Chapter-Arithmetic Progressions

1. Introduction to Arithmetic Progression (AP)

An Arithmetic Progression is a sequence where the difference between any two consecutive terms is constant.

Example 1:
Identify if the sequence 2, 5, 8, 11, 14 is an AP.
Solution: Yes, it's an AP. The common difference is 3.

Example 2:
Is 3, 9, 27, 81 an AP?
Solution: No, it's not an AP. The difference between consecutive terms is not constant.

2. nth Term of an AP

The nth term of an AP is given by the formula: $a_n = a + (n - 1)d$
Where a is the first term, n is the position of the term, and d is the common difference.

Example 1:
Find the 10th term of the AP: 3, 7, 11, 15, ...
Solution:
$a = 3$, $d = 4$
$a_{10} = 3 + (10 - 1)4 = 3 + 36 = 39$

Example 2:
In an AP, if the 3rd term is 12 and the 7th term is 24, find the 10th term.
Solution:
$a_3 = a + 2d = 12$
$a_7 = a + 6d = 24$
Subtracting: $4d = 12$
$d = 3$
$a + 2d = 12$
$a = 6$
Now, $a_{10} = 6 + (10 - 1)3 = 33$

3. Sum of n Terms of an AP

The sum of n terms of an AP is given by:
$S_n = n/2[2a + (n - 1)d]$ or $S_n = n/2(a + l)$, where l is the last term.

Example 1:
Find the sum of the first 20 terms of the AP: 2, 5, 8, 11, ...
Solution:
$a = 2$, $d = 3$, $n = 20$

$S_{20} = 20/2[2(2) + (20 - 1)3]$

$= 10[4 + 57]$

$= 10 \times 61 = 610$

Example 2:

The sum of first n terms of an AP is 430. If the first term is 10 and the last term is 38, find n.

Solution:

$S_n = n/2(a + l)$

$430 = n/2(10 + 38)$

$430 = 24n$

$n = 430/24 \approx 17.92$

Since n must be a whole number, n = 18