

1.3 Geometric Sequences

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Geometric \rightarrow Multiply by the same number to get each consecutive term.

Common ratio(r) \rightarrow the number you multiply by.

3, 6, 12, 24 ... $r = 2$

64, 32, 16, 8 ... $r = 1/2$

5, -15, 45, -135 ... $r = -3$

-2, -6, -18 ... $r = 3$

* If the sequence is decreasing, r is a fraction where $-1 < r < 1$.

$$r = \frac{t_{n+1}}{t_n}$$

General Term: $t_n = t_1(r)^{n-1}$

Ex. 1 Find the first 4 terms of a sequence if $t_1 = 4$ and $r = -2$

General Term $t_n = 4(-2)^{n-1}$ $n=1$ $t_1 = 4(-2)^{1-1}$

$t_4 = 4(-2)^{4-1}$ $t_3 = 4(-2)^{3-1}$ $t_2 = 4(-2)^{2-1}$ $t_1 = 4(-2)^{0}$

$t_4 = 4(-2)^3$ $t_3 = 4(-2)^2$ $t_2 = 4(-2)^1$ $t_1 = 4(1)$

$t_4 = 4(-8)$ $t_3 = 4(4)$ $t_2 = 4(-2)$ $t_1 = 4$

$t_4 = -32$ $t_3 = 16$ $t_2 = -8$

4, -8, 16, -32

Ex. 2 Write the general term:

4, 2, 1, 1/2, ...

$t_n = 4(1/2)^{n-1}$ $r = 1/2$ $t_1 = 4$

Ex. 3 In a geometric sequence $t_3 = 54$ and $t_6 = -1458$. Find t_1 and r .

$t_1 = \frac{54}{r^2}$ $\frac{-1458}{64} = \frac{54r^3}{64}$

$t_2 = \frac{54}{r}$ $-27 = r^3$

$t_4 = 54r$ $-3 = r$

$t_5 = 54r^2$ $t_1 = 6$

$t_6 = -1458 = 54r^3$

Ex. 4 In a sequence $t_2 = 10$ and $t_6 = 160$. Write the general term.

$$t_1 = 5$$

$$t_2 = 10$$

$$t_3 = 10r$$

$$t_4 = 10r^2$$

$$t_5 = 10r^3$$

$$t_6 = 160 = 10r^4$$

$$\frac{160}{10} = \frac{10r^4}{10}$$

$$16 = r^4$$

$$2 = r$$

general term

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

Ex. 5: The color of some clothing fades over time when washed. Suppose a pair of jeans fades by 5% with each washing.

a) Write a general term to represent the % of colour left after each wash.

$$t_1 = 100 \rightarrow \text{No washes}$$

$$r = 0.95$$

$$t_n = 100(0.95)^{n-1}$$

b) How much color is left after 100 washes?

$$t_{101} = 100(0.95)^{101-1}$$

$$t_{101} = 100(0.95)^{100}$$

$$t_{101} = 0.59\%$$

Pg. 39-40 # 1-5, 7, 9