MATHEMATICS · GRADES 4-6

Input-output tables

Difficulty level: Intermediate

Mathematics: Grades 4-6

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Overview of the concept

This is how you spot the rule behind a pattern of numbers, like a vending machine that always gives back twice the coins you put in. A table of inputs and outputs hides a rule in plain sight, and finding it is how you predict what comes next without guessing. You use it to work out a phone plan from a few bills, to find the pattern in a sequence, or to check that a machine or a formula is doing what it is supposed to do.



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Worked examples

EXAMPLE 1

Q A machine adds 4 to any number. Input 3 gives what output?

SOLUTION

This is an input-output question, and the one rule to remember is to apply the rule exactly as written: output = input + 4.

The input is 3, so the output is 3 + 4 = 7.

The answer is 7. The machine does not change its rule from one input to the next.

EXAMPLE 2

Q Inputs 1, 2, 3 give outputs 3, 6, 9. What is the rule?

SOLUTION

Compare each input with its output. 1 gives 3, 2 gives 6, 3 gives 9.

Every output is 3 times its input, so the rule is: multiply by 3.

Check it: 1 x 3 = 3, 2 x 3 = 6, 3 x 3 = 9. The rule works for every row.

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Practice questions

1 A machine adds 5 to any number. What is the output when the input is 7?

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2 A machine doubles a number, then adds 1. What is the output when the input is 6?

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3 A machine adds 10 to any score. What are the outputs for inputs 1, 2 and 3?

- **A** 11, 12, 13
- **B** 10, 20, 30
- **C** 1, 2, 3
- **D** 11, 21, 31

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4 A machine adds 4. The output is 11. What was the input?

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5 Inputs 1, 2, 3 give outputs 5, 7, 9. What is the rule?

- **A** Multiply by 2, then add 3
- **B** Add 3, then multiply by 2
- **C** Multiply by 3, then add 2
- **D** Add 2, then multiply by 3

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6 Inputs 1, 2, 3 give outputs 5, 6, 7. What is the rule?

- **A** Add 3
- **B** Add 4
- **C** Add 5
- **D** Multiply by 2

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7 Inputs 1, 2, 3 give outputs 2, 4, 6. What is the rule?

- **A** Multiply by 2
- **B** Multiply by 3
- **C** Add 2
- **D** Divide by 2

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8 A table converts centimetres to millimetres. How many millimetres is 6 cm?

Centimetres	Millimetres
1	10
2	20
6	?

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9 A machine multiplies by 4. What is the output when the input is 5?

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10 One pattern adds 3 each time starting at 0: 0, 3, 6, 9. Another adds 6 each time starting at 0: 0, 6, 12, 18. How do the matching terms compare?

A. Each term in the second pattern is twice the matching term in the first

B. Each term in the second pattern is three times the matching term in the first

C. Each term in the second pattern is half the matching term in the first

D. The two patterns have the same terms

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ANSWER KEY

1. 12

2. 13

3. 11, 12, 13

4. 7

5. Multiply by 2, then add 3

6. Add 4

7. Multiply by 2

8. 60 mm

9. 20

10. Each term in the second pattern is twice the matching term in the first

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