

Pattern Rule Quest

Use tables and expressions to grow number patterns.

GRADE 4 • TEKS 4.5.B

4.5.B "represent problems using an input-output table and numerical expressions to generate a number pattern that follows a given rule representing the relationship of the values in the resulting sequence and their position in the sequence;"

NAME _____

DATE _____

LINK POSITIONS AND VALUES

An input-output table matches each position in a pattern to its value. Read the rule carefully and follow its steps in order. A numerical expression shows how to find the value at one position.

WORKED EXAMPLE

Rule: Multiply the position number by 11, then add 19. Find the values at positions 3, 4, and 5.

1. For position 3: $3 * 11 + 19 = 52$.

2. For position 4: $4 * 11 + 19 = 63$.

3. For position 5: $5 * 11 + 19 = 74$.

Answer: Position 3: 52; position 4: 63; position 5: 74.

PRACTICE 6 problems

1 Rule: Multiply the position number by 6, then add 8. Make an input-output table for positions 1, 7, and 10. What is the output at position 7?

ANSWER _____

2 A pattern starts with 10 at position 1. Add 8 for each next position. Make an input-output table for positions 1, 2, and 6. Then write a numerical expression for the value at position 6.

ANSWER _____

3 The rule is: Multiply the input by 8, then subtract 2. Find the outputs for inputs 1 and 6.

ANSWER _____

4 A pattern has 12 at position 1 and increases by 7 for each next position. Write a numerical expression for position 8. Then find the value.

ANSWER _____

5 The rule is: Multiply the input by 9, then subtract 1. Make a table for inputs 6 and 8. What is the difference between the outputs?

ANSWER _____

6 A pattern has 14 at position 1 and increases by 6 for each next position. Write a numerical expression for position 7. Then find the value.

ANSWER _____

APPLY IT Show your work

- 1** Mia has 15 arcade tickets before she plays any games. She earns 6 tickets for each game she plays. Complete the input-output table. Then write a numerical expression and find her total after 9 games.

ARCADE TICKETS

Games Played	Total Tickets
0	_____
6	_____
9	_____

ANSWER _____

- 2** Leo's game score is 16 points at level 1. His score rises by 7 points at each next level. Make an input-output table for levels 1, 6, and 10. Write a numerical expression and find his score at level 10.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A pattern has 18 at position 1, and each next value is 9 greater. Without listing every value, write a numerical expression to find the value at position 12. Find the value and explain why the expression uses $12 - 1$.

WORK SPACE AND ANSWER

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Rule: Multiply the position number by 6, then add 8. Make an input-output table for positions 1, 7, and 10. What is the output at position 7?	Position 1: 14; position 7: 50; position 10: 68. The output at position 7 is 50.
2	A pattern starts with 10 at position 1. Add 8 for each next position. Make an input-output table for positions 1, 2, and 6. Then write a numerical expression for the value at position 6.	Position 1: 10; position 2: 18; position 6: 50. $10 + (6 - 1) * 8 = 50$.
3	The rule is: Multiply the input by 8, then subtract 2. Find the outputs for inputs 1 and 6.	Input 1: 6; input 6: 46.
4	A pattern has 12 at position 1 and increases by 7 for each next position. Write a numerical expression for position 8. Then find the value.	$12 + (8 - 1) * 7 = 61$.
5	The rule is: Multiply the input by 9, then subtract 1. Make a table for inputs 6 and 8. What is the difference between the outputs?	Input 6: 53; input 8: 71. The difference is 18.
6	A pattern has 14 at position 1 and increases by 6 for each next position. Write a numerical expression for position 7. Then find the value.	$14 + (7 - 1) * 6 = 50$.

PART 2 • APPLY IT

- 0 games: 15 tickets; 6 games: 51 tickets; 9 games: 69 tickets. $15 + 9 * 6 = 69$.** Start with 15 tickets and add 6 tickets for each game. For 9 games, calculate $15 + 9 * 6$.
- Level 1: 16; level 6: 51; level 10: 79. $16 + (10 - 1) * 7 = 79$.** Level 1 already has 16 points, so there are 9 score increases by level 10. Add 9 groups of 7 to 16.

CHALLENGE

$18 + (12 - 1) * 9 = 117$. The pattern starts at position 1, so only 11 increases of 9 are needed to reach position 12.

Accept correct input-output tables and equivalent numerical expressions that follow the stated rule. For patterns beginning at position 1, accept expressions that show one fewer increase than the position number.