MATHEMATICS · GRADES 10-12

Relations versus functions

Difficulty level: Advanced

Mathematics: Grades 10-12

This document was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

Overview of the concept

This is how you tell whether each input has exactly one output, like a vending machine where each button gives one snack versus a menu where one price could mean several dishes. A vending machine button that always gives the same snack is a function, while a price on a menu that could mean several dishes is not. A student number that points to one student is a function, while a first name shared by three students is not. Knowing the difference tells you whether an input pins down a single answer or leaves it open.



Rule

A relation is a function if every input has exactly one output.

If one input has two different outputs, it is a relation but not a function. The same output twice is fine.

© 2026 Brett Robbins. All Rights Reserved.

Worked examples

EXAMPLE 1

Q Is $\{(1, 2), (2, 3), (3, 4)\}$ a function?



SOLUTION

Check each input: 1 goes to 2, 2 goes to 3, 3 goes to 4.

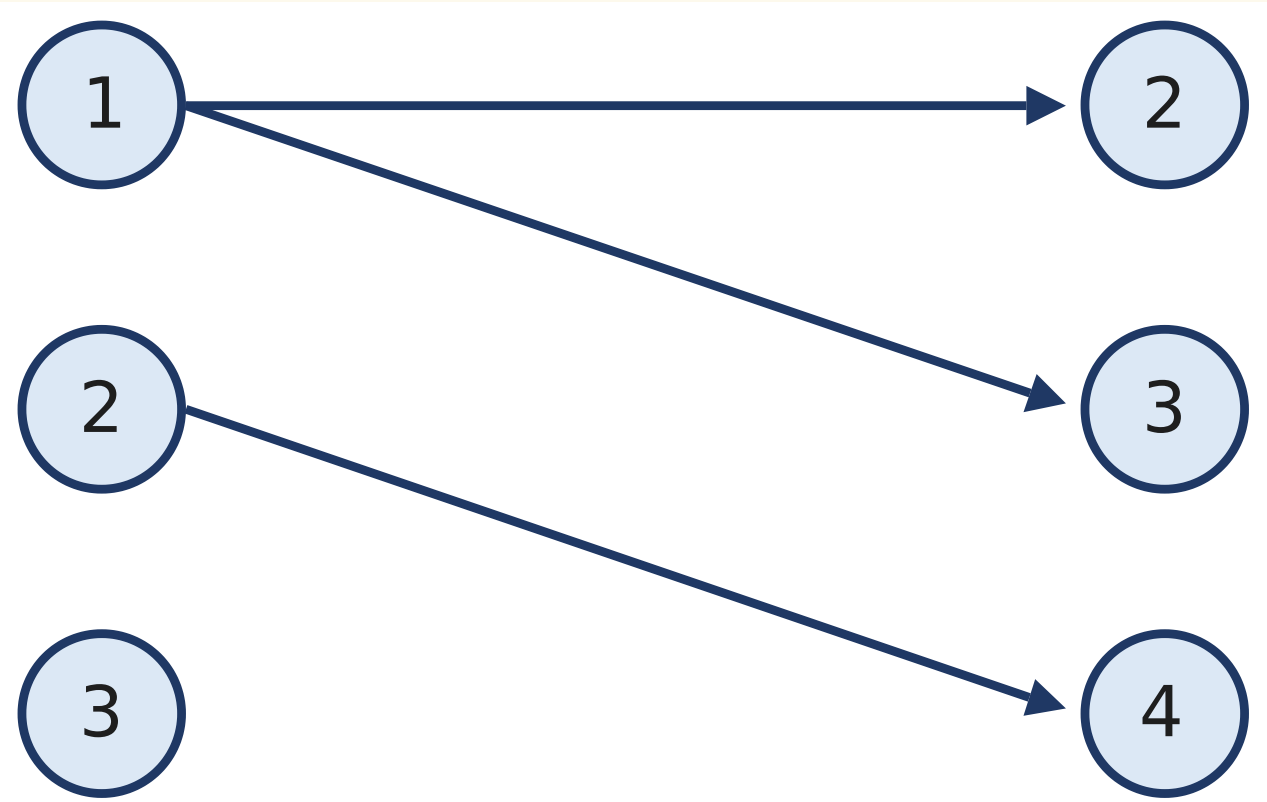
No input appears with two different outputs.

So yes, it is a function.

© 2026 Brett Robbins. All Rights Reserved.

EXAMPLE 2

Q Is {(1, 2), (1, 3), (2, 4)} a function?



SOLUTION

Check each input: 1 goes to 2 and also to 3.

One input has two different outputs, which breaks the function rule.

So no, it is a relation but not a function.

© 2026 Brett Robbins. All Rights Reserved.

Practice questions

1 $\{(1, 5), (2, 6), (3, 7)\}$. Is it a function? Answer yes or no.

A Yes

B No

Understand It with Pulse | Flag a mistake

2 $\{(1, 5), (1, 6)\}$. Is it a function? Answer yes or no.

A Yes

B No

Understand It with Pulse | Flag a mistake

3 $\{(2, 3), (4, 3), (6, 3)\}$. Is it a function? Answer yes or no.

A Yes

B No

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

4 For the relation $\{(1, 2), (2, 3), (3, 4)\}$, what is the domain?

- **A** {1, 2, 3}
- **B** {2, 3, 4}
- **C** {1, 2, 3, 4}
- **D** {4}

Understand It with Pulse | Flag a mistake

5 Which ordered pair could you add to $\{(1, 2), (2, 3)\}$ and still have a function?

- **A** (1, 5)
- **B** (3, 4)
- **C** (2, 9)
- **D** (1, 3)

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

6 A vending machine has one snack behind each button. Is the button-to-snack pairing a function? Answer yes or no.

- **A** Yes
- **B** No

Understand It with Pulse | Flag a mistake

7 Which of these is a function?

- **A** {(1, 2), (2, 3)}
- **B** {(1, 2), (1, 3)}
- **C** {(2, 1), (2, 2)}

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

8

A student notices two inputs sharing one output. Why is that allowed, when one input with two outputs is not?

A. One input may have two different outputs

B. Two inputs may never share an output

C. A function gives one output for each input, but different inputs may share an output

D. A function gives two outputs for each input

Understand It with Pulse

Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

9 For the relation $\{(1, 4), (2, 4), (3, 4)\}$, what is the range?

- A $\{4\}$
- B $\{1, 2, 3\}$
- C $\{1, 2, 3, 4\}$
- D $\{1, 4\}$

Understand It with Pulse | Flag a mistake

10 Three are functions and one is not. Which one is not a function:

- A $\{(1, 1), (2, 2)\}$
- B $\{(1, 1), (1, 2)\}$
- C $\{(3, 3)\}$
- D $\{(1, 2), (2, 2)\}$

Understand It with Pulse | Flag a mistake

© 2026 Brett Robbins. All Rights Reserved.

ANSWER KEY

1. yes

2. no

3. yes

4. {1, 2, 3}

5. (3, 4)

6. yes

7. {(1, 2), (2, 3)}

8. A function gives one output for each input, but different inputs may share an output

9. {4}

10. {(1, 1), (1, 2)}

© 2026 Brett Robbins. All Rights Reserved.