How to Solve: Arithmetic and Geometric Progression

By [BrushMyQuant](#)

YouTube Video Link to this Post is [Here](#)

Following is Covered in this post

Theory

- What is Arithmetic Progression (AP)?
- AP Formulas
- AP Problems
- What is Geometric Progression (GP)?
- GP Formulas
- GP Problems
- Miscellaneous Problems

What is Arithmetic Progression (AP)?

A sequence of numbers such that the difference between the consecutive terms is constant. It is also known as Arithmetic Sequence or Arithmetic Series
Example: 2 , 5 , 8 , 11…. (Consecutive terms have the same common difference of 3)

AP Formulas

- **N^{th} Term of an Arithmetic Series**

  Arithmetic Series is given by a , a+d, a+2d,...
  $T_1 = a = a + (1-1)d$
  $T_2 = a + d = a + (2-1)d$
  $T_3 = a + 2d = a + (3-1)d$
  .
  .

$T_n = a + (n-1)d$

- **N^{th} of an Arithmetic Series, T_n = a + (n-1)d**
  where,
  a is the first term of the sequence
  d is the difference between consecutive terms in the sequence (common difference)
  n is the number of terms
  T_n is the nth term in the sequence

- **Sum of n terms of a AP is given by**

  $S_n = \frac{n}{2}[2a+(n-1)d]$

  $S_n = n * \frac{(a+(a+(n-1)d))}{2}$
  S_n = Number of terms * Mean of First term and Last term

- **Number of terms in an AP is given by**

  n = $(T_n-T_1)/d+1$

- **For Arithmetic Series**

Mean = Median = Avg. of 1st and Last term = Avg. of 2nd term from the starting and second term from the end = Avg. of 3rd term from the starting and third term from the end and so on....

AP Problems

Q1. Find the number of terms in the series 3,4,5,…,21

Sol: Number of terms = 19, Check Video for solution

Q2. Find the sum of first "n" positive integers (i.e. 1 + 2 + 3 +… + n)

Sol: Series is given by 1, 2, 3, 4, …, n

Sum of the series

= Number of terms * Mean of First and Last term

= n * $\frac{(1+n)}{2}$

Sum of first n positive integers = $\frac{(n*(n+1))}{2}$

- Sum of First n Positive integers

    Sum of first n integers = $\frac{(n*(n+1))}{2}$

    This can be used only when

    - Terms are starting from 1 and
    - Series comprises of consecutive integers

Q3. Find the sum of first 50 positive integers.

Sol. 1275. Check Video for solution

Q4. Find the sum of all the integers between 40 and 100 inclusive.

Sol. 4270. Check Video for solution

Q5. Which term of the sequence 1,4,7,10,… is 43?

Sol. 15. Check Video for solution

Q6. If the first term of a sequence is 2, the last term of the sequence is 44 and the number of terms is 15. Find the sum of all the terms of the sequence?

Sol. 345. Check Video for solution

What is Geometric Progression (GP)?

- Geometric Series is a series in which consecutive terms have the same ratio.
- It is also known as Geometric Sequence or Geometric Series
- Example: 2 , 6 , 18 , 54…. (Consecutive terms have the same ratio of 3:1)

GP Formulas

Nth Term of a Geometric Series

Geometric Series is given by

$a, ar, ar^2, ar^3, \ldots, ar^{n-1}$
$T_1 = a = ar^{1-1}$
$T2 = ar = ar^{2-1}$
$T3 = ar^2 = ar^{3-1}$
.
.
$T_n = ar^{n-1}$

Sum of n terms of a GP is given by

$$S_n = a\frac{r^n - 1}{r - 1}$$

GP Problems

Q1. Find the sum of first 10 terms of a Geometric series whose first term is 3 and common ratio is 2.

Sol. 3069. Check Video for solution

Q2. Which term of the geometric series 4,8,16,… is 4096?

Sol. 11. Check Video for solution

Miscellaneous Problems

Following is not an Arithmetic or a Geometric series. Find the nth term of this series T_n of the series:

1. 1, 4, 9, 16,…
2. 1, 8, 27, 64, …
3. 2, 5, 10, 17,…
4. 2, 9, 28, 65,…
5. 2, 6, 12, 20,…
6. 2, 4, 8, 16, …
7. 1, 2, 3, 4, 5, 8, 7, 16,…
8. 1, 2, 3, 5, 8, 13,…
9. 1, 2, 2, 4, 8, 32, …

Sol. **Check Video for solution**
1. $T_n = n^2$
2. $T_n = n^3$
3. $T_n = n^2 + 1$
4. $T_n = n^3 + 1$
5. $T_n = n^2 + n$
6. $T_n = 2n$
7. $T_{Odd} = n$, $T_{Even} = 2^{n/2}$
8. $T_n = T_{n-1} + T_{n-2}$ for $n >= 3$
9. $T_n = T_{n-1} * T_{n-2}$ for $n >= 3$

Hope it Helps!