Algebra 1   7.7 $\times$ r rule

Identify and generate geometric sequences
Relate geometric sequences to exponential
functions
sequence
＋ arithmetic sequence (3.5)
geometric sequence
common ratio
whiteboards

Arithmetic or geometric? Explain.

2A. $-3, 15, -75, 375, \ldots$

g r=-5

2B. $24, 36, 54, 81, \ldots$

g r= 1.5

3, 6, 12, 24, 48...
first term: $a_1 = 3$
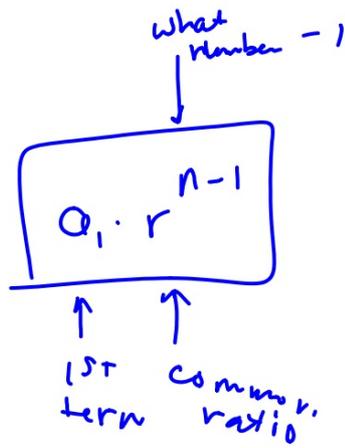common ratio (r): $r = 2$
look for patterns

what number $- 1$

1	3
2	$3 \cdot 2$
3	$3 \cdot 2 \cdot 2$
4	$3 \cdot 2 \cdot 2 \cdot 2$
$\vdots$	
8	$3 \cdot 2^7$
$\vdots$	
21	$3 \cdot 2^{26}$

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

$\uparrow$ 1st term $\uparrow$ common ratio

27. The first term of a geometric series is 2 and the common ratio is 4. What is the 14th term of the sequence?

$a_1 = 2 \quad r = 4$

$$2(4)^{13}$$

134,217,728

28. What is the 15th term of the geometric sequence $-9, 27, -81, \ldots$? $\dfrac{-81}{27}$

$a_1 = -9 \qquad r = -3$

$\dfrac{27}{-9}$

$-9 \cdot (-3)^{14}$

$-43,046,721$

KeyConcept nth term of a Geometric Sequence

The **n**th term a_n of a geometric sequence with first term a_1 and common ratio **r** is given by the following formula, where **n** is any positive integer and $a_1, r \neq 0$.

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

any term   1ST term

Example 3 Find the *n*th Term of a Geometric Sequence

a. Write an equation for the *n*th term of the sequence −6, 12, −24, 48, ...

$$a_1 = -6 \qquad r = -2$$

$$\boxed{a_n = -6(-2)^{n-1}}$$

find a_1
find r
answer the question

b. Find the ninth term of this sequence.

$$a_9 = -6(-2)^8 = \boxed{-1536}$$

3. Write an equation for the nth term of the geometric sequence 96, 48, 24, 12, ...
Then find the tenth term of the sequence.

$$a_1 = 96 \qquad r = \frac{1}{2}$$

$$a_n = (96)\left(\frac{1}{2}\right)^{n-1}$$

$$a_{10} = 96\left(\frac{1}{2}\right)^9 = 0.1875$$

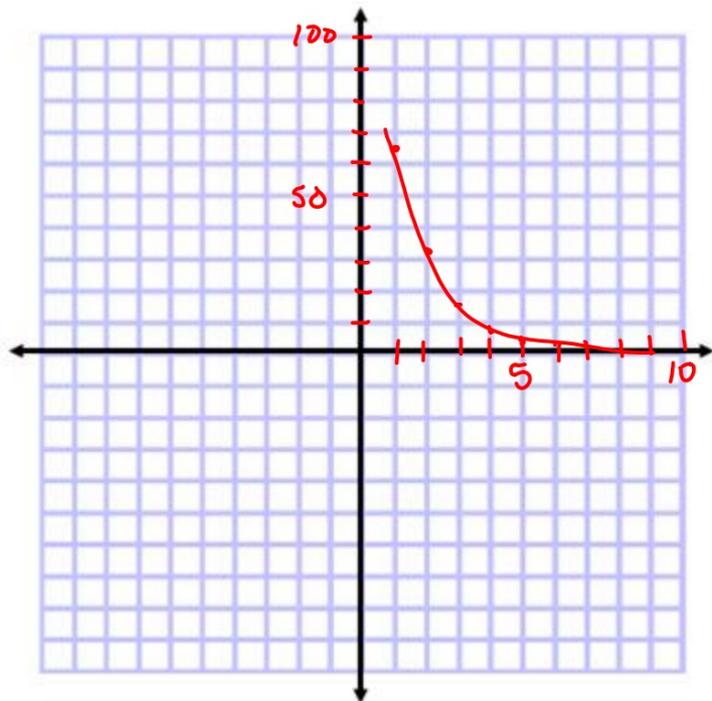## 🌐 Real-World Example 4 Graph a Geometric Sequence

BASKETBALL The NCAA women's basketball tournament begins with 64 teams. In each round, one half of the teams are left to compete, until only one team remains. Draw a graph to represe

term	
1	64
2	32
3	16
4	8
5	4
6	2

(1,64)

$$y = \left(\frac{1}{2}\right)^{x}$$

$a_1 = 3$ $r = 3$ Graph first 5

3   9   27   81   243

WB 7.7

1	3
2	9
3	27
4	81
5	243