

# What Is a Function?

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

A **function** is a rule that pairs every input with *exactly one* output. Think of a vending machine: press one button (the input) and you always get the same snack (the output). If a single input could give two different outputs, the rule is **not a function**. When a relation is given as a set of ordered pairs  $(x, y)$ , the  $x$ -values are the inputs — if any  $x$  shows up twice with *different*  $y$ -values, it fails. It is perfectly fine for two different inputs to share the same output, though; that still counts as a function.

◇ **Example:** Is the relation  $\{(1, 4), (2, 7), (3, 7), (5, 9)\}$  a function?  
 ⇒ Let's check the inputs — the first number in each pair. They are 1, 2, 3, and 5, and every one of them is different. Since no input is repeated, each input has exactly one output, so this is a function. Notice that 2 and 3 both give the output 7 — that's completely allowed! A function only breaks if the *same input* points to two different outputs.

**Answer:** function

## PRACTICE

Decide whether each relation is a function. Write function or not a function.

- |   |       |  |       |
|---|-------|--|-------|
| 1. $\{(0, 1), (1, 2), (2, 3)\}$         | _____ | 11. $\{(-3, -1), (-2, 0), (-1, 1), (0, 2)\}$ | _____ |
| 2. $\{(4, 5), (4, 6), (7, 8)\}$         | _____ | 12. $\{(1, 5), (2, 5), (3, 5), (1, 6)\}$     | _____ |
| 3. $\{(2, 9), (3, 9), (4, 9)\}$         | _____ | 13. $\{(100, 1), (200, 2), (300, 3)\}$       | _____ |
| 4. $\{(1, 1), (2, 2), (1, 3)\}$         | _____ | 14. $\{(4, 1), (5, 1), (4, 1)\}$             | _____ |
| 5. $\{(-2, 5), (-1, 5), (0, 5)\}$       | _____ | 15. $\{(-1, 2), (-1, -2), (4, 3)\}$          | _____ |
| 6. $\{(5, 0), (6, 1), (5, 2)\}$         | _____ | 16. $\{(0, 7), (1, 7), (2, 7), (3, 7)\}$     | _____ |
| 7. $\{(10, 3), (20, 6), (30, 9)\}$      | _____ | 17. $\{(2, 3), (3, 4), (4, 5), (3, 6)\}$     | _____ |
| 8. $\{(8, 8), (8, 9)\}$                 | _____ | 18. $\{(9, 0), (8, 1), (7, 2), (6, 3)\}$     | _____ |
| 9. $\{(0, 0), (1, 1), (2, 4), (3, 9)\}$ | _____ | 19. $\{(1, 1), (1, 2), (1, 3), (1, 4)\}$     | _____ |
| 10. $\{(7, 2), (3, 2), (7, 5)\}$        | _____ | 20. $\{(-5, 25), (-4, 16), (5, 25)\}$        | _____ |

### ◆ Word Problems

21. At a school store, each item has one price: a pencil costs \$1, a notebook costs \$3, and an eraser costs \$1. Write the relation as ordered pairs (item code: pencil = 1, notebook = 2, eraser = 3) and decide if price is a function of the item code. \_\_\_\_\_
22. A taxi charges by zone. The driver records: zone 1 → \$8, zone 2 → \$12, zone 1 → \$10. Is the fare a function of the zone? Explain. \_\_\_\_\_
23. A coach pairs each player with a jersey number: Ava → 7, Ben → 10, Cleo → 7. Treating each player as an input, is the jersey number a function of the player? \_\_\_\_\_
24. A weather log lists the temperature for each hour: hour 1 → 60°, hour 2 → 63°, hour 2 → 65°. Is temperature a function of the hour? \_\_\_\_\_



