

11-5 Recursively Defined Sequences

Name Master E
Date _____ Block _____

A. Write the RECURSIVE RULE for each type of sequence.

Arithmetic Sequence:

$$a_n = a_{n-1} + d$$

Geometric Sequence:

$$a_n = r \cdot a_{n-1}$$

What is the difference between a recursive rule and recursive formula?

The recursive rule defines the next term and is the middle part of the recursive formula, which also gives the first term and the next term you will need to find.

B. Write the first six terms of each sequence, starting with a_1 .

1.) $a_1 = -18$

$$a_n = a_{n-1} + 6, \text{ where } n \geq 2$$

-18, -12, -6, 0, 6, 12

2.) $a_1 = 0.5$

$$a_n = 3a_{n-1}, \text{ where } n \geq 2$$

0.5, 1.5, 4.5, 13.5, 40.5, 121.5

3.) $a_1 = 35.6$

$$a_n = a_{n-1} - 4.2, \text{ where } n \geq 2$$

35.6, 31.4, 27.2, 23, 18.8, 14.6

4.) $a_1 = 8$

$$a_n = -0.5a_{n-1}, \text{ where } n \geq 2$$

8, -4, 2, -1, $\frac{1}{2}$, $-\frac{1}{4}$

5.) $a_1 = 5$

$$a_n = 3a_{n-1} - 1, \text{ where } n \geq 2$$

5, 14, 41, 122, 365, 1094

6.) $a_1 = -2$

$$a_n = 2a_{n-1} + 4, \text{ where } n \geq 2$$

-2, 0, 4, 12, 28, 60

C. Determine the pattern and write the next term for each of the following sequences. State whether each pattern is arithmetic, geometric, or neither. Write a recursive rule to generate each sequence that is arithmetic or geometric. Find the 8th term of each sequence.

Sequence	Next term	Type of Sequence	Recursive Rule	8 th Term
1.) 3, 6, 12, 24, ... $r=2$	<u>48</u>	<u>Geometric</u>	<u>$a_n = 2a_{n-1}$</u>	<u>384</u>
2.) 3, 7, 11, 15, ... $d=4$	<u>19</u>	<u>Arithmetic</u>	<u>$a_n = a_{n-1} + 4$</u>	<u>31</u>
3.) 3, -2, -7, -12, ... $d=-5$	<u>-17</u>	<u>Arithmetic</u>	<u>$a_n = a_{n-1} - 5$</u>	<u>-32</u>
4.) 16, 4, 1, $\frac{1}{4}$, ... $r = \frac{1}{4}$	<u>$\frac{1}{16}$</u>	<u>Geometric</u>	<u>$a_n = \frac{1}{4}a_{n-1}$</u>	<u>$\frac{1}{1024}$</u>

D. Write a recursive formula for each of the following sequences. Find the 15th term of each sequence.

$$a_n = a_1 + (n-1)d$$

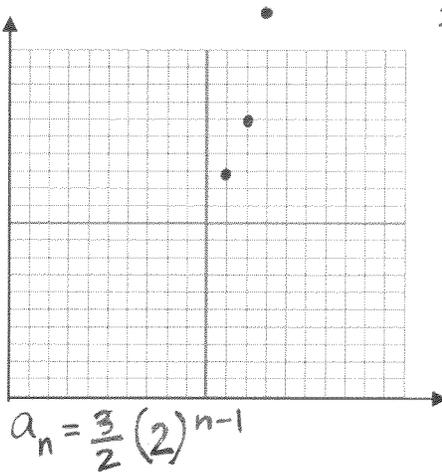
$$a_n = a_1 \cdot r^{n-1}$$

Sequence	Recursive Formula	15 th Term
1.) 3, 6, 12, 24, ...	$a_1 = 3, a_n = 2a_{n-1}, \text{ where } n \geq 2$	$a_{15} = 3(2)^{14} = \boxed{49,152}$
2.) 3, 7, 11, 15, ...	$a_1 = 3, a_n = a_{n-1} + 4, \text{ where } n \geq 2$	$a_{15} = 3 + 14(4) = \boxed{59}$
3.) 3, -2, -7, -12, ...	$a_1 = 3, a_n = a_{n-1} - 5, \text{ where } n \geq 2$	$a_{15} = 3 + 14(-5) = \boxed{-67}$
4.) 16, 4, 1, $\frac{1}{4}$, ...	$a_1 = 16, a_n = \frac{1}{4}a_{n-1}, \text{ where } n \geq 2$	omit

E. Graph each sequence in problems 1 – 4 on the first page. Complete each table as shown in problem 1.

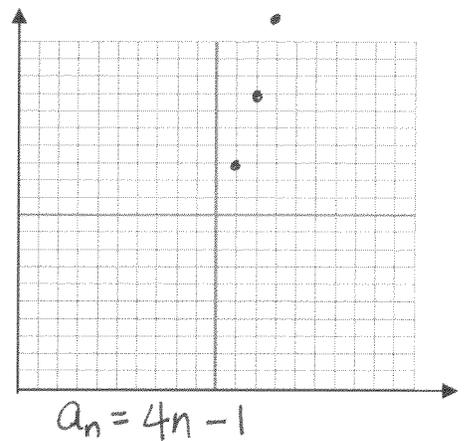
1.) 3, 6, 12, 24, ...

x	y
1	3
2	6
3	12
4	24
5	48



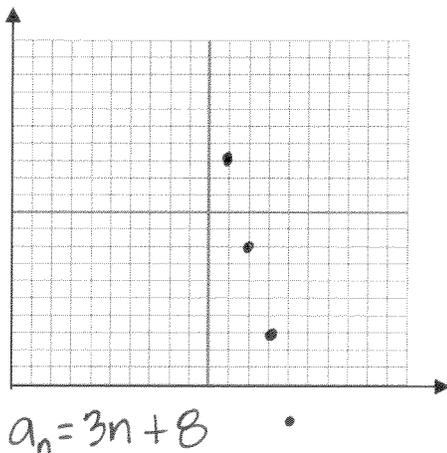
2.) 3, 7, 11, 15, ...

x	y
1	3
2	7
3	11
4	15



3.) 3, -2, -7, -12, ...

x	y
1	3
2	-2
3	-7
4	-12



4.) 16, 4, 1, $\frac{1}{4}$, ...

x	y
1	16
2	4
3	1
4	$\frac{1}{4}$

