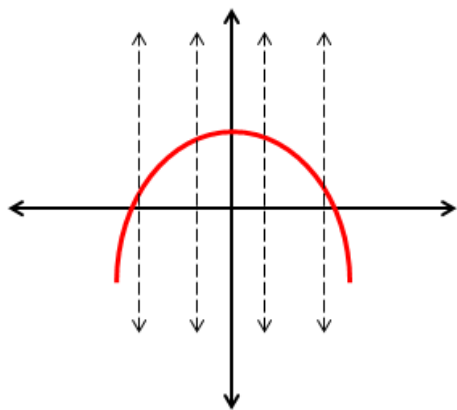


Mapping Diagram

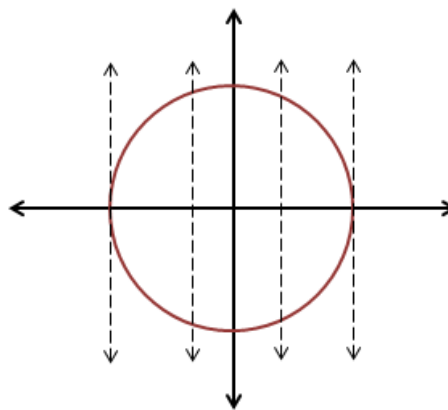
Vertical Line Test

If we are given the graph of a relation, we can tell whether the relation is a function or not by using a vertical line test on the graph. The rule is:

“Draw vertical lines (parallel to the y-axis) passing through the graph. If any vertical line passes through more than 1 point on the graph at the same time, then the relation is a function.”



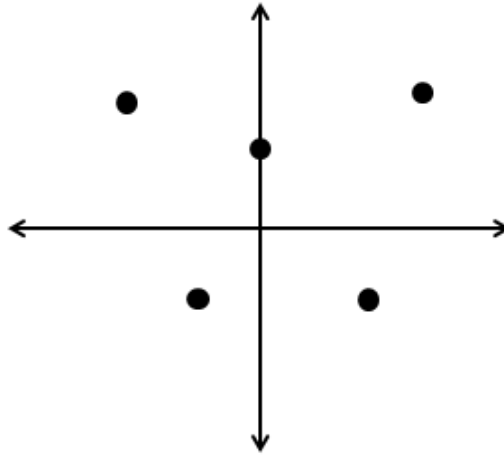
It is a Function



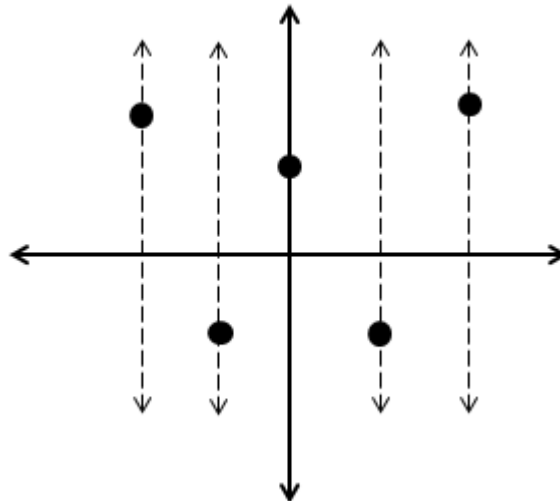
It is not a Function

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Problem 2: Use the vertical line test to determine whether the relation represented by the graph is a function or not.



Solution:



Since the vertical line test is passed, the graph represents a **function**.