Arithmetic Progression

Let us begin by understanding what arithmetic progressions is, Arithmetic Progression can be simply defined as a series of numbers wherein the difference between any of the 2 consecutive numbers is always the same. For Example, In a given series of natural numbers, i.e., 6, 7,8,9,10, …n, we can say that the series is an arithmetic progression as the difference between 2 consecutive terms (7 and 8 or 6 and 7) is equal to 1 (7-6).

If we consider a series of odd numbers and one of even numbers, then it will be an AP as the common difference between any two consecutive terms of the respective series is equal to 2.

According to the class 10 arithmetic progression chapter, In an arithmetic progression, the series refers to the sum of elements of the successive numbers. The difference between one term and its next term is always constant in AP.

We can say, if we just add similar values or numbers to the previous numbers every time, the result will be constant. This property can be understood from the below-mentioned formula:

$$a1 + an = a2 + an-1 = \ldots = ak + an-k+1 \text{ and } an = \tfrac{1}{2}(an-1 + an+1)$$

Now that we are through the theoretical understanding of class 10 arithmetic progression, let us move forward and understand the concept through solved examples.

Example 1: Find the AP given by x + b, x + 3b, x + 5b,…

Solution 1: Here a = x + b ,

d = x + 3b – (x + b)

d = x + 3b – x – b

∴ d = 2b

The general term of an AP is given by the formula

an = a + (n – 1) d

an = x + b + (n – 1)2b

∴ *an = x + (2n – 1)b*

Arithmetic Progression And The Sequence Of Numbers

In our class 10 arithmetic progression notes, the next topic is the sequence of numbers in AP. When the difference between two successive numbers is always constant, then it can be termed as a sequence. For Example:

- 1, 2, 3, 4, 5… is a sequence, which is arithmetic progression and has a common difference of 1
- 3, 5, 7, 9, 11… is another common sequence that is an arithmetic progression and has a common difference of 2
- In a given sequence, 10, 20, 30, 40, 50… that is arithmetic progression has a common difference of 10

The arithmetic sequence can also be written as:

{ a, a + b, a + 2b, a + 3b, a + 4b, ….}

Where,

a is the first term, and

b is the difference between the terms

Example 2: Which term of the A.P. 3,8,13 …is 78?

Solution: Here an = a + (n – 1) d = 78

a= 3, d = 8- 3 = 5

Therefore,

3 + (n -1) (5) = 78

(n-1) * 5 = 78 – 3 = 75

n – 1 = 75/5 = 15

n = 15 + 1 = 1

Hence, 78 is the 16th term.

Example 3: Which term of the A.P. 3, 15, 27, 39 … will be 132 more than its 54th term?

Solution: Given series is 3, 15, 27, 39…

Here, a =3, d= 15-3 = 12

Since an = ak = (n-k) d

an – a54 = (n-54) 12

132 = 12n – 54 * 12 …..(since an – a 54 = 132 given)

12 n = 132 + 54 * 12 = 12 (11+ 54)

n= 11 + 54 = 65

Progression and Its Types

As we move further with the class 10 arithmetic progression, we will now learn the various types of progression. Progression is a kind of special sequence of numbers. This makes it possible to determine or obtain the formula of the n^{th} term. Majorly, progressions can be bifurcated into three categories such as:

- Harmonic Progression (HP)
- Geometric Progression (GP)
- Arithmetic Progressions (AP)

The arithmetic progressions (AP) is basically the simplest progression sequence used. It is a difference noticed between any 2 successive terms that are always constant in AP.

Notation In Arithmetic Progressions

Through our class 10 arithmetic progression notes, you are familiar with the definition of AP and when a fixed number can be added to any of its terms which are also known as the common difference in AP. Three major terms denoted in arithmetic progressions are:

- Common difference
- nth term
- Sum of the nth term

All of them represent the properties of an arithmetic progression.

Uses Of Arithmetic Progressions

Arithmetic progressions are used to set or generalize a pattern in observable studies.

To calculate the sum of an AP, it is vital to have the first term, common differences between the terms and number of all the terms. The general formula to find the *n*th term is:

$$an = a + (n-1) \times d$$

Alternative formula is, $S = n/2\ [\ 2a + (n-1) \times d]$

The *n*th Term of the Arithmetic Progression

The formula for obtaining the *n*th term of an AP is a = a + (n+1) d.

In this formula, a is the initial term in the arithmetic sequence while d is the common difference between the terms.

Both of these values can either be a negative or a positive integer. It is because the actual value of the arithmetic sequence can be a negative value, and the difference between any two sequences can be a negative integer.

n is also a number in terms of an arithmetic sequence. As negative integers are not used to count anything, the value of the *n*th term in the formula will not be a negative integer.

In the formula of AP the sum of the progression term with ‘n’ term, ‘a’ as the first term, and ‘d’ as the common difference are given as:

$$S = n/2\ [2a + (n-1)\ d]$$

Example 4: Find the 15th term of the arithmetic progression 3, 9, 15, 21,….?

Solution: In the given AP, a = 3, d = (9 – 3) = 6, n =15

T15 = a + (n – 1)d

= 3 + (15 -1)6

= 3 + 84 = 87

Thus, we hope that through this blog about class 10 Maths arithmetic progression, you are now through with one of the most essential topics of class 10th. Reach out to our Leverage Edu experts for assistance regarding career guidance and stream selection.