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

64, 32, 16, 8, . .

11-3 Geometric Sequences

$r=2$

Objective: Use geometric sequences and find geometric means.

4, 8, 16, 32, 64, . .

A **geometric sequence** is a sequence in which every term after the first is found by multiplying the previous term by a constant r, called the common ratio.

EX 1. 324, 108, 36, 12, 4.

$r=\frac{1}{3}$

$r=\frac{a_2}{a_1}=\frac{108}{324}=\frac{1}{3}$

EX 2. 8, 20, 50, 125, 312.5

$r=\frac{a_2=20}{a_1\ 8}=2.5$

×2.5

No Rounding

nth term of a geometric sequence.

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

n=any positive integer.

a_n=nth term | a_1=first term | r=common ratio

EX 3. Find the 6th term of the geometric sequence for which $a_1=-3$, r=-2.

way 1

$\underset{a_1}{-3}, 6, -12, 24, -48, \underset{a_6}{96}$

$a_6=96$

way 2:

$a_n=a_1(r)^{n-1} \rightarrow a_6=-3(-2)^{6-1}=$

n=

5

1

96

EX 4. Write an equation for the nth term of the geometric sequence 5, 10, 20, 40, ...

"General"

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

$a_1=5$ $r=2$

$a_n=5(2)^{n-1}$

EX 5. Find the 7th term of the geometric sequence for which $a_3=96$, r=2.

n=7

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

$a_7=24(2)^{7-1}$

$\underset{a_1}{24}, \underset{a_2}{48}, \underset{a_3}{96}$

$a_7=1536$

Geometric Means: are the missing terms between 2 non-successive terms of a geometric sequence.

EX 6. Find the 3 geometric means between 2.25 and 576.

$r=4$ $\quad 2.25,\ \_\_,\ \_\_,\ \_\_,\ 576$ (a_1, a_5)

We need "r"!

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

$\frac{576}{2.25} = \frac{2.25(r)^{5-1}}{2.25}$

$\sqrt[4]{256} = \sqrt[4]{r^4}$

$r = \pm 4$

OR

$r=-4$ $\quad 2.25,\ -9,\ 36,\ -144,\ 576$

Condensed Answer

$2.25,\ \pm 9,\ 36,\ -144,\ 576$