8.1 Relations and Functions

Goal: Use graphs to represent relations and functions.

Vocabulary

Relation:

Domain:

Range:

Input:

Output:

Function:

Vertical line test:

Example 1 *Identifying the Domain and Range*

Identify the domain and range of the relation represented by the table below that shows one Norway Spruce tree's height at different ages.

(X, y)

Age (years), x	5	10	15	20	25
Height (ft), y	13	25	34	43	52

Domain input x

Range output y

Solution

The relation consists of the ordered pairs (5,13) (10,25) (15,34) (20,43) (25,52). The domain of the relation is the set of all x's, or inputs. The range is the set of all y's, or outputs.

Domain: 5, 10, 15, 20, 25 **Range:** 13, 25, 34, 43, 52

D: 5, 10, 15, 20, 25 R: 13, 25, 34, 43, 52

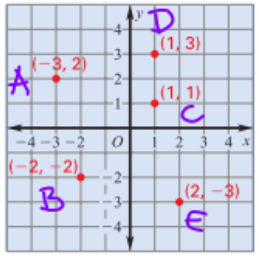
Example 2 *Representing a Relation*

Represent the relation $(-3, 2), (-2, -2), (1, 1), (1, 3), (2, -3)$ as indicated.

a. A graph **b.** A mapping diagram

Solution

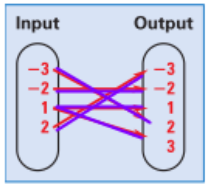
a. Graph the ordered pairs as (x, y) in a coordinate plane.



up or down

left or right

b. List the inputs and the outputs in order. Draw arrows from the inputs to their outputs



Example 3 *Identifying Functions*

Tell whether the relation is a function.

a. The relation in Example 1

b. The relation in Example 2.

Solution

a. The relation isn't a function because the points (1, 3) & (1, 1) share the same vertical line. ~~This makes sense, as a single tree can have height at a given point in time.~~

b. The relation isn't a function because the input 1 can't have two outputs 1 & 3

Checkpoint Identify the domain and range of the relation and tell whether the relation is a function.

1. $(-5, 2), (-3, -1), (-1, 0), (2, 3), (5, 4)$

D: $-5, -3, -1, 2, 5$
R: $-1, 0, 2, 3, 4$

yes, it's a function

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

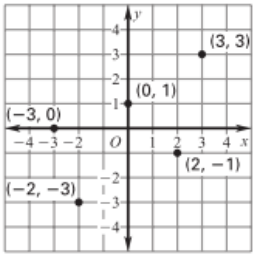
2. $(-4, -3), (-3, 2), (0, 0), (1, -1), (2, 3), (3, 1), (3, -2)$

Example 4 *Using the Vertical Line Test*

To understand why the vertical line test works, remember that a function has exactly one output for each input.

a. In the graph below, no vertical line passes through more than one point. So, the relation represented by the graph

is a function



b. In the graph below, the vertical line shown passes through two points. So, the relation represented by the graph

is not a function