LESSON MAKER PRO

Sequence Switch Lab

Move between rules, formulas, and real situations.

HIGH SCHOOL · AII-F.BF.2

AII-F.BF.2 "Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms."

NAME _____ DATE _____

TWO WAYS TO SHOW A SEQUENCE

An arithmetic sequence changes by adding or subtracting the same difference each time. A geometric sequence changes by multiplying by the same ratio each time. A recursive rule tells how to get the next term, while an explicit formula gives any term directly from n.

WORKED EXAMPLE

An arithmetic sequence has $a_1 = 13$ and common difference 6. Write a recursive rule and an explicit formula.

1. The first term is 13, and each new term adds 6.
2. Write the recursive rule: $a_1 = 13$ and $a_n = a_{n-1} + 6$ for $n \geq 2$.
3. Use the first term and the number of changes: $a_n = 13 + 6(n - 1)$.
4. Simplify: $a_n = 13 + 6n - 6 = 6n + 7$.

Answer: $a_1 = 13$; $a_n = a_{n-1} + 6$ for $n \geq 2$; $a_n = 13 + 6(n - 1) = 6n + 7$

PRACTICE 6 problems

1 An arithmetic sequence has $a_1 = 4$ and common difference 3. Write a recursive rule and an explicit formula.

ANSWER _____

2 A geometric sequence has $a_1 = 81$ and common ratio 1/3. Write a recursive rule and an explicit formula.

ANSWER _____

3 A sequence is defined by $b_1 = 8$ and $b_n = b_{n-1} - 2$ for $n \geq 2$. Write an explicit formula and find b_9.

ANSWER _____

4 A geometric sequence is defined by $c_n = 9(2)^{n-1}$. Write a recursive rule and find c_4.

ANSWER _____

5 The sequence 11, 44, 176, ... is geometric. Write a recursive rule and an explicit formula.

ANSWER _____

6 A sequence is defined by $d_n = 32 - 5(n - 1)$. Write a recursive rule and list the first three terms.

ANSWER _____

APPLY IT Show your work

1 A student's video channel has the follower counts shown in the table. Let a_n be the number of followers in week n. Write a recursive rule and an explicit formula. Then find the number of followers in week 8. Assume the counts form an arithmetic sequence throughout these eight weeks.

CHANNEL FOLLOWERS

Week	Followers
1	18
2	22
3	26

ANSWER

2 A creator's video gets 80 reposts on day 1. Each new day, the number of reposts is 1/2 of the previous day's number. Let r_n be the number of reposts on day n. Write a recursive rule and an explicit formula. Then find r_5.

CHALLENGE One step up

An arithmetic sequence has $a_3 = 15$ and $a_8 = 40$. Write a recursive rule and an explicit formula. Explain how you found the common difference and the first term.

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	An arithmetic sequence has $a_1 = 4$ and common difference 3. Write a recursive rule and an explicit formula.	**$a_1 = 4$; $a_n = a_{n-1} + 3$ for $n \geq 2$; $a_n = 4 + 3(n - 1) = 3n + 1$**
2	A geometric sequence has $a_1 = 81$ and common ratio 1/3. Write a recursive rule and an explicit formula.	**$a_1 = 81$; $a_n = (1/3)a_{n-1}$ for $n \geq 2$; $a_n = 81(1/3)^{n-1}$**
3	A sequence is defined by $b_1 = 8$ and $b_n = b_{n-1} - 2$ for $n \geq 2$. Write an explicit formula and find b_9.	**$b_n = 8 - 2(n - 1) = 10 - 2n$; $b_9 = -8$**
4	A geometric sequence is defined by $c_n = 9(2)^{n-1}$. Write a recursive rule and find c_4.	**$c_1 = 9$; $c_n = 2c_{n-1}$ for $n \geq 2$; $c_4 = 72$**
5	The sequence 11, 44, 176, ... is geometric. Write a recursive rule and an explicit formula.	**$a_1 = 11$; $a_n = 4a_{n-1}$ for $n \geq 2$; $a_n = 11(4)^{n-1}$**
6	A sequence is defined by $d_n = 32 - 5(n - 1)$. Write a recursive rule and list the first three terms.	**$d_1 = 32$; $d_n = d_{n-1} - 5$ for $n \geq 2$; 32, 27, 22**

PART 2 · APPLY IT

1. **$a_1 = 18$; $a_n = a_{n-1} + 4$ for $n \geq 2$; $a_n = 18 + 4(n - 1)$; $a_8 = 46$** The follower count increases by 4 each week, so the sequence is arithmetic. Substitute $n = 8$ into $18 + 4(n - 1)$ to get 46.
2. **$r_1 = 80$; $r_n = (1/2)r_{n-1}$ for $n \geq 2$; $r_n = 80(1/2)^{n-1}$; $r_5 = 5$** The repost count is multiplied by 1/2 each day, so the sequence is geometric. Evaluate $80(1/2)^4$ to get 5.

CHALLENGE

The common difference is (40 - 15)/(8 - 3) = 5. Since $a_3 = 15$, the first term is 15 - 2(5) = 5. Recursive rule: $a_1 = 5$ and $a_n = a_{n-1} + 5$ for $n \geq 2$. Explicit formula: $a_n = 5 + 5(n - 1) = 5n$.

Accept equivalent explicit formulas that correctly use the first term and n - 1, whether or not they are simplified. Require both the initial term and the recursive operation in every recursive rule.