

Input Output Detectives

Decide whether relations are functions and read function notation.

HIGH SCHOOL • HSF-IF.A.1

CCSS.Math.Content.HSF-IF.A.1 "Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain..."

NAME _____

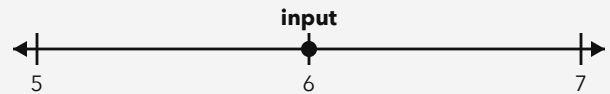
DATE _____

ONE INPUT, ONE OUTPUT

A function assigns each input in its domain exactly one output in its range. Different inputs may share an output, but one input cannot have two different outputs. In $f(x)$, x is the input and $f(x)$ is the output. The graph of f consists of the ordered pairs $(x, f(x))$ for every input in its domain.

WORKED EXAMPLE

The marked point on the number line is the input for $f(x) = 4x - 9$. Find $f(6)$.



1. Start with $f(x) = 4x - 9$.
2. Substitute 6 for x : $f(6) = 4(6) - 9$.
3. Multiply and subtract: $f(6) = 24 - 9 = 15$.

Answer: $f(6) = 15$

PRACTICE 6 problems

- 1** Is the relation $\{(0, 1), (1, 3), (2, 1)\}$ a function? Explain why the repeated output 1 is allowed.

ANSWER _____

- 2** Is the relation $\{(-2, 0), (-2, 3), (1, 1)\}$ a function? Explain briefly.

ANSWER _____

- 3** For $g(x) = -2x + 1$, find $g(-1)$.

ANSWER _____

- 4** The function h has $h(-3) = 8$ and $h(0) = -1$. What is the output when the input is 0?

ANSWER _____

- 5** The entire domain of f is $\{-1, 2, 3\}$. Its values are $f(-1) = 0$, $f(2) = 0$, and $f(3) = 2$. List the domain and range.

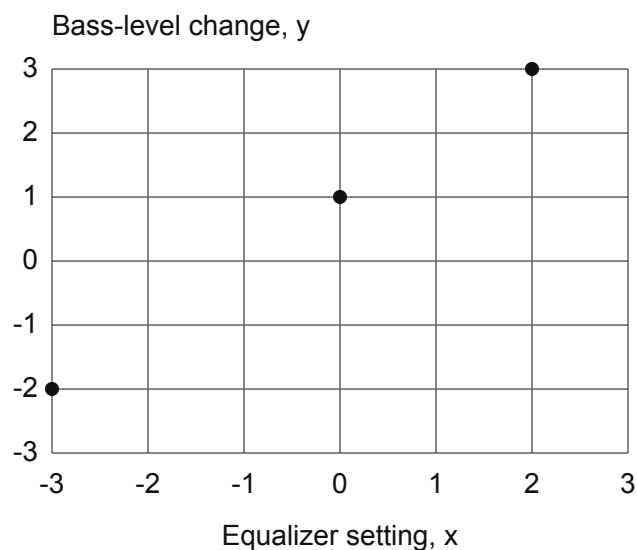
ANSWER _____

- 6** For $p(x) = x^2 - 1$, name the ordered pair on the graph $y = p(x)$ when $x = 2$.

ANSWER _____

APPLY IT Show your work

- 1** The plotted points are the entire relation between a music app's equalizer setting x and bass-level change y . Is this relation a function? If so, call it f and find $f(0)$.



ANSWER _____

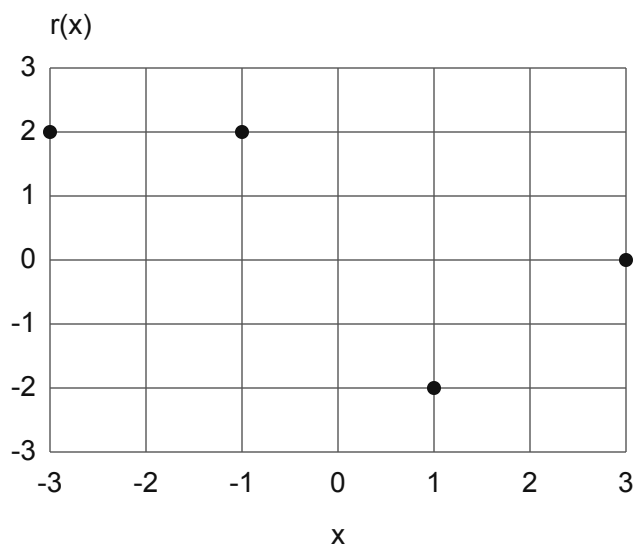
- 2** An esports club has exactly three players: Ari, Bo, and Cam. Their only assignments are $f(\text{Ari}) = \text{Blue}$, $f(\text{Bo}) = \text{Gold}$, and $f(\text{Cam}) = \text{Blue}$. Is f a function? What is $f(\text{Bo})$?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The plotted points show the entire relation r . Mia says r is not a function because the output 2 is used twice. Is Mia correct? Explain using the inputs. Then list the domain and range of r .



WORK SPACE AND ANSWER

PRACTICE 1

Is the relation $\{(0, 1), (1, 3), (2, 1)\}$ a function?
Explain why the repeated output 1 is allowed.

Yes. Each input has exactly one output; different inputs may share 1.

PRACTICE 2

Is the relation $\{(-2, 0), (-2, 3), (1, 1)\}$ a function?
Explain briefly.

No. The input -2 has two outputs, 0 and 3.

PRACTICE 3

For $g(x) = -2x + 1$, find $g(-1)$.

3

PRACTICE 4

The function h has $h(-3) = 8$ and $h(0) = -1$. What is the output when the input is 0?

-1

PRACTICE 5

The entire domain of f is $\{-1, 2, 3\}$. Its values are $f(-1) = 0$, $f(2) = 0$, and $f(3) = 2$. List the domain and range.

Domain: $\{-1, 2, 3\}$; Range: $\{0, 2\}$

PRACTICE 6

For $p(x) = x^2 - 1$, name the ordered pair on the graph $y = p(x)$ when $x = 2$.

(2, 3)

APPLY IT 1

Yes; $f(0) = 1$.

Each displayed x -value is paired with only one y -value, so the relation is a function. The point with $x = 0$ has $y = 1$.

APPLY IT 2

Yes; $f(\text{Bo}) = \text{Gold}$.

Each player has exactly one assigned room.
More than one player may be assigned to Blue, so the repeated output does not prevent f from being a function.

CHALLENGE

No. r is a function because each input, -3, -1, 1, and 3, has exactly one output. Two different inputs may share the output 2. Domain: $\{-3, -1, 1, 3\}$; Range: $\{-2, 0, 2\}$.

Accept domain and range sets in any order.
Accept equivalent wording that states an input has more than one output when explaining why a relation is not a function.