MATHEMATICS Chapter–5

Arithmetic Progression

EXERCISE 5.3

3. In an AP:

Soln:- **(……Contd)**

(v) given $d = 5$, $S_9 = 75$, find a and a_9

Here $S_9 = 75$

$d = 5$

We know that

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

$$S_9 = \frac{9}{2}[2a + (9-1)d]$$

$$S_9 = \frac{9}{2}[2a + 8d]$$

$$S_9 = 9(a + 4d)$$

$$S_9 = 9(a + 4x5)$$

$$S_9 = 9(a + 20)$$

$$75 = 9a + 180$$

$$9a = 75 - 180$$

$$9a = -105$$

$$a = -105/9$$

$$a = 35/3$$

We know that

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

$a_9 = a + (9-1)(d)$

$a_9 = a + 8(d)$

$$a_9 = -\frac{35}{3} + 40$$

$$a_9 = \frac{-35 + 120}{3}$$

$$a_9 = \frac{85}{3}$$

(vi) given $a = 2$, $d = 8$, $S_n = 90$, find n and a_n.

Soln:- *Here* $a = 2$,

$d = 8$,

$S_n = 90$,

We know that

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

$$90 = \frac{n}{2}[2(2) + (n-1)8]$$

$$90 = n(2 + (n-1)4)$$

$$90 = n[2 + 4n - 4]$$

$$90 = n(4n - 2)$$

$$90 = 2n(2n - 1)$$

$$45 = n(2n - 1)$$

$$45 = 2n^2 - n$$

$$2n^2 - n - 45 = 0$$

$$2n^2 - 10n + 9n - 45 = 0$$

$$2n(n-5) + 9(n-5) = 0$$

$$(n-5)(2n+9) = 0$$

$$n - 5 = 0$$

$$n = 5$$

We know that

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

$a_n = 2 + (5-1)(8)$

$a_n = 2 + 4(8)$

$a_n = 2 + 32$

$a_n = 34$

(vii) given $a = 8$, $a_n = 62$, $S_n = 210$, find n and d.

Soln:- *Here* $a = 8$, $a_n = 62$, $S_n = 210$

We know that

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

$62 = 8 + (n-1)d$

$62 - 8 = (n-1)d$

$54 = (n-1)d$

$(n-1)d = 54 \ldots\ldots\ldots\ldots (1)$

We know that

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

$$210 = \frac{n}{2}[2(8) + (n-1)d]$$

$$210 = \frac{n}{2}[16 + 54]$$

$$usin\,g(1)$$

$$210 = \frac{n}{2}[70]$$

$$210 = 35n$$

$$n = \frac{210}{35}$$

$$n = 6$$

Putting n= 6 in Equation (1) We get

$(6-1)d = 54$

$5d = 54$

$d = 54/5$

(viii) given $a_n = 4$, $d = 2$, $S_n = -14$, find n and a.

Soln:- *Here* $a_n = 4$,

$d = 2$,

$S_n = -14$

We know that

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

$4 = a + (n-1)2$

$4 = a + 2n - 2$

$4 + 2 = a + 2n$

$6 = a + 2n$

$a + 2n = 6 \ldots\ldots\ldots\ldots (1)$

We know that

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

$$-14 = \frac{n}{2}[2(a) + (n-1)2]$$

$$-14 = n[a + (n-1)]$$

$$-14 = n[a - n - 1]$$

$$-14 = n[6 - n - 1]$$

From(1), $a + 2n = 6$

$a + n = 6 - n$

$-14 = -n^2 + 5n$

$n^2 - 5n - 14 = 0$

$n^2 - 7n + 2n - 14$

$n(n-7) + 2(n-7) = 0$

$(n-7)(n+2) = 0$

$n - 7 = 0$ or $n + 2 = 0$

$n = 7$ or $n = -2$

$n = -2$

(Contd……)