

Rule Machine

Find the rule, then make each pattern grow or shrink.

GRADE 4 • 4.PFA.1.d

4.PFA.1.d "Solve contextual problems that involve identifying, describing, and extending increasing and decreasing patterns using single-operation input and output rules."

NAME _____

DATE _____

INPUT AND OUTPUT RULES

An input goes into a rule, and the rule makes an output. Find whether the rule adds, subtracts, multiplies, or divides by the same number each time. Then use the same rule to fill in new inputs or outputs.

WORKED EXAMPLE

Input: 3, 6, 9 Output: 11, 14, 17
What is the rule? What is the output when the input is 12?

1. Compare 3 to 11: $11 - 3 = 8$.
2. Check: $6 + 8 = 14$ and $9 + 8 = 17$.
3. Use the rule: $12 + 8 = 20$.

Answer: Rule: add 8. Output: 20.

PRACTICE 6 problems

- 1** Input: 25, 30, 35, 40 Output: 21, 26, 31, ____
Describe the rule. Fill in the missing output.

ANSWER _____

- 2** Input: 50, 45, 40, 35 Output: 43, 38, 33, ____
Describe the rule. Fill in the missing output.

ANSWER _____

- 3** Input: 13, 15, 16, 18 Output: 52, 60, 64, ____
Describe the rule. Fill in the missing output.

ANSWER _____

- 4** Input: ____, 70, 80, 90 Output: 44, 54, 64, 74
Describe the rule. Fill in the missing input.

ANSWER _____

- 5** Input: 100, 90, 80, 70 Output: 95, 85, 75, ____
Describe the rule. Fill in the missing output.

ANSWER _____

- 6** Input: 21, 31, 41, 51 Output: 51, 61, 71, ____
Describe the rule. Fill in the missing output.

ANSWER _____

APPLY IT Show your work

1

At an arcade, a bonus chest adds the same number of coins to each player's coin total. The table shows the coin total before and after opening the chest. Before: 24, 29, 34 After: 43, 48, 53 Describe the rule. A player has 39 coins before opening the chest. How many coins does the player have after?

WORK SPACE

ANSWER _____

2

The robotics club tests battery packs. The table shows energy units before and after one test. Before: 62, 70 After: 44, 52 Describe the rule. A pack has 85 energy units before a test. How many energy units does it have after?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A mystery machine has this table. Input: 27, 35, 46, 58 Output: 54, 70, 92, ____ Is the rule add 27 or multiply by 2? Explain how you know, then fill in the missing output.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Input: 25, 30, 35, 40 Output: 21, 26, 31, ____ Describe the rule. Fill in the missing output.	Rule: subtract 4. Missing output: 36.
2	Input: 50, 45, 40, 35 Output: 43, 38, 33, ____ Describe the rule. Fill in the missing output.	Rule: subtract 7. Missing output: 28.
3	Input: 13, 15, 16, 18 Output: 52, 60, 64, ____ Describe the rule. Fill in the missing output.	Rule: multiply by 4. Missing output: 72.
4	Input: ____, 70, 80, 90 Output: 44, 54, 64, 74 Describe the rule. Fill in the missing input.	Rule: subtract 16. Missing input: 60.
5	Input: 100, 90, 80, 70 Output: 95, 85, 75, ____ Describe the rule. Fill in the missing output.	Rule: subtract 5. Missing output: 65.
6	Input: 21, 31, 41, 51 Output: 51, 61, 71, ____ Describe the rule. Fill in the missing output.	Rule: add 30. Missing output: 81.

PART 2 • APPLY IT

- Rule: add 19. The player has 58 coins after opening the chest.** Each after total is 19 more than the before total. Add 19 to 39 to get 58.
- Rule: subtract 18. The pack has 67 energy units after the test.** Each after amount is 18 less than the before amount. Subtract 18 from 85 to get 67.

CHALLENGE

The rule is multiply by 2. Adding 27 to 35 would give 62, not 70, but multiplying 35 by 2 gives 70. The missing output is 116.

Accept equivalent rule wording such as "take away" for subtract or "times" for multiply. Students should state both the rule and the requested missing value.