LESSON MAKER PRO

Recursive Sequence Moves

Build each term from the one before it.

HIGH SCHOOL · MA.912.LT.1

MA.912.LT.1 "Apply recursive methods to solve problems."

NAME _____ DATE _____

THE BIG IDEA

A recursive rule gives a starting term and tells you how to create each new term from the previous term. To find a later term, repeat the rule one step at a time and record each result. A complete recursive definition includes the starting term and the rule.

WORKED EXAMPLE

Given $a_1 = 17$ and $a_n = a_{n-1} + 8$ for $n \geq 2$, find a_5.

1. Start with $a_1 = 17$.
2. $a_2 = 17 + 8 = 25$.
3. $a_3 = 25 + 8 = 33$ and $a_4 = 33 + 8 = 41$.
4. $a_5 = 41 + 8 = 49$.

Answer: $a_5 = 49$

PRACTICE 6 problems

1 Given $a_1 = 2$ and $a_n = a_{n-1} + 7$ for $n \geq 2$, find a_6.

ANSWER _____

2 Given $a_1 = 64$ and $a_n = a_{n-1} / 2$ for $n \geq 2$, find a_3.

ANSWER _____

3 The terms of a sequence are 12, 18, 24, 30, ... Write a recursive definition for the sequence.

ANSWER _____

_____

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

ANSWER _____

5 Given $a_1 = 1$ and $a_n = a_{n-1} + n$ for $n \geq 2$, find a_4 and a_6.

ANSWER _____

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

ANSWER _____

APPLY IT Show your work

1 A student council channel gains 18 subscribers during its first week. Each following week, it gains 6 more subscribers than it gained the week before. Write a recursive rule for the weekly subscriber gains. Then find the number of subscribers gained during week 7.

WORK SPACE

ANSWER _____

2 A coding club has 3 students at its first meeting. At each following meeting, attendance is twice the previous attendance plus 4 students. Write a recursive rule for attendance. Then find the attendance at the fourth meeting.

WORK SPACE

ANSWER _____

CHALLENGE One step up

An arithmetic recursive sequence has the form $a_1 = s$ and $a_n = a_{n-1} + d$. Its third term is 20, and its seventh term is 48. Find s and d. Explain how the two given terms determine your answer.

WORK SPACE AND ANSWER

ANSWER KEY

Recursive Sequence Moves

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Given $a_1 = 2$ and $a_n = a_{n-1} + 7$ for $n \geq 2$, find a_6.	**37**
2	Given $a_1 = 64$ and $a_n = a_{n-1} / 2$ for $n \geq 2$, find a_3.	**16**
3	The terms of a sequence are 12, 18, 24, 30, ... Write a recursive definition for the sequence.	**$a_1 = 12$; $a_n = a_{n-1} + 6$ for $n \geq 2$**
4	Given $a_1 = 3$ and $a_n = 2a_{n-1} + 1$ for $n \geq 2$, find a_4.	**31**
5	Given $a_1 = 1$ and $a_n = a_{n-1} + n$ for $n \geq 2$, find a_4 and a_6.	**$a_4 = 10$; $a_6 = 21$**
6	Given $a_1 = 81$ and $a_n = a_{n-1} / 3$ for $n \geq 2$, find a_4.	**3**

PART 2 · APPLY IT

1. **$a_1 = 18$; $a_n = a_{n-1} + 6$ for $n \geq 2$; $a_7 = 54$** Treat a_n as the number of subscribers gained in week n. Add 6 repeatedly from the first week's gain through week 7.
2. **$a_1 = 3$; $a_n = 2a_{n-1} + 4$ for $n \geq 2$; $a_4 = 52$** Use the first meeting as the starting term. Apply the rule three times: 3, 10, 24, 52.

CHALLENGE

s = 6 and d = 7. From the third term to the seventh term are four equal increases, so 4d = 48 - 20 = 28 and d = 7. Then $a_1 = 20 - 2(7) = 6$.

Accept equivalent recursive notation that clearly gives the same starting term and recurrence. For the challenge, accept any valid explanation that finds the common increase from the four steps between the third and seventh terms, then works backward to the first term.