## Answer Keys

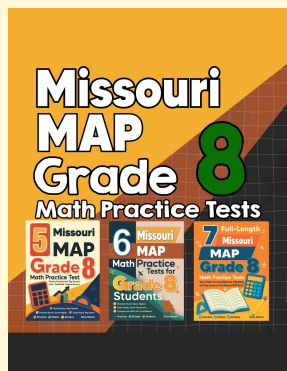
- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. function</li> <li>2. not a function</li> <li>3. function</li> <li>4. not a function</li> <li>5. function</li> <li>6. not a function</li> <li>7. function</li> <li>8. not a function</li> <li>9. function</li> <li>10. not a function</li> <li>11. function</li> <li>12. not a function</li> </ol> | <ol style="list-style-type: none"> <li>13. function</li> <li>14. function</li> <li>15. not a function</li> <li>16. function</li> <li>17. not a function</li> <li>18. function</li> <li>19. not a function</li> <li>20. function</li> <li>21. <math>\{(1, 1), (2, 3), (3, 1)\}</math>; function</li> <li>22. not a function</li> <li>23. function</li> <li>24. not a function</li> </ol> |
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### Step-by-Step Explanations

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|---|---|
| <ol style="list-style-type: none"> <li>1. The inputs 0, 1, 2 are all different, so each one has exactly one output. That makes it a function.</li> <li>2. The input 4 appears twice with different outputs (5 and 6), so the rule is not a function.</li> <li>3. All three inputs are different. Sharing the output 9 is fine, so this is a function.</li> <li>4. The input 1 shows up with both 1 and 3, so one input gives two outputs — not a function.</li> <li>5. The inputs <math>-2, -1, 0</math> are distinct, so each has one output. A shared output is allowed: it's a function.</li> <li>6. The input 5 is paired with both 0 and 2. One input, two outputs — not a function.</li> <li>7. Every input (10, 20, 30) is different, so each maps to exactly one output. It's a function.</li> <li>8. The same input 8 gives two different outputs, 8 and 9. That breaks the function rule.</li> <li>9. The inputs 0, 1, 2, 3 are all different, so this rule (it's <math>y = x^2</math>) is a function.</li> <li>10. Input 7 pairs with both 2 and 5. A repeated input with different outputs means it is not a function.</li> <li>11. All four inputs differ, so each has one output. This is a function.</li> <li>12. Input 1 appears with 5 and again with 6 — two outputs for one input, so it's not a function.</li> <li>13. The inputs are distinct, so every input has exactly one output. It is a function.</li> </ol> | <ol style="list-style-type: none"> <li>14. Input 4 repeats, but both times it gives the <i>same</i> output 1. Same input, same output is fine — it's a function.</li> <li>15. Input <math>-1</math> maps to both 2 and <math>-2</math>. That's two outputs for one input, so not a function.</li> <li>16. Inputs 0, 1, 2, 3 are all different. Sharing the output 7 is allowed: it's a function.</li> <li>17. Input 3 is paired with both 4 and 6, so the relation is not a function.</li> <li>18. Each input (9, 8, 7, 6) is distinct, so each has exactly one output. This is a function.</li> <li>19. The single input 1 is paired with four different outputs. One input cannot give many outputs — not a function.</li> <li>20. The inputs <math>-5, -4, 5</math> are all different. Two of them share the output 25, which is allowed — it's a function.</li> <li>21. The item codes 1, 2, 3 are all different inputs, so each item has exactly one price. The pencil and eraser sharing a \$1 price is fine — price <i>is</i> a function of the item code.</li> <li>22. Zone 1 shows up twice with two different fares, \$8 and \$10. Since one input (zone 1) gives two outputs, the fare is not a function of the zone.</li> <li>23. The inputs Ava, Ben, and Cleo are three different players, so each has exactly one jersey number. Ava and Cleo sharing the number 7 is allowed — it's a function.</li> <li>24. Hour 2 is recorded with two different temperatures, <math>63^\circ</math> and <math>65^\circ</math>. The same input cannot have two outputs, so temperature is not a function of the hour here.</li> </ol> |
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