

# Algebra 1

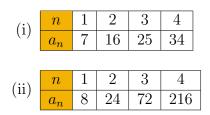
## **Topic: Recursively Defined Sequences**

#### 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.



- (iii)  $243, 81, 27, 9, \ldots$
- (iv)  $3, 11, 19, 27, 35, \ldots$

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

- (i)  $5, 10, 15, 20, 25, \ldots$ (iv)  $7, 11, 15, 19, 23, \ldots$ (ii)  $2, 6, 18, 54, 162, \ldots$
- (iii)  $3, 6, 12, 24, 48, \ldots$  (v)  $1, 3, 9, 27, 81, \ldots$

#### 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  $2, 4, 6, 8, 10, \ldots$ ?

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	).	192	
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B. 96 D. 384

- 3. What is the recursive formula for the sequence  $3, 9, 27, 81, 243, \ldots$ ?
  - 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  $n \ge 2$ .

5. What is the recursive formula for the sequence  $5, 10, 20, 40, 80, \ldots$ ?

A. 
$$a_1 = 5, a_n = 2a_{n-1}$$
  
B.  $a_1 = 5, a_n = a_{n-1} + 5$   
C.  $a_1 = 5, a_n = 3a_{n-1}$   
D.  $a_1 = 5, a_n = a_{n-1} \cdot 5$ 

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