LESSON MAKER PRO

Find the Pattern

Write rules for sequences and use them to predict terms.

HIGH SCHOOL · F-IF.3

F-IF.3 "Use the fact that sequences are functions whose domain is a subset of the integers to identify sequences and generate their explicit formulas."

NAME _____ DATE _____

SEQUENCE RULES

A sequence is a function whose inputs are integers, often n = 1, 2, 3, … . If each term changes by the same amount d, use $a_n = a_1 + (n - 1)d$. If each term is multiplied by the same number r, use $a_n = a_1 r^{n - 1}$.

WORKED EXAMPLE

Write an explicit formula for the sequence in the table.

n	a_n
1	14
2	18
3	22
4	26

1. Find the difference: 18 - 14 = 4.
2. Use the first term: $a_n = 14 + 4(n - 1)$.
3. Simplify: $a_n = 4n + 10$.

Answer: $a_n = 4n + 10$

PRACTICE 4 problems

1 Write an explicit formula for 2, 7, 12, 17, … . The first term is n = 1.

ANSWER _____

2 Write an explicit formula for 30, 23, 16, 9, … . The first term is n = 1.

ANSWER _____

3 Write an explicit formula for 3, 9, 27, 81, … . The first term is n = 1.

ANSWER _____

4 A rule gives two outputs, 8 and 10, for n = 2. Does this rule define a sequence? Explain.

ANSWER _____

APPLY IT Show your work

1 You save $6 in week 1. Each week after that, you save $5 more than you saved the week before. Write a formula for the amount saved in week n. How much do you save in week 8?

WORK SPACE

ANSWER _____

2 A gaming club sells 7 tickets on day 1. Each day, it sells twice as many tickets as the day before. Write a formula for tickets sold on day n. How many does it sell on day 5?

WORK SPACE

ANSWER _____

CHALLENGE One step up

An arithmetic sequence has $a_3 = 17$ and $a_7 = 37$. Write an explicit formula. Explain how you found the first term.

WORK SPACE AND ANSWER

Find the Pattern

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Write an explicit formula for 2, 7, 12, 17, … . The first term is n = 1.	**$a_n = 5n - 3$**
2	Write an explicit formula for 30, 23, 16, 9, … . The first term is n = 1.	**$a_n = 37 - 7n$**
3	Write an explicit formula for 3, 9, 27, 81, … . The first term is n = 1.	**$a_n = 3^n$**
4	A rule gives two outputs, 8 and 10, for n = 2. Does this rule define a sequence? Explain.	**No. A function cannot give two outputs for the same input.**

PART 2 · APPLY IT

1. **$a_n = 6 + 5(n - 1)$; $41 in week 8** The weekly amount starts at $6 and increases by $5. Substitute n = 8 to get 6 + 5(7) = 41.
2. **$a_n = 7(2^{n-1})$; 112 tickets on day 5** Daily sales start at 7 and double. On day 5, sales are $7(2^4) = 112$.

CHALLENGE

The difference is (37 - 17)/(7 - 3) = 5. The first term is 17 - 2(5) = 7, so $a_n = 7 + 5(n - 1)$, or $5n + 2$.

Accept equivalent explicit formulas with n = 1 as the first term. For the challenge, the explanation must show how to work back from the third term to the first.