Sec. 2-1 Relations and Functions

relation

Definition: set of pairs of inputs and outputs

Can be represented by:
- ordered pairs
- input/output table
- points on a coordinate plane
- mapping
- equations

Ex: $\{(-2,7),(3,5),(6,1),(7,-1)\}$

x input	y output
-2	7
3	5
6	1
7	-1

Non examples:

$x \rightarrow$ variable

$7x \rightarrow$ expression

$5 \rightarrow$ constant

Domain set of inputs, x-coordinates

Range set of outputs, y-coordinates

function

Definition: each input has exactly one output

If you can draw a vertical line through the graph which touches the graph more than once, it is NOT a function

"the relation fails the vertical line test"

Examples:

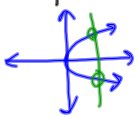
$\{(1,5),(2,7),(3,-2),(4,6)\}$

x	y
3	7
2	1
5	-2

Non-example:

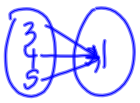
$\{(1,5),(2,7),(1,-2),(4,6)\}$

the input 1 has two outputs

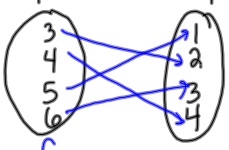


x	y
3	7
2	1
3	-2

Mapping



Input Output



function

Input Output

not a function

Function rule: an equation that represents an output value in terms of an input value

Function Notation:

$y = 5x - 3 \rightarrow f(x) = 5x - 3$

y: output; x: input; "f of x"

$f(1) = 5(1) - 3$

Substitute $x = 1$

$f(1) = 2$ $\quad (1, 2)$

input output

$y = 2$

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Ex: Determine the domain and range and tell whether the relation is a function. Explain.

a. $\{(3,-8),(-9,1),(3,2),(-4,1),(-11,-2)\}$

domain: $\{-11,-9,-4,3\}$

range: $\{-8,-2,1,2\}$

not a function

the input 3 has two output

b. $\{(1,1),(2,0),(3,1),(4,3),(0,2)\}$

domain: $\{0,1,2,3,4\}$

range: $\{0,1,2,3\}$

function

each input has exactly one output

Find $f(x) = 17x + 3$ for $x = 4$. Write as an ordered pair.

$f(4) = 17(4) + 3$

$f(4) = 68 + 3$ $(4, 71)$

$f(4) = 71$

A pizza costs \$14 and delivery is \$1.50. What function rule models the total cost of the number of pizzas delivered? Evaluate for 5 pizzas.

$f(x) = 14x + 1.5$

$f(5) = 14(5) + 1.5$

$= 70 + 1.5$

$= 71.5$ \$71.50

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