

Pattern Rule Detectives

Find the expression that connects each input and output.

GRADE 5 • MA.5.AR.3.1

MA.5.AR.3.1 "Given a numerical pattern, identify and write a rule that can describe the pattern as an expression."

NAME _____

DATE _____

BUILD THE RULE

A rule tells what to do to an input to make an output. Look for the same operations each time, then write the input as a blank in an expression.

WORKED EXAMPLE

Input 7 gives 97. Input 9 gives 121.
Input 11 gives 145. Write a rule.

1. Multiply each input by 12.
2. $7 \times 12 = 84$.
3. Add 13 to get 97.
4. Check: $9 \times 12 + 13 = 121$.

Answer: $(\underline{\quad} \times 12) + 13$

PRACTICE 6 problems

- 1** Input 1 gives 6. Input 2 gives 10. Input 4 gives 18. Write a rule.

ANSWER _____

- 2** Input 4 gives 22. Input 6 gives 32. Input 8 gives 42. Write a rule.

ANSWER _____

- 3** Input 20 gives 16. Input 30 gives 26. Input 40 gives 36. Write a rule.

ANSWER _____

- 4** Input 5 gives 20. Input 10 gives 40. Input 15 gives 60. Write a rule.

ANSWER _____

- 5** Input 2 gives 16. Input 3 gives 24. Input 4 gives 32. Write a rule.

ANSWER _____

- 6** Input 40 gives 17. Input 50 gives 27. Input 60 gives 37. Write a rule.

ANSWER _____

APPLY IT Show your work

- 1** A music app starts a playlist with 4 featured songs. It adds 3 new songs each day. After 2 days, there are 10 songs. After 5 days, there are 19 songs. Write an expression rule for the total number of songs after any number of days.

WORK SPACE

ANSWER _____

- 2** In a coding club, a robot begins with 5 points. It earns 6 points for each completed mission. After 2 missions, it has 17 points. After 4 missions, it has 29 points. Write an expression rule for the robot's total points after any number of missions.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Input 4 gives 35. Input 6 gives 51. Input 8 gives 67. Write a rule. Then explain how you know the rule works for all three inputs.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Input 1 gives 6. Input 2 gives 10. Input 4 gives 18. Write a rule.	$(_\times 4) + 2$
2	Input 4 gives 22. Input 6 gives 32. Input 8 gives 42. Write a rule.	$(_\times 5) + 2$
3	Input 20 gives 16. Input 30 gives 26. Input 40 gives 36. Write a rule.	$__ - 4$
4	Input 5 gives 20. Input 10 gives 40. Input 15 gives 60. Write a rule.	$__ \times 4$
5	Input 2 gives 16. Input 3 gives 24. Input 4 gives 32. Write a rule.	$__ \times 8$
6	Input 40 gives 17. Input 50 gives 27. Input 60 gives 37. Write a rule.	$__ - 23$

PART 2 • APPLY IT

- $(_\times 3) + 4$ Multiply the number of days by 3. Then add the 4 featured songs.
- $(_\times 6) + 5$ Multiply the number of missions by 6. Then add the 5 starting points.

CHALLENGE

$(_\times 8) + 3$. Each input is multiplied by 8, then 3 is added, which gives 35, 51, and 67.

Accept equivalent expressions that multiply the input first and then add or subtract the same amount. For example, $2 + (4 \times __)$ is equivalent to $(_\times 4) + 2$.