LESSON MAKER PRO

Sequence Signals

Build rules from patterns and contexts

HIGH SCHOOL · A1P.AF.G.22

A1P.AF.G.22 "Define sequences as functions, including recursive definitions, whose domain is a subset of the integers. a. Write explicit and recursive formulas for arithmetic and geometric sequences and connect them to linear and exponential functions."

NAME _____ DATE _____

TWO WAYS TO WRITE A RULE

A sequence is a function whose inputs are integers in a stated domain. An explicit rule finds a term directly. A recursive rule gives a starting term and uses the previous term. Adding a fixed amount follows a linear function; multiplying by a fixed amount follows an exponential function.

WORKED EXAMPLE

Use the table to write explicit and recursive rules for a_n, $n>=1$.

SEQUENCE TERMS

n	a_n
1	7
2	11
3	15

1. Each term is 4 more than the previous term.
2. Explicit: $a_n=7+4(n-1)=4n+3$.
3. Recursive: start at 7, then add 4 each time.

Answer: $a_n=4n+3$; $a_1=7$, $a_n=a_{n-1}+4$ for $n>=2$

PRACTICE 4 problems

1 For 2, 5, 8, ..., write explicit and recursive rules for a_n, $n>=1$.

ANSWER _____

2 For 64, 32, 16, ..., write explicit and recursive rules for a_n, $n>=1$.

ANSWER _____

3 If $a_n=6n-1$ for $n>=1$, find a_1 and write a recursive rule.

ANSWER _____

4 If $a_1=9$ and $a_n=3a_{n-1}$ for $n>=2$, write an explicit rule. Is the related function linear or exponential?

ANSWER _____

APPLY IT Show your work

1 Your playlist has 10 songs at week 0. You add 6 songs each week. Let a_n be the total after week n. Write explicit and recursive rules, and name the related function type.

WORK SPACE

ANSWER _____

2 A video gets 20 views on day 1. Its daily views triple each day. Let v_n be its views on day n. Write explicit and recursive rules. How many views does it get on day 4?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A geometric sequence has $a_2=50$ and $a_4=200$. Its common ratio is positive. Write explicit and recursive rules for $n>=1$. Show how you found the ratio.

WORK SPACE AND ANSWER

ANSWER KEY

Sequence Signals

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For 2, 5, 8, ..., write explicit and recursive rules for a_n, n>=1.	**$a_n=2+3(n-1)$; $a_1=2$, $a_n=a_{n-1}+3$ for n>=2**
2	For 64, 32, 16, ..., write explicit and recursive rules for a_n, n>=1.	**$a_n=64(1/2)^{n-1}$; $a_1=64$, $a_n=(1/2)a_{n-1}$ for n>=2**
3	If $a_n=6n-1$ for n>=1, find a_1 and write a recursive rule.	**$a_1=5$; $a_n=a_{n-1}+6$ for n>=2**
4	If $a_1=9$ and $a_n=3a_{n-1}$ for n>=2, write an explicit rule. Is the related function linear or exponential?	**$a_n=9(3)^{n-1}$; exponential**

PART 2 · APPLY IT

1. **$a_n=10+6n$ for n>=0; $a_0=10$, $a_n=a_{n-1}+6$ for n>=1; linear** Week 0 gives the starting value. The total increases by 6 each week.
2. **$v_n=20(3)^{n-1}$ for n>=1; $v_1=20$, $v_n=3v_{n-1}$ for n>=2; 540 views** Day 1 is the starting value, and the daily multiplier is 3. On day 4, the video gets $20(3)^3=540$ views.

CHALLENGE

The ratio satisfies $r^2=200/50=4$, so r=2. Then $a_1=50/2=25$. Explicit: $a_n=25(2)^{n-1}$. Recursive: $a_1=25$, $a_n=2a_{n-1}$ for n>=2.

Accept equivalent explicit formulas and correctly stated recursive rules with their starting terms. In the challenge, the positive-ratio condition rules out -2.