

2.1/2.2 A Relations and Functions

A. Relations

1. A relation is a set of ordered pairs

$$A = \{(-1, 3), (2, 0), (2, 5), (-3, 2)\}$$

2. The domain is the set of first coordinates: $\{-1, 2, -3\}$

$$\text{Thus } \text{dom } A = \{-1, 2, -3\} = \{-3, -1, 2\}$$

3. The range is the set of second coordinates: $\{3, 0, 5, 2\}$

$$\text{Thus } \text{rng } A = \{0, 2, 3, 5\}$$

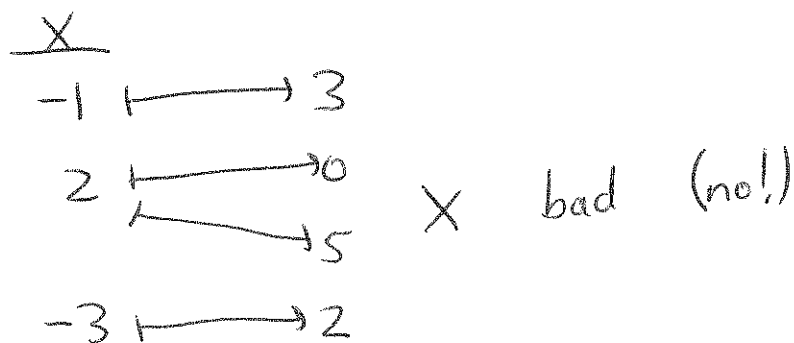
B. Functions

1. A function is a "special" relation that satisfies the following:

Each x-value is allowed only one y-value

2. We test relations by using a mapping table:

Is the relation $A = \{(-1, 3), (2, 0), (2, 5), (-3, 2)\}$ a function?



A is not a function (2 has y-values 0 and 5)

3. If we see multiple arrows branching from an x-value

, we don't have a function

C. Examples

$$\text{Let } B = \{(3,4), (2,4), (1,4), (-3,2)\}$$

$$C = \{(1,2), (-2,3), (5,1), (-2,4)\}$$

- a) Find $\text{dom } B$, $\text{rng } B$, $\text{dom } C$, $\text{rng } C$.
b) Determine if B or C is a function.

Solution

a) $\text{dom } B$: domain $\Rightarrow$ list of 1st coordinates

$$\text{dom } B = \{3, 2, 1, -3\}$$

$\text{rng } B$: range $\Rightarrow$ list of 2nd coordinates

$$\text{rng } B = \{4, 2\}$$

$$\text{dom } C = \{1, -2, 5\}$$

$$\text{rng } C = \{2, 3, 1, 4\}$$

b) Is B a function?

$$\begin{array}{l} 3 \mapsto 4 \\ 2 \mapsto 4 \\ 1 \mapsto 4 \\ -3 \mapsto 2 \end{array}$$

YES

Is C a function?

$$\begin{array}{l} 1 \mapsto 2 \\ -2 \mapsto 3 \\ -2 \mapsto 4 \\ 5 \mapsto 1 \end{array}$$

X bad

NO