

Name: _____

Date: _____

13.2 NOTES: Recursive Formulas for Geometric Sequences

Algebra 1

I. Let's investigate the sequence: 2, 6, 18, 54, 162...

Do you notice any patterns? _____.

As the sequence continues, the terms of the sequence _____
by _____.

Since the **ratio** between successive terms is constant, this is called a
_____.

The **ratio**, r , between the terms is called the _____.

The terms of a sequence are known as $a_1, a_2, a_3, a_4, a_5, \dots$. So, in the sequence
above: $a_1 = \underline{\hspace{2cm}}$ $a_4 = \underline{\hspace{2cm}}$ $a_7 = \underline{\hspace{2cm}}$

1. Find the **common ratio**, r , in the following geometric sequences.

a. 1, -2, 4, -8, 16...

b. 10, 15, 22.5, 33.75...

$r = \underline{\hspace{2cm}}$

$r = \underline{\hspace{2cm}}$

2. Write the sequence whose 2nd term is 8 and has a common ratio of 2.

3. Determine whether or not each sequence is a geometric sequence.

a. -4, 1, $-\frac{1}{4}$, $\frac{1}{16}$...

b. 3, 7.5, 18.5, 46.25, ...

4. Find the next three terms of the geometric sequence.

8, 4, 2, _____, _____, _____ ...

Recursive Formulas for Geometric Sequences

II. Consider the sequence: $a_1 = 3, a_2 = 6, a_3 = 12, a_4 = 24, a_5 = 48$

Suppose, for example, a_n is a_3 , what number represents a_{n+1} ? _____ a_{n-1} ? _____

$$\dots a_{n-2}, a_{n-1}, a_n, a_{n+1}, a_{n+2} \dots$$

Can you create a formula that relates a_n (any term) and a_{n-1} (the term before a_n) for the sequence above? _____. This is the *recursive form* of a geometric sequence. You also need to indicate the starting term _____.

So, in general...
$$a_n = a_{n-1} \cdot r \quad \text{or} \quad a_{n+1} = a_n \cdot r$$

1. Write 2 possible recursive formulas for the sequence 12, 6, 3, 1.5...
2. Write the sequence whose recursive formula is $a_n = a_{n-1} \cdot 5$ and $a_1 = 3$.

III. Consider the following sequence in *Function Notation*:

$$f(1) = 5, f(2) = 10, f(3) = 20, f(4) = 40 \dots$$

1. What would this sequence look like?
2. Is it geometric? Why or Why not?
3. What is the common ratio?
4. What is $f(7)$?
5. Write 2 possible recursive formulas.

IV. A geometric sequence is defined by the recursive formula:

$$A(n) = A(n - 1) \cdot 4 \text{ for } n \geq 2 \text{ and } A(1) = 2$$

1. Find the fourth term of the sequence.
2. What does $A(6)$ represent?

3. Write another recursive formula to represent the sequence above.

V. For each of the following situations, find the common ratio (r), write a recursive formula, and identify a_6 .

1. -2, 6, -18, 54...

2. $\frac{2}{5}, \frac{4}{15}, \frac{8}{45}, \dots$

3. James started a job with a weekly salary of \$400. After one year, and for each year that followed, his weekly salary was increased by 10%.

VI. For each of the following recursive rules, list the first four terms of the sequence.

1. $a_{n+1} = a_n \cdot 2$ and $a_1 = -4$

2. $F(n) = 3F(n - 1)$ and $F(2) = 21$

3. $B(n + 1) = \frac{1}{2}B(n)$ and $B(1) = -2$

**VII. Write the first four terms of the sequence with $a_5 = 48$ and $r = \frac{1}{4}$.
Write a recursive formula to represent the sequence.**

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13.2 HW: Recursive Formulas for Geometric Sequences

Algebra 1

1. For each of the following situations, find the common ratio, a recursive formula, and a_5 .

a. -1, 4, -16, 64...

b. $\frac{1}{2}, \frac{3}{10}, \frac{9}{50}, \frac{27}{250}, \dots$

c. Billy has started paying off his \$1000 loan. Each month, he pays back 10% of the balance. The following values are how much he still owes on his loan after each payment.

\$900, \$810, \$729, \$656.10...

2. For each of the following recursive rules, list the first four terms of the sequence:

a. $a_{n+1} = a_n \cdot 2$ and $a_1 = 2.5$

b. $F(n) = F(n - 1) \cdot \frac{1}{5}$ and $F(2) = 100$

c. $C(n + 1) = 3C(n)$ and $C(1) = 4$

3. Write the first four terms of the sequence with $a_5 = 96$ and $r = \frac{1}{2}$.
Write a recursive formula to represent the sequence.