LESSON MAKER PRO

Recursive Patterns

Build each term from the one before it.

HIGH SCHOOL · MA.912.LT.1.2

MA.912.LT.1.2 "Solve problems involving recurrence relations."

NAME _____ DATE _____

BUILD TERMS IN ORDER

A recurrence relation gives a starting term and a rule for making each new term from an earlier term. To find a later term, begin with the initial value and apply the rule one step at a time.

WORKED EXAMPLE

Given $a_1 = 9$ and $a_n = a_{n-1} + 6$ for $n \geq 2$, find a_4.

1. Start with $a_1 = 9$.
2. Add 6: $a_2 = 15$.
3. Add 6: $a_3 = 21$.
4. Add 6: $a_4 = 27$.

Answer: $a_4 = 27$

PRACTICE 6 problems

1 Given $a_1 = 5$ and $a_n = a_{n-1} + 3$ for $n \geq 2$, find a_5.

ANSWER _____

2 Given $a_1 = 30$ and $a_n = a_{n-1} - 2$ for $n \geq 2$, find a_5.

ANSWER _____

3 Given $a_1 = 2$ and $a_n = 3a_{n-1}$ for $n \geq 2$, find a_5.

ANSWER _____

4 Use the table to write a recurrence relation for the sequence. Then find a_5.

SEQUENCE VALUES

Term	Value
a_1	8
a_2	13
a_3	18
a_4	23

ANSWER _____

5 Given $a_1 = 81$ and $a_n = a_{n-1} / 3$ for $n \geq 2$, find a_4.

ANSWER _____

6 Given $a_1 = 4$ and $a_n = a_{n-1} + 7$ for $n \geq 2$, what value of n makes $a_n = 32$?

ANSWER _____

APPLY IT Show your work

1 A student saves for concert tickets. During week 1, the student has $14. Each following week, the amount saved increases by $8. If a_n is the amount saved during week n, how much has the student saved during week 5?

WORK SPACE

ANSWER _____

2 A gaming club has 4 students at its first tournament meeting. At each new meeting, the number of students is 3 times the number at the previous meeting. If a_n is the number of students at meeting n, how many students are at the fourth meeting?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A sequence is defined by $a_1 = 2$ and $a_n = 2a_{n-1} + 1$ for $n \geq 2$. Find a_5. Explain how you obtained each new term.

WORK SPACE AND ANSWER

ANSWER KEY

Recursive Patterns

HIGH SCHOOL · MA.912.LT.1.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Given $a_1 = 5$ and $a_n = a_{n-1} + 3$ for $n \geq 2$, find a_5.	**17**
2	Given $a_1 = 30$ and $a_n = a_{n-1} - 2$ for $n \geq 2$, find a_5.	**22**
3	Given $a_1 = 2$ and $a_n = 3a_{n-1}$ for $n \geq 2$, find a_5.	**162**
4	Use the table to write a recurrence relation for the sequence. Then find a_5.	**$a_1 = 8$ and $a_n = a_{n-1} + 5$; $a_5 = 28$**
5	Given $a_1 = 81$ and $a_n = a_{n-1} / 3$ for $n \geq 2$, find a_4.	**3**
6	Given $a_1 = 4$ and $a_n = a_{n-1} + 7$ for $n \geq 2$, what value of n makes $a_n = 32$?	**5**

PART 2 · APPLY IT

1. **$46** Use $a_1 = 14$ and add 8 for each new week. The amounts are 14, 22, 30, 38, and 46.
2. **108 students** Use $a_1 = 4$ and multiply by 3 for each new meeting. The terms are 4, 12, 36, and 108.

CHALLENGE

$a_5 = 47$. The terms are 2, 5, 11, 23, and 47 because each term is twice the previous term plus 1.

Accept equivalent recurrence notation, such as $a_n = 5 + a_{n-1}$. For written explanations, accept any accurate sequence of recursive steps that reaches the correct term.