



# Algebra 1

## Topic: Recursively Defined Sequences

### Instructions

Solve the following problems related to recursively defined sequences. Show all steps clearly and check your solutions.

### Practice Problems

1. Determine whether the recursive rule represents an arithmetic sequence or a geometric sequence.

(i)  $a_1 = 2, a_n = 7a_{n-1}$

(iii)  $a_1 = 10, a_n = 18a_{n-1} + 1$

(ii)  $a_1 = 5, a_n = a_{n-1} - 4$

(iv)  $a_1 = 3, a_n = 6a_{n-1}$

2. Write the first six terms of the sequence. Then graph the sequence.

(i)  $a_1 = 0, a_n = a_{n-1} + 2$

(iv)  $a_1 = 8, a_n = 1.5a_{n-1}$

(ii)  $a_1 = 10, a_n = a_{n-1} - 5$

(v)  $a_1 = 80, a_n = -\frac{1}{2}a_{n-1}$

(iii)  $a_1 = 2, a_n = 3a_{n-1}$

(vi)  $a_1 = -7, a_n = -4a_{n-1}$

3. Write a recursive rule for the sequence.

(i)

$n$	1	2	3	4
$a_n$	7	16	25	34

(ii)

$n$	1	2	3	4
$a_n$	8	24	72	216

(iii) 243, 81, 27, 9, ...

(iv) 3, 11, 19, 27, 35, ...

4. Identify whether the sequence is arithmetic, geometric, or neither.

(i) 5, 10, 15, 20, 25, ...

(iv) 7, 11, 15, 19, 23, ...

(ii) 2, 6, 18, 54, 162, ...

(iii) 3, 6, 12, 24, 48, ...

(v) 1, 3, 9, 27, 81, ...

5. Write an explicit rule for the recursive rule.

(i)  $a_1 = -2$ ,  $a_n = a_{n-1} + 4$

(iv)  $a_1 = 7$ ,  $a_n = -a_{n-1} + 5$

(ii)  $a_1 = 8$ ,  $a_n = a_{n-1} - 6$

(v)  $a_1 = 10$ ,  $a_n = 0.5a_{n-1}$

(iii)  $a_1 = 3$ ,  $a_n = 2a_{n-1} + 3$

(vi)  $a_1 = -3$ ,  $a_n = 2a_{n-1} - 1$

6. Write a recursive rule for the explicit rule.

(i)  $a_n = 3n - 1$

(iv)  $a_n = 6n - 4$

(ii)  $a_n = 2n + 5$

(v)  $a_n = 0.5n + 7$

(iii)  $a_n = 4n - 8$

(vi)  $a_n = 5n - 3$

7. Graph the first four terms of the sequence with the given description. Write a recursive rule and an explicit rule for the sequence.

(i) The first term of a sequence is 3. Each term of the sequence is 4 more than the preceding term.

(ii) The first term of a sequence is 12. Each term of the sequence is half the preceding term.

(iii) The first term of a sequence is -2. Each term of the sequence is 3 times the preceding term.

(iv) The first term of a sequence is 10. Each term of the sequence is 5 less than the preceding term.

## Multiple-Choice Questions

1. What is the recursive formula for the sequence 2, 4, 6, 8, 10, ...?

A.  $a_1 = 2$ ,  $a_n = a_{n-1} + 2$

C.  $a_1 = 2$ ,  $a_n = a_{n-1} - 2$

B.  $a_1 = 2$ ,  $a_n = 2a_{n-1}$

D.  $a_1 = 2$ ,  $a_n = 3a_{n-1}$

2. What is the value of  $a_6$  in the sequence defined by  $a_1 = 3$  and  $a_n = a_{n-1} \cdot 2$ ?

A. 48

C. 192

B. 96

D. 384

3. What is the recursive formula for the sequence  $3, 9, 27, 81, 243, \dots$ ?
- A.  $a_1 = 3, a_n = a_{n-1} + 3$                       C.  $a_1 = 3, a_n = 3a_{n-1}$   
B.  $a_1 = 3, a_n = a_{n-1} \cdot 3$                       D.  $a_1 = 3, a_n = a_{n-1} \cdot 3 + 2$
4. Find the first term of the sequence where  $a_1 = 4$  and  $a_n = 3a_{n-1} - 1$  for  $n \geq 2$ .
- A. 4                      C. 6  
B. 5                      D. 7
5. What is the recursive formula for the sequence  $5, 10, 20, 40, 80, \dots$ ?
- A.  $a_1 = 5, a_n = 2a_{n-1}$                       C.  $a_1 = 5, a_n = 3a_{n-1}$   
B.  $a_1 = 5, a_n = a_{n-1} + 5$                       D.  $a_1 = 5, a_n = a_{n-1} \cdot 5$

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