

Name: _____

Date: _____

UNIT 5

LESSON 40

DO NOW: Which of the following sequences is a geometric sequence?

(a) {2, 4, 6, 8, 10, ...}

(b) {2, 4, 8, 16, 32, ...}

(c) {2, 4, 7, 11, 16, ...}

(d) {2, 8, 14, 20, 26, ...}

A $d = 2$ $r = 2$

Neither

A $d = 6$ AIM: GEOMETRIC FORMULA**Geometric Formula to find the n^{th} term**

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

Vocabulary of Sequences a_1 = the first term in the sequence a_n = the n^{th} term in the sequence n = the term number r = the common ratio***You do NOT have to memorize! It's on the reference sheet!**

1. Given the geometric sequence 2, 6, 18, 54, ...

a) Write the explicit formula

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

$$a_n = 2(3)^{n-1}$$

$a_1 = 2$

$r = 3$

*do not multiply the "a" and "r" values b/c of pemdas

b) Use the explicit formula to find the 12th term.

$$a_{12} = 2(3)^{12-1}$$

$$a_{12} = 354,294$$

predict very large #

Sequence term	a_n
a_1	2
a_2	6
a_3	18
a_4	54
a_5	162

2. Given the geometric sequence 160, 80, 40, ...

a) Write the explicit formula

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

$$a_n = 160\left(\frac{1}{2}\right)^{n-1}$$

$a_1 = 160$

$r = \frac{1}{2}$

$r = \frac{80}{160} \text{ OR } \frac{10}{20}$

b) Use the explicit formula to find the 8th term.

$$a_8 = 160\left(\frac{1}{2}\right)^{8-1}$$

$$a_8 = \frac{5}{4} \text{ or } 1.25$$

predict very small #

Sequence term	a_n
a_1	160
a_2	80
a_3	40
a_4	20
a_5	10

To summarize the process of writing a recursive formula for a geometric sequence:

1. Determine if the sequence is geometric (*Do you multiply or divide the same amount from one term to the next?*)
2. Find the common ratio. (*The number you multiply or divide.*)
3. Create a recursive formula by stating the first term, and then stating the formula to be the common ratio times the previous term.

$$a_1 = \text{first term} \leftarrow \begin{array}{|l|} \hline \text{always state} \\ \text{first term} \\ \hline \end{array}$$

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

common
ratio

previous
term

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3. Consider the sequence following: 3, 9, 27, 81...

a) Write a *recursive formula* for the sequence.

$$a_n = 3 \cdot a_{n-1}$$

$$\boxed{a_n = 3a_{n-1}}$$

$$r = \frac{9}{3} = 3$$

b) Write an *explicit formula* for the sequence.

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

$$\boxed{a_n = 3(3)^{n-1}}$$

c) Use the explicit formula to find the 10th term.

$$a_{10} = 3(3)^{10-1}$$

$$\boxed{a_{10} = 59,049}$$

4. Consider the sequence following: 4, 8, 16, 32, 64...

a) Write a *recursive formula* for the sequence.

$$\boxed{a_n = 2a_{n-1}}$$

$$r = \frac{8}{4} = 2$$

b) Write an *explicit formula* for the sequence.

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

$$\boxed{a_n = 4(2)^{n-1}}$$

c) Use the explicit formula to find the 16th term.

$$a_{16} = 4(2)^{16-1}$$

$$\boxed{a_{16} = 131,072}$$

***STRATEGIES for answering multiple choice questions below:

- First determine whether the sequence is arithmetic or geometric.
- Then write down the sequence formula from the reference sheet.
- Eliminate choices that do not resemble the formula!
- If needed, plug in terms into the choices left over!

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

OR

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

5. A sequence has the following terms: $a_1 = 4$, $a_2 = 10$, $a_3 = 25$, $a_4 = 62.5$. Which formula represents the n th term in the sequence?

~~1) $a_n = 4 + 2.5n$~~

~~2) $a_n = 4 + 2.5(n-1)$~~

3) $a_n = 4(2.5)^n$

4) $a_n = 4(2.5)^{n-1}$

$a_n = a_1 r^{(n-1)}$

G) 4, 10, 25, 62.5

$r = \frac{10}{4} = 2.5$

6. What is a formula for the n th term of sequence B shown below? $n = 1 \ 2 \ 3 \ 4$

B = 10, 12, 14, 16, ... (A) $d = 2$

1) $b_n = 8 + 2n$

2) $b_n = 10 + 2n$

~~3) $b_n = 10(2)^n$~~

~~4) $b_n = 10(2)^{n-1}$~~

$8 + 2(1) = 10 \checkmark$

$8 + 2(2) = 12 \checkmark$

$8 + 2(3) = 14 \checkmark$

⋮

Name: _____

EXIT TICKET

Given the geometric sequence 16, 32, 64, 128.....

a) Write the explicit formula for the sequence.

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

$a_n = 16(2)^{n-1}$

$r = \frac{32}{16} = 2$

b) Use the explicit formula to find the 17th term.

$a_{17} = 16(2)^{17-1}$

$a_{17} = 1,048,576$

c) Write a recursive formula for the sequence.

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

$a_n = 2a_{n-1}$

