

Pattern Machine Lab

Use rules to build number patterns.

GRADE 4 • 4.PFA.1.c

4.PFA.1.c "Given a rule, create increasing and decreasing patterns using numbers and input/output tables (including function machines)."

NAME _____

DATE _____

FOLLOW THE RULE

A function machine uses the same rule every time. When the numbers go up by the same amount, the pattern is increasing. When the numbers go down by the same amount, the pattern is decreasing.

WORKED EXAMPLE

Rule: add 7. Input: 13. What is the output?

1. Start with the input, 13.
2. Add 7: $13 + 7 = 20$.
3. Write 20 as the output.

Answer: 20

PRACTICE 6 problems

- 1** Rule: add 5. Complete the table. Input: 4 | 9 | 11 Output: ____ | ____ | ____

ANSWER _____

- 2** Rule: subtract 4. Complete the table. Input: 18 | 14 | 10 Output: ____ | ____ | ____

ANSWER _____

- 3** Find the rule. Is this an increasing or decreasing pattern? Input: 31 | 28 | 25
Output: 28 | 25 | 22

ANSWER _____

- 4** A function machine adds 12. Complete the outputs. Input: 6 | 9 | 11 Output: ____ | ____ | ____

ANSWER _____

- 5** Start at 15. Add 6 each time. Write the next four numbers.

ANSWER _____

- 6** Rule: subtract 8. Complete the missing input. Input: ____ | 26 | 24 Output: 22 | 18 | 16

ANSWER _____

APPLY IT Show your work

- 1** In an animal-rescue game, Amir has 42 coins before playing. He earns 6 coins after each completed level. Make an input/output table for 0, 1, 2, and 3 completed levels. What is Amir's total number of coins each time?

WORK SPACE

ANSWER _____

- 2** A robot's battery is at 90% before a mission. It loses 11 percentage points after each mission. Make an input/output table for 0, 1, 2, and 3 missions. What is the battery percent each time?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A machine makes a decreasing pattern. Input 3 gives output 55. Input 4 gives output 46. Input 5 gives output 37. Input 6 gives output 28. What output will the machine give for input 8? Explain your reasoning.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Rule: add 5. Complete the table. Input: 4 9 11 Output: ____ ____ ____	9 14 16
2	Rule: subtract 4. Complete the table. Input: 18 14 10 Output: ____ ____ ____	14 10 6
3	Find the rule. Is this an increasing or decreasing pattern? Input: 31 28 25 Output: 28 25 22	Subtract 3. Decreasing pattern.
4	A function machine adds 12. Complete the outputs. Input: 6 9 11 Output: ____ ____ ____	18 21 23
5	Start at 15. Add 6 each time. Write the next four numbers.	21, 27, 33, 39
6	Rule: subtract 8. Complete the missing input. Input: ____ 26 24 Output: 22 18 16	30

PART 2 • APPLY IT

- 0 levels: 42 coins; 1 level: 48 coins; 2 levels: 54 coins; 3 levels: 60 coins.** Use the rule total coins = $42 + 6$ for each completed level. The totals form an increasing pattern.
- 0 missions: 90%; 1 mission: 79%; 2 missions: 68%; 3 missions: 57%.** Start at 90 and subtract 11 for each mission. The battery percentages form a decreasing pattern.

CHALLENGE

10. The output drops by 9 for each increase of 1 in the input. From input 6 to input 8 is two steps, so subtract 18 from 28: $28 - 18 = 10$.

Accept tables written in columns, rows, or ordered pairs if each input is matched with the correct output. For the challenge, accept any clear explanation that identifies subtracting 9 twice from 28.