Geometric Progression

This contains a common Ratio, among or between the elements.

* Geometric sequence is also known as Geometric Progression ie GP.

* Geometric Progression is a discrete analogue of exponential function $f(x) = ar^x$.

For Example

$a_n = (1/2)^n$ for $n = 0, 1, 2, 3$

sol^n: $-1, 1/2, 1/4, 1/8$

* Here example

Normal sequence: $\{2, 4, 8, 16, 32\}$

Here we use division, since difference is not applicable.

$\frac{a_2}{a_1} = 2$ $\frac{a_4}{a_3} = 2$

$\frac{a_3}{a_2} = 2$ and so on

If the ratio remains same, then the sequence that is said to be Geometric progression, GP.

Geometric progression:

$a + ar + ar^2 + \dots + ar^n$

$r = $ common ratio

$a = $ initial term.

nth term of geometric Progression: $\boxed{a_n = a_1 r^{n-1}}$

Arithmetic Progression

An arithmetic progression is a sequence of the form

$a, a+d, a+2d, \dots, a+nd \dots$

where, the initial term 'a' and the common difference 'd' are real numbers.

* The Arithmetic Progression is a discrete analogue of the linear function, $f(x) = dx + a$

For example:-
the sequence $2, 4, 6, 8 \dots$ is an arithmetic Progression/sequence with common difference 2.

How we can find the common difference of an AP?

→ Just by finding the difference between any two adjacent terms

The following sequence is an AP with common difference 5 and initial term 0. For example:

0   5   10   15   20   25
  5   5   5   5   5

Example

Example

* Write down the 8th term in Geometric Progression, $1, 3, 9 \dots$

$a_1 = 1, a_2 = 3, a_3 = 9, n = 8$

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

$a_8 = a_1 r^{8-1} = (3)^7 (1) = 2187$

Definition

A sequence is a function from a subset of the set of integers to a set S.

Notation

We use the notation a_n to denote the image of the integer n. We call a_n an nth term of the sequence.

$\{a_1, a_2, a_3, a_4\}$

Example

Consider the sequence $\{a_n\}$ where, $a_n = 1/n$. The list of the term of this sequence beginning with a1, namely: a1, a2, a3 ... starts with

$1, 1/2, 1/3, \dots$

SEQUENCE

Types

Depending on the function type, the sequence is divided into two types. They are:-
1) Arithematic progression
2) Geometric progression

Number of Elements

— Depending on the number of elements there are two types. They are:-
1) Finite sequence 2) Infinite sequence

Example

infinte $- \{1, 2, 3, 4, 5 \dots\}$

finite $- \{2, 4, 5\}$

Explained more with example.

$S_n = -1 + 4n$

for $n = 0, 1, 2, 3$

sol^n: $-1, 3, 7, 11 \dots$

⊞ Common difference of AP.

Suppose, $a_1, a_2, a_3, \dots a_n$, is an AP. then, the common difference "d" can be obtained as:

$\boxed{d = a_2 - a_1 = a_3 - a_2 = \dots = a_n - a_n}$

d can be positive, negative or zero.