Basic Concepts

1. Some numbers arranged in a definite order, according to a definite rule, are said to form a **sequence**.
2. A sequence is called an **arithmetic progression** (AP), if the difference of any of its terms and the preceding term is always the same i.e. $a_{n+1} - a_n$= constant
3. The constant number is called the **common difference** of the A.P.
4. If a is the first term and d the common difference of an A.P., then the general form of the A.P. is $a, a+d, a+2d,$ ... ...
5. Let a be the first term and d be the common difference of an A.P., its n^{th} term or general term is given by $a_n = a + (n-1)d$
6. If l is the last term of the A.P., then nth term from the end is nth term of an A.P., whose first term is l and common difference is $-d$.
   $\therefore$ nth term from the end = last term + $(n-1)(-d)$
   $\Rightarrow$ nth term from the end = $l - (n-1)d$
7. If a, b, c are in A.P., then

(i) $(a+k), (b+k), (c+k)$ are in A.P.
(ii) $(a-k), (b-k), (c-k)$ are in A.P.
(iii) ak, bk, ck are in A.P.
(iv) $\frac{a}{k}, \frac{b}{k}, \frac{c}{k}$ are in A.P.

8. Remember the following while working with consecutive terms in A.P.

(i) Three consecutive terms in an A.P. $a-d, a, a+d$
First term = $a-d$, common difference = d
Their sum = $a - d + a + a + d = 3a$

(ii) Four consecutive terms in an A.P. $a-3d, a-d, a+d, a+3d$
First term: $a-3d$, common difference = $2d$
Their sum = $a - 3d + a - d + a + d + a + 3d = 4a$

(iii) Five consecutive terms in an A.P. $a-2d, a-d, a, a+d, a+2d$
First term = $a-2d$, common difference = d

9. The sum S_n up to n terms of an A.P. whose first term is a and common difference d is given by $S_n = \frac{n}{2}[2a + (n-1)d]$
10. If the first term and the last term of an A.P. are a_1 and a_n, then $S_n = \frac{n}{2}(a_1 + a_n) = \frac{n}{2}(first\ term + last\ term)$

    If $a_1 = a$, the first term and $a_n = l$, the last term, then $S_n = \frac{n}{2}(a + l)$
11. $S_n - S_{n-1} = a_n